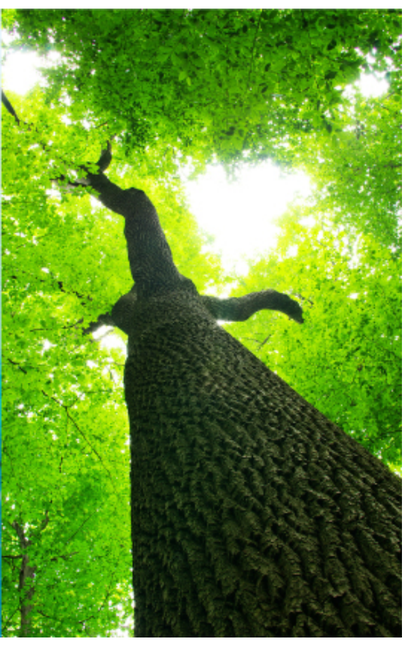
2023 International Conference on Environmental Quality Concern, Control and Conservation





CONFERENCE PROCEEDING

EQC³ 2023

May 04-06, 2023
Taichung & Kaohsiung, Taiwan

National Chung Hsing University
National Kaohsiung University of Sciences and Technology
The Chinese Institute of Environmental Engineering

國立高雄科技大學
National Kaohsiung University of Science and Technology
142 Haizhuan Rd., Nanzi Dist.,
Kaohsiung 81121, Taiwan

9F., No. 283, Sec. 1, Fuxing S. Rd.,
Da'an Dist., Taipei City

國立中興大學
NATIONAL CHUNG HSING UNIVERSITY
145 Xingda Rd., South Dist.
Taichung 40227, Taiwan

EQC^3 2023

2023 International Conference on Environmental Quality Concern, Control and Conservation

May 4-6, 2023
Taiwan

Organized by

National Chung Hsing University, Taichung, Taiwan
National Kaohsiung University of Science and Technology, Kaohsiung, Taiwan
The Chinese Institute of Environmental Engineering, Taiwan

Co-organized by

Seoul National University, Korea
King Mongkut's University of Technology Thonburi, Thailand
University of the Philippine-Diliman, Philippines
Bicol State College of Applied Sciences and Technology, Philippines
Mapua University, Philippines
Vietnam National University, Vietnam
Ho Chi Minh City University of Technology, Vietnam
Universitas 17 Agustus 1945 Surabaya, Indonesia
Arizona State University, USA

Sponsored by

National Science and Technology Council, Taiwan
College of Engineering, National Chung Hsing University, Taiwan
Innovative Center on sustainable Negative-Carbon Resources(iSNR), National Chung Hsing University, Taiwan
National Kaohsiung University of Science and Technology, Taiwan
Ever-Clear Environmental Eng. Corp., Taiwan

TABLE OF CONTENTS

Page

INTRODUCTION

In 2006, the EQC Conference was held first at Chia Nan University of Pharmacy and Science, Taiwan. This Conference was organized multi-nationally to exchange professional as well as academic experiences on the environmental issues of concern such as water, solid waste, hazardous waste, air pollution and environmental quality of different phases. There were delegates from Thailand, Philippines, and Korea participating in this international conference. Afterwards, the EQC is continually organized every year at Chia Nan University of Pharmacy and Science. In 2009 and 2010, the EQC was held at I-Shou University, and Chung-Hwa University of Medical Technology, respectively. In 2011, 2013, 2015, 2017, and 2019, the EQC was held at National Kaohsiung Marine University. In 2022, National Kaohsiung University of Science and Technology and National Chung Hsing University hosted the EQC conference. In 2023, it will continue to be jointly organized by National Chung Hsing University and National Kaohsiung University of Science and Technology.

The Organizing Committee of EQC^3 2023
May 4, 2023

MAIN THEMES

- Water, wastewater and solid waste treatment processes
- Surface water monitoring and modeling
- Groundwater modeling and remediation
- Green and sustainable remediation
- Wastewater reclamation technologies
- Solid waste management and treatment
- Hazardous waste management and disposal
- Air pollution control and pollution prevention
- Air quality monitoring and engineering
- Marine environmental monitoring and conservation
- Environmental quality monitoring, assessment and control
- Environmental legal aspects of concern
- Flood control and hydrodynamic modeling
- Marine monitoring and pollution prevention
- Resources recycling and sustainable engineering
- Climate change and disaster mitigation
- Ecotourism
- Green architecture and design

CONFERENCE ORGANIZING TEAM

Conference Chair

- Distinguished Prof. Ming-Chun Lu,
  National Chung Hsing University, Taiwan.
- Prof. Chitsan Lin,
  National Kaohsiung University of Science and Technology, Taiwan.

Conference Co-Chair

- Assoc. Prof. Siang-Chen Wu,
  National Chung Hsing, University, Taiwan
- Prof. Chien-Chuan Shern,
  National Kaohsiung University of Science and Technology, Taiwan.

Organizing Members

- Prof. Po-Hsiung Lin, National Chung Hsing University, Taiwan
- Assoc. Prof. Chia-Ying Chen, National Chung Hsing University, Taiwan
- Prof. Hui-Hsin Tseng, National Chung Hsing University, Taiwan
- Asst. Prof. Yu-Hao Lin, National Chung Hsing, University, Taiwan
- Prof. Jeyong Yoon, Seoul National University, South Korea
- Assoc. Prof. Jin Anotai, King Mongkut's University of Technology Thonburi, Thailand
- Prof. Florencio C. Ballesteros, University of the Philippines, Philippines
- Assoc. Prof. Anabella C. Vilando, South East Asian University of Technology, Philippines
- Prof. Delia B. Senoro, Mapúa University, Philippines
- Prof. The Anh Luu, Vietnam National University, Vietnam
- Assoc. Prof. Xuan-Thanh Bui, Ho Chi Minh City University of Technology, Vietnam
- Dr. Ir. R. A. Retno Hastijanti, Universitas 17 Agustus 1945 Surabaya, Indonesia
- Asst. Prof. Sergi Garcia-Segura, Arizona State University, USA

International Committee

- Chair Prof. Jimmy C. M. Kao, National Sun Yat-Sen University, Taiwan
- Chair Prof. Tsair-Fuh Lin, National Cheng Kung University, Taiwan
- Prof. Chia-Hung Hou, National Taiwan University, Taiwan
- Asst. Prof. Nonglak Boonrattanakij, King Mongkut's University of Technology Thonburi, Thailand

- Distinguished Prof. Yao-Tung Lin, National Chung Hsing University, Taiwan
- Prof. Justin Chun-Te Lin, Feng Chia University, Taiwan
- Assoc. Prof. Chun-Chi Chen, Feng Chia University, Taiwan
- Assoc. Prof. Yi-Kuo Chang, Central Taiwan University of Science and Technology, Taiwan
- Distinguished Prof. Chih-Hsiang Liao, Chia Nan University of Pharmacy and Science, Taiwan
- Distinguished Prof. Jih-Ming Chyan, Chia Nan University of Pharmacy and Science, Taiwan
- Prof. Meng-Wei Wan, Chia Nan University of Pharmacy and Science, Taiwan
- Assoc. Prof. I-Ming Chen, Chia Nan University of Pharmacy and Science, Taiwan
- Prof. Yao-Hui Huang, National Cheng Kung University, Taiwan
- Assoc. Prof. Yu-Jen Shih, National Sun Yat-Sen University, Taiwan
- Prof. Chih-Huang Weng, I-Shou University, Taiwan
- Prof. Changha Lee, Seoul National University, South Korea,
- Assoc. Prof. Maria Lourdes P. Dalida, University of the Philippines, Philippines
- Prof. Mark Daniel G. de Luna, University of the Philippines, Philippines
- Assoc. Pro. Cybelle Concepcion M. Futalan, University of the Philippines Los Baños, Philippines
- Assoc. Prof. Angelo Earvin Sy Choi, De La Salle University, Philippines
- Assoc. Prof. Nolan C. Tolosa, University of San Agustin, Philippines
- Dr. Ir. Muslimin Abdulrahim, Universitas 17 Agustus 1945 Surabaya, Indonesia
- Asst. Prof. Sergi Garcia Segura, Arizona State University, USA
- Asst. Prof. Van-Giang Le, Vietnam National University, Vietnam

PROGRAM AT A GLANCE

Program schedule, May 4-6, 2023 (May 4 in Taichung and May 5-6 in Kaohsiung)

May 4, 2023 (NCHU, Taichung) *Address:145 Xingda Rd., South Dist., Taichung City, Taiwan*	
08:30 – 09:00	**Registration** (International Conference Hall, College of Science, NCHU)
09:00 – 09:20	**Opening** President Fuh-Sheng Shieh
09:20 – 09:40	**About the EQC^3: historical events, and current progresses** Prof. Ming-Chun Lu
09:40 – 09:50	**Signing memorandum of understanding**
09:50 – 10:00	**Group photo**
10: 00 – 10:40	2050 Carbon Neutrality to Overcome the Climate Crisis and Carbon Neutral Engineering *Prof. Jeyong Yoon*, Seoul National University, South Korea
10:40 – 11:10	**Coffee Break**
11:10 – 11:40	Oil Removal for Industrial Wastewater *Prof. Jin Anotai*, King Mongkut's University of Thonburi, Thailand
11:40 – 12:10	WEEE management from a circular economy perspective: The Case of the Philippines *Prof. Florencio C. Ballesteros, Jr*, University of Philippines-Diliman, Philippines
12:10 – 14:00	**Lunch**
14:00 – 14:30	Microwave Processing of Waste for Circular Waste Management *Prof. Su Shiung Lam*, Universiti Malaysia Terengganu, Malaysia
14:30 – 15:00	Microplastics Pollution in the Marine Environment Prof. Cheng-Di Dong, National Kaohsiung University of Science and Technology, Taiwan
15:00 – 15:30	Energy-efficient desalination and resource recovery using advanced electrochemical separation technologies *Prof. Chia-Hung Hou,* Graduate Institute of Environmental Engineering, National Taiwan University, Taiwan
15:30 – 16:00	Applications of Advanced Technology in Real Wastewater Treatment *Dr. Yujen Huang*, Ever-Clear Environmental Eng. Corp., Taiwan
16:00 – 16:20	**Coffee Break**
16:20 – 17:00	**Panel discussion**
17:30 – 19:30	**Welcome dinner for Keynote speakers**

May 5, 2023 (NKUST, Nanzih Campus Kaohsiung)

Address: No. 142, Haizhuan Road, Nanzi District, Kaohsiung City, Taiwan

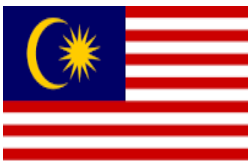
08:00 – 08:30	**Registration (5F, *Conference hall - Chih- Yuan Building*)**					
08:30 – 09:00	**Opening** President: Ching-Yu YANG					
09:00 – 09:30	Developing Innovation Based on Local Wisdom, Towards a Zero Carbon Emission City Case Study: Surabaya, Indonesia *Assoc. Prof. RA Retno Hastijanti,* The University of 17 Agustus 1945 Surabaya					
09:30 – 10:00	Membrane Bioreactor: Recent Advances and Treatment Performance *Assoc. Prof. Xuan Thanh BUI*, Ho Chi Minh City University of Technology, Vietnam					
10:00 – 10:20	**Group Photo/Coffee Break**					
10:20	**Oral Presentation Program** **(15 min for oral presentation, including Q/A)**					
10:20 – 12:20	Session A-1 (2F - Room 3202, Chih-Yuan Building)	Session A-2 (2F - Room 3205, Chih-Yuan Building)	Session A-3 (2F - Room 7205, Da-Hsin Building)	Session A-4 (3F - Room 7304, Da-Hsin Building)	Session A-5 (5F - Room 7508, Da-Hsin Building)	Session A-6 (3F - Room 5305, Hong-De Building)
	EQC-23017	EQC-23038	EQC-23002	EQC-23011	EQC-23019	EQC-23077
	EQC-23001	EQC-23100	EQC-23003	EQC-23016	EQC-23024	EQC-23089
	EQC-23048	EQC-23063	EQC-23070	EQC-23023	EQC-23030	EQC-23090
	EQC-23051	EQC-23028	EQC-23105	EQC-23026	EQC-23074	EQC-23099
	EQC-23006	EQC-23029	EQC-23069	EQC-23032	EQC-23076	EQC-23115
	EQC-23064	EQC-23085	EQC-23072	EQC-23060	EQC-23086	EQC-23013
	EQC-23022	EQC-23078	EQC-23042	EQC-23067	EQC-23087	EQC-23098
	EQC-23065	EQC-23012	EQC-23043	EQC-23108	EQC-23103	EQC-23045
12:20 – 13:30	**Lunch *(Seminar Rooms)***					
13:30 – 15:00	Session B-1 (2F - Room 3202, Chih-Yuan Building)	Session B-2 (2F - Room 3205, Chih-Yuan Building)	Session B-3 (2F - Room 7205, Da-Hsin Building)	Session B-4 (3F - Room 7304, Da-Hsin Building)	Session B-5 (5F - Room 7508, Da-Hsin Building)	Session B-6 (3F - Room 5305, Hong-De Building)
	EQC-23005	EQC-23073	EQC-23007	EQC-23104	EQC-23040	EQC-23118
	EQC-23015	EQC-23107	EQC-23120	EQC-23062	EQC-23034	EQC-23044
	EQC-23041	EQC-23058	EQC-23053	EQC-23071	EQC-23035	EQC-23033
	EQC-23008	EQC-23081	EQC-23054	EQC-23091	EQC-23036	EQC-23052
	EQC-23047	EQC-23049	EQC-23056	EQC-23109	EQC-23037	EQC-23009
	EQC-23018	EQC-23080	EQC-23004	EQC-23021	EQC-23097	EQC-23094
15:00 – 15:20	**Coffee Break/Poster Session (*2F – Chih-Yuan Building, 3F – Da-Hsin Building*)**					

15:20 – 16:50	Session C-1 (2F - Room 3202, Chih-Yuan Building)	Session C-2 (2F - Room 3205, Chih-Yuan Building)	Session C-3 (2F - Room 7205, Da-Hsin Building)	Session C-4 (3F - Room 7304, Da-Hsin Building)	Session C-5 (5F - Room 7508, Da-Hsin Building)	Session C-6 (3F - Room 5305, Hong-De Building)
	EQC-23095	EQC-23088	EQC-23057	EQC-23093	EQC-23014	EQC-23025
	EQC-23116	EQC-23075	EQC-23059	EQC-23079	EQC-23082	EQC-23046
	EQC-23010	EQC-23106	EQC-23110	EQC-23061	EQC-23083	EQC-23096
	EQC-23027	EQC-23066	EQC-23068	EQC-23111	EQC-23113	EQC-23102
	EQC-23101	EQC-23039	EQC-23084	EQC-23119	EQC-23114	EQC-23112
	EQC-23092	EQC-23055		EQC-23121		
17:00 – 17:30	**Closing Ceremony (*5F, Conference hall -Chih- Yuan Building*)**					
18:00 – 20:00	**Farewell dinner (invited only)** *Address: No. 205, Fude 2nd Rd., Lingya Dist., Kaohsiung City, Taiwan* **享溫馨 KTV-Jianguo**					
May 6, 2023						
08:30 – 17:00	**Technical tour (invited only)**					

Especially thanks for the contribution of almost 250 academics from eight countries to EQC³ 2023


Australia


Indonesia


Malaysia


Philippines


South Korea


Taiwan


Thailand

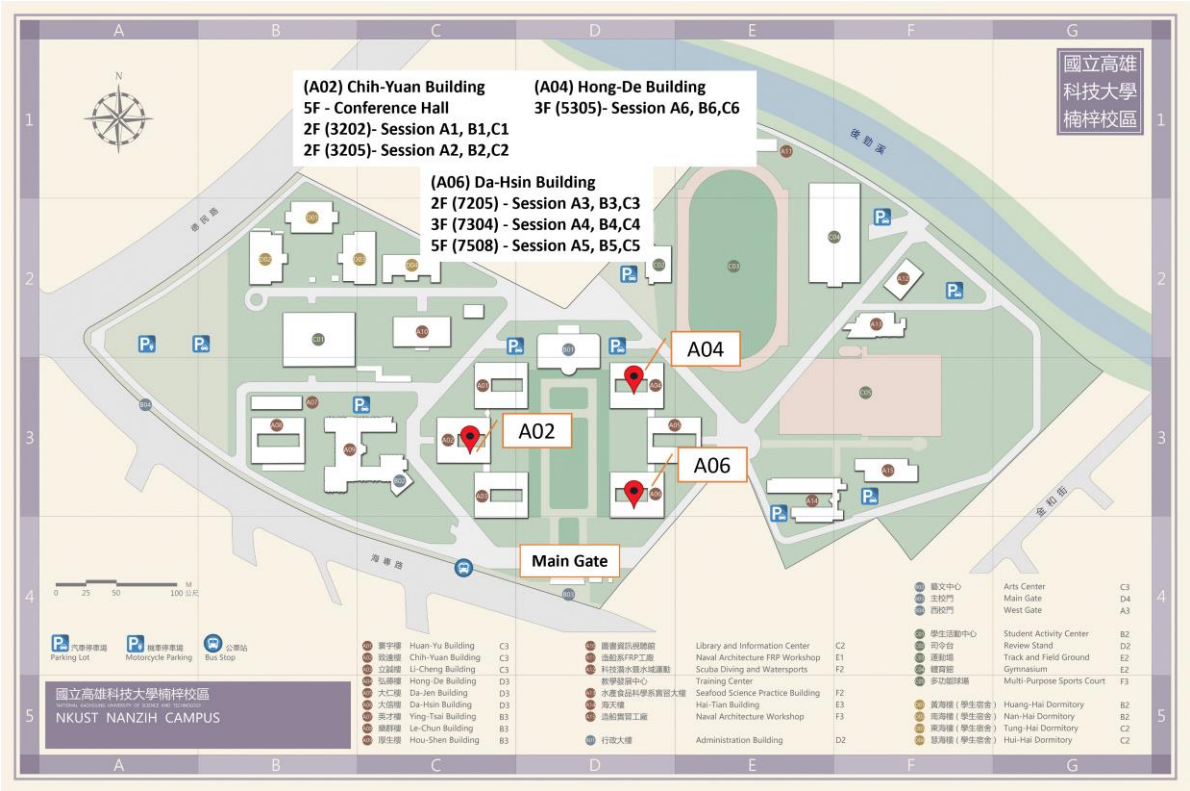

Vietnam

NCHU Map

Map to NCHU

1. Orange Line from Wucyuan West Road Interchange: Wucyuan W Rd. turn right →Wucyuan S.Rd. turn left → Cingda Rd. go straight → NCHU
2. Blue Line from Taichung Port Rd Interchange : Taichung Port Rd turn right →Yingcai Rd.→Guoguang Rd.→turn right → NCHU
3. Green Line from Taichung Train station: Taichung Rd. turn right → Xingda Rd. → NCHU

NKUST-Nanzih Campus Map



Go to NKUST-Nanzih Campus:

1. By Bus

Take the following bus and get off at the University (Nanzih Campus): 6, 29, 28, 301

2. By Train

(1) After arriving at Nanzih Station, transfer to bus 6 or 29 to the University (Nanzih Campus)
(2) After arriving at Kaohsiung Station, transfer to bus 28 or 301 and get off at Houjin Junior High School

3. By Taiwan High Speed Rail

After arriving at Zuoying Station, take the MRT Red Line to **R20 Houjin Station (Exit 2)** and walk about 100 meters.

4. By MRT

Take the MRT Red Line to **R20 Houjin Station (Exit 2)** and walk about 100 meters.

5. By Car

(1) Route 1: Exit at Nanzih Interchange to downtown → Nanyang Rd. → Cinan Rd. → Tuku 1st Rd. → Haijhuan Rd.
(2) Route 2: Exit at Gangshan Interchange to downtown → Nanyang Rd. → Jiachang Rd. → Haijhuan Rd.
(3) Route 3: Take Taiwan Provincial Highway 1 to Gaonan Bridge to the direction of Kaohsiung, drive on Jiachang Rd. and turn right to Haijhuan Rd.

ORAL PRESENTATION PROGRAM

Session A-1 Chair: Assoc. Prof. Erison C. Roque

Co-Chair: Asst. Prof. Thanh-Binh Nguyen

Time	Topic Name	EQC-No.
10:20 – 10:35	Recovery of cobalt and copper in the presence of complexing agents using fluidized-bed homogeneous granulation process *Nonglak Boonrattanakij, Suthinee Puangsuwan, Anabella C. Vilando , Ming-Chun Lu*	EQC-23017 (p.60)
10:35 – 10:50	Application of Calcium-based Chemical Oxo-Precipitation (Ca-COP) Process to Remove Boron from Flue Gas Desulfurization Wastewater *Nicolaus Nezha Nunez Mahasti, Yao-Hui Huang*	EQC-23001 (p.44)
10:50 – 11:05	Application of nano zero-valent iron coated Carboxymethyl Cellulose on removal of wastewater contained Congo Red dye *Phuong-Thao Nguyen, Ngoc Minh-Thu Vuong, Thi Dieu-Hien Vo, Thi Kim-Quyen Vo, Huu-Vinh Nguyen, Pham Hong-An Nguyen, Thi Thuy-Hoa Le, Thi Tuyet-Nhung Hoang, Xuan-Thanh Bui*	EQC-23048 (p.88)
11:05 – 11:20	Application of Fluidized Bed Homogeneous Crystallization for Simultaneous Recovery of Fe and Cu as Particles from Wastewater *Laurencia Wiryana Effendi, Nicolaus Nezha Nunez Mahasti, Yao-Hui Huang*	EQC-23051 (p.90)
11:20 – 11:35	Recovery of Struvite from Swine Wastewater using Fluidized Bed Homogeneous Crytallization Process *Van-Giang Le, Xuan-Hong Nguyen, Gia-Cuong Nguyen, The-Anh Luu*	EQC-23006 (p.49)
11:35 – 11:50	Fluidized Bed Homogeneous Crystallization (FBHC) : A novel method for recovery of tungsten as iron(III) oxytungstate from synthetic wastewater *Yao-Chang Chuang, Yao-Hui Huang*	EQC-23064 (p.103)
11:50 – 12:05	Copper recovery from treatment of simulated copper-iron wastewater using fluidized bed homogeneous crystallization reactor *Jayson Sime D. Jeremias, Maria Lourdes P. Dalida, Ming-Chun Lu*	EQC-23022 (p.64)
12:05 – 12:20	The recovery of sulfur as ZnS particles from sulfide-contained wastewater using fluidized bed homogeneous crystallization technology *Hsu-Hua Chang, Po-Lin Liao, Yao-Hui Huang*	EQC-23065 (p.104)
12:20 – 13:30	Lunch Time	

Session A-2 Chair: Assoc. Prof. Christine Schönberg

Co-Chair: Asst. Prof. Seigfreid Kempis

Time	Topic Name	EQC-No.
10:20 – 10:35	Experimental study on the bubble size from multi-hole Venturi jet at different temperatures and salinity *Ming-Yu Sun, Jian-Chuan Shern, Yi-An Liao*	EQC-23038 (p.78)
10:35 – 10:50	Effects of light intensity and electrical stimulation on cultivating the reef coral, Pocillopora acuta and crustose coralline algae *Hsing-Chuan Chiang, Jian-Chuan Shern, Tung-Yung Fan*	EQC-23100 (p.139)
10:50 – 11:05	The aeration effect of hollow propeller aerator with different number of paddles and multiple holes in water *Guo-Zhan Hong, Jian-Chuan Shern*	EQC-23063 (p.102)
11:05 – 11:20	Hypo Sludge and Seawater as Partial Replacements to Cement and Freshwater in the Production of Concrete Hollow Blocks *Rose Daianne D. Bernardino, Lisette Jasper R. Dupalco, Earl Tristan M. Serna, Jerome Jordan F. Famadico*	EQC-23028 (p.69)
11:20 – 11:35	Metals in brackish and marine water fish, its spatial distribution and human health implications: The case in PPC, Philippines *Maria Mojena G. Plasus, Ronnel C. Nolos, Alejandro Felipe B. Gorospe, Allaine T. Baaco, Chitsan Lin and Delia B. Senoro*	EQC-23029 (p.70)
11:35 – 11:50	Assessment on the Learning Environment of Zoological Park: METAMORPHOSIS, Rethinking Malabon Zoo through Immersive Design to Enhance Visitor's Experience and Animal Welfare *Rheniel Vincent B. Sevilla, and Arianne Joy Q. Dullas*	EQC-23085 (p.124)
11:50 – 12:05	Comparative evaluation of inorganic and chitosan coagulants for flocculation of algae Chlorella Vulgaris *Tran Phung Nha-Thuyen, Tran Bui-Phuc*	EQC-23078 (p.117)
12:05 – 12:20	Correlation of Harmful Algal Bloom Occurrence with Water Quality and Climate Characteristics in Malampaya Sound, Taytay, Palawan, Philippines *Lutgardo B. Alcantara, Lota A. Creencia, John Roderick V. Madarcos, Karen G. Madarcos, Joel D.C. Sumeldan, Cristobal B. Cayetano, Arlene L. Avillanosa1, Victoria Cheung*	EQC-23012 (p.55)
12:20 – 13:30	Lunch Time	

Session A-3 Chair: Assoc. Prof. Kuo Shu-Lung

Co-Chair: Asst. Prof. John Manuel B. Vergel

Time	Topic Name	EQC-No.
10:20 – 10:35	Bioswale Design Optimization to Maximize the Efficiency of Reducing Surface Water Runoff *Lady Lyn Escarieses, Rico Rhen C. Aguilar, Raquelle N. Alcantara, Sarah Jane A. Aquino, Mary Ann Pauline I. Piedra, Florante D. Poso Jr., Bon Ryan P. Aniban*	EQC-23002 (p.45)
10:35 – 10:50	Sustainable Drainage System: Assessment of The Optimum Lid Practices to Minimize the Storm Water Runoff *Lady Lyn Escarieses, Mico V. Buenconsejo, James Bryan R. Galang, Jose Patricio R. Lagrata, Roshel Ann T. Marcelino, Florante D. Poso Jr.*	EQC-23003 (p.46)
10:50 – 11:05	Rainwater Harvesting: its Water Quality, Health Impacts, and Treatment Technologies in Drinking Water *Decerie Dawn Guardiano, Joshua Philip Rosario, Klein Kenneth Bartolome,and Carl Francis Z. Lacson*	EQC-23070 (p.109)
11:05 – 11:20	Inundation Analysis for A Proposed Detention Basin Using Environmental Protection Agency Stormwater Management (Epa-Swmm) Model at Barangay Saog, Marilao, Bulacan *Duane Ikhail A. Badua, Romeo B. Donato Jr., Russell Mae A. Hernandez, Shayrence Twayle T. Saplaco, Carlos Jerome SJ. Tuazon, Ian Gail D. Cabrera, Donamel M. Saiyari, Kenneth Bryan M. Tana*	EQC-23105 (p.145)
11:20 – 11:35	Benefits and Challenges in Shifting from Chemical to Natural Coagulants in Drinking Water Treatments *Angelie Jade J. Alonzo, Vanette M. Alboleras, Luis Miguel A. Agoncillo and Carl Francis Z. Lacson*	EQC-23069 (p.108)
11:35 – 11:50	Microplastic Toxicity and Translocation, Its Traces in Drinking Water, and Membrane Filtration System as Potential Post-Treatment Process *Ziah Kiyana J. Sison, Kimberly Joy Silva, Randell M. de Raya, Katrina Cheng, Venson Cai, and Carl Francis Z. Lacson*	EQC-23072 (p.111)
11:50 – 12:05	A study on oxidative desulfurization using ferrate prepared from drinking water treatment sludge *Zheng-Hong Chen, Ming-Jie Xiao, Angelo Earvin Sy Choi, Micah Haboc, Meng-Wei Wan*	EQC-23042 (p.82)
12:05 – 12:20	A chromium adsorption study using m-phenylenediamine modified iron-manganese oxide magnet prepared from drinking water treatment sludge *Yu-Ting Chen, Ming-Jie Xiao, Yi-Lun Li, Zheng-Hong Chen, Meng-Wei Wan*	EQC-23043 (p.83)
12:20 – 13:30	Lunch Time	

Session A-4 Chair: Assoc. Prof. Maria Cristina P. Vegafria

Co-Chair: Assoc. Prof. Yuvarat Ngernyen

Time	Topic Name	EQC-No.
10:20 – 10:35	Citral Oil Nanoemulsion for Antimicrobial Kinetic of Escherichia Coli and Staphylococcus Aureus *Muhammad Imran, Chih-Huang Weng, Yu-Jie Chien, and Yao-Tung Lin*	EQC-23011 (p.54)
10:35 – 10:50	Efficient removal of steroid hormones by activation of oxidant with a metal ferrite under visible light irradiation *Kitipong Poomipuen, Chanat Chokejaroenrat, Yao-Tung Lin, Chainarong Sakulthaew*	EQC-23016 (p.59)
10:50 – 11:05	A green and sustainable fruit waste valorization model: Optimal green extraction of phytochemicals and antioxidant activity from agricultural residue using a response surface methodology *Ying-Chen Chen, Chih-Huang Weng, Jun-Lin Wu, Huey-Ling Lin, Jenn-Wen Huang, Yao-Tung Lin*	EQC-23023 (p.65)
11:05 – 11:20	Eco-Print Batik: Plant-Based Recycling Innovation in Indonesia *Erni Puspanantasari Putri, Bonifacius Raditya Sri Pramana Putra, and Agatha Hannabel Avnanta Puteri*	EQC-23026 (p.68)
11:20 – 11:35	Philippines Abaca as Sustainable Cellulose Fibre Insulation *Tomas U. Ganiron, Jr, Chandler Mathew E. Lopez, John Kyle G. Moton, and John Carlo C. Paleracio*	EQC-23032 (p.72)
11:35 – 11:50	Optimizing Mineral Medium Components for Enhancing Benzene Biodegradation by Acinetobacter guillouiae: Effect of growth rate on degradation efficiency *Yu-Wen Hsiao, Siang Chen Wu*	EQC-23060 (p.99)
11:50 – 12:05	Lignin Synthesis from Black Liquor and Bio-crude Oil Production Using Hydrothermal Liquefaction *Nakarin Duangkaew, Carl Francis Lacson, Nurak Grisdanurak, Sutasinee Neramittagapong*	EQC-23067 (p.106)
12:05 – 12:20	Development of Reinforced Polyvinyl Acetate Wood Adhesive using Bacterial Nanocellulose *Maria Sheila K. Ramos, Ralf Ruffel M. Abarca, Viatto Leonard D. Palangan, Judy Ann D. Hambre, Roger B. Dologuin Jr.*	EQC-23108 (p.148)
12:20 – 13:30	Lunch Time	

Session A-5 Chair: Assoc. Prof. Sheryl Dinglasan Fenol

Co-Chair: Asst. Prof. Chi-Wei Wang

Time	Topic Name	EQC-No.
10:20 – 10:35	Assessing Strategies for Mitigating Greenhouse Gas Emissions from Soils: A Systematic Review *Cherrie Lyn Villanueva*	EQC-23019 (p.62)
10:35 – 10:50	Evaluation of various natural weeds and reaction conditions for reductive degradation of 1,3-dinitrobenzene *Xuyen Thi Hong Luong, Yu-Shan Chen, Chenju Liang, Yao-Tsung Chen*	EQC-23024 (p.66)
10:50 – 11:05	Water Hyacinth as A Geonet Material for Soil Slope Protection *Ivan Karl B. Camacho, Shiela B. Galsim, Ryan D. Pandapatan, Rachelle S. Santos, Florante D. Poso Jr.*	EQC-23030 (p.71)
11:05 – 11:20	Experimental study on improving physical and chemical properties of mudstone soil and planting crops by using volcanic pumice *You-Ren Chen, Jian-Chuan Shern*	EQC-23074 (p.113)
11:20 – 11:35	Natural factors affecting coastal erosion in the Mekong Delta and the effectiveness of West Sea embankment in case of sea level rise due to climate change *Long Ta Bui, Hanh Thi Hong Pham*	EQC-23076 (p.115)
11:35 – 11:50	BAKARA IBAUNA - Redevelopment of an Urban Wetland Park Utilizing Regenerative Design: A Case of Las Piñas- Parañaque Critical Habitat and Ecotourism Area (LPPCHEA) *Mikaella Dianne E. Bernardo, Arianne Joy Dullas*	EQC-23086 (p.125)
11:50 – 12:05	Application of Efficient Daylighting Strategies: Reducing Energy Use and Maximizing Natural Lighting through Window Design, A Public Library and Study Hub in Malate, Manila *Jeremieah Millen N. Ines, and Arianne Joy Q. Dullas*	EQC-23087 (p.126)
12:05 – 12:20	Macronutrients Uptake of Lahi-Lahi (Syzygium acuminatissimum, Blume) Nursery Seedlings as Mediated by Biofertilizers in Heavy Metal Contaminated Mined-Out Soils in Surigao Del Norte, Philippines *Mitz C. Tapi-on, Nelly S. Aggangan, Dennis S. Gilbero, Hernando P. Bacosa, Jaime Q. Guihawan, Ruben F. Amparado, Jr.*	EQC-23103 (p.142)
12:20 – 13:30	Lunch Time	

Session A-6 Chair: Assoc. Prof. Florante D. Poso, Jr.

Co-Chair: Assoc. Prof. Chainarong Sakulthaew

Time	Topic Name	EQC-No.
10:20 – 10:35	Assessing of self – cleaning factor role on River Water Environmental Capacity–a case study of Cay Bang catchment, Binh Duong, Vietnam *Long Ta Bui, Diem Luong Thi Tran, Nhi Hoang Tuyet Nguyen*	EQC-23077 (p.116)
10:35 – 10:50	Analyzing the relationship of water pricing and water conservation for sustainable water management in Multifamily Residential Building in Manila, Philippines *Adrian Jim Reyes, Michelle Pernia*	EQC-23089 (p.128)
10:50 – 11:05	An integrated flood risk assessment of rural and peri-urban communities: A case study in Angat, Bulacan *Van Barry Par, Ma. Aileen Leah Guzman, May Celine Thelma Vicente, Jude Anthony Estiva, and Jairus Josol*	EQC-23090 (p.129)
11:05 – 11:20	Water Quality Status of Bucayo Creek, Hermosa, Bataan, Philippines, Based on Palmer Pollution Index, Family Biotic Index, Shannon Diversity Index, and Water Quality Index *Victor E. Valderama Jr. and Marco Roberto VC. Scharer*	EQC-23099 (p.138)
11:20 – 11:35	Comparative Assessment of Current Wastewater Treatment Technologies in the Selected Hospitals in Metro Manila *Joshua S. Egnisaban, John Exequiel T. Talagag, Ezekiel Clive M. Tango, Edzel C. Vetus, Krizel F. Villaluz, Donamel M. Saiyari, Edna P. Arojado*	EQC-23115 (p.155)
11:35 – 11:50	Climate change awareness and risk perceptions in the coastal marine ecosystem of Palawan, Philippines *Lutgardo Alcantara, Lota Creencia, Karen Madarcos, John Roderick Madarcos, Jean Beth Jontila, Fiona Culhane*	EQC-23013 (p.56)
11:50 – 12:05	Chitosan Production from Waste Crustacean Shells in Iligan City, Philippines: Supply Analysis and Characterization for Mine Wastewater Treatment Application *Maria Cristina P. Vegafria, Kenneth Roy M. Rojo, Seigfreid D. Kempis, and Leaniel C. Silva*	EQC-23098 (p.137)
12:05 – 12:20	A Comparative Assessment of Morphological Properties and Chemical Composition of Microplastics in River Marikina and San Juan Rivers in The Philippines Using Microscopy and FTIR Analysis *Leonard Francis M. Manlangit, Mary Jean N. Omaña, Moises M. Ribon, Ephraim-V C. Viray, Lesly Ann Pauline A. Manaoat, Donamel M. Saiyari1, Ramir M. Cruz*	EQC-23045 (p.85)
12:20 – 13:30	Lunch Time	

Session B-1 Chair: Prof. Chia-Hung Hou

Co-Chair: Asst. Prof. Jerome Jordan F. Famadico

Time	Topic Name	EQC-No.
13:30 – 13:45	Effectiveness of Chrysopogon Zizanioides in Reducing Lead Content in Water *John Manuel B. Vergel, Kim Kelly R. Ang, Vincent Karl R. Cabie, Louis Geoffrey G. Eusebio, Sun M. Valerio, Florante D. Poso Jr.*	EQC-23005 (p.48)
13:45 – 14:00	Using heterogeneous catalytic ozonation for removing paraben-contaminated water *Apiladda Pattanateeradetch, Chainarong Sakulthaew, Athaphon Angkaew, Yao-Tung Lin, Chanat Chokejaroenrat*	EQC-23015 (p.58)
14:00 – 14:15	Removal of dibenzothiophene sulfone using iron-manganese oxide magnet derived from a water purification plant sludge *Zheng-Hong Chen, Yi-Lun Li, Angelo Earvin Sy Choi, Maegan Gwyneth Alcaraz, Meng-Wei Wan*	EQC-23041 (p.81)
14:15 – 14:30	Adsorptive Removal of Ibuprofen from Aqueous Solution with Chrysanthemum-based Activated Carbon: Solid Waste of Beverage Industry *Chaiwat Rattanet, Jesper T. N. Knijnenburg, Supattra Budsaereechai, and Yuvarat Ngernyen*	EQC-23008 (p.51)
14:30 – 14:45	Effects of Environmental Anions on Molybdenum Disulfide Nanosheets in the Aquatic System *Ting-Wei Lee and Chiaying Chen*	EQC-23047 (p.87)
14:45 – 15:00	Treatment of Wastewater Containing Imidacloprid Pesticide by Electro-Fenton Process *Jia-Zih Wang, Chart Chiemchaisri, Ming-Chun Lu*	EQC-23018 (p.61)
15:00 – 15:20	Coffee Break/Poster Session	

Session B-2 Chair: Assoc. Prof. Xuan Thanh BUI

Co-Chair: Asst. Prof. Kaewta Jetsrisuparb

Time	Topic Name	EQC-No.
13:30 – 13:45	A review on fluidized-bed homogeneous crystallization process: recent advances, uses, and future direction *Victor E. Valderama Jr., Florencio C. Ballesteros Jr., Sergi Garcia-Segura and Ming-Chun Lu*	EQC-23073 (p.112)
13:45 – 14:00	Potable Water Quality Assessment on Purified Water and Tap Water in Barangay Poblacion, Muntinlupa City, Philippines *Liam-Jezner T. Cabrera, Jenny A. Dinauanao, Roy Jhon M. Gorpido, Lea Regina R. Sapuco, Donamel M. Saiyari, Melvin G. Singayan*	EQC-23107 (p.147)
14:00 – 14:15	Feasibility Study of Real 1,4-Dioxane Wastewater Treatment Combining with Biological and Chemical Oxidation Technology *Ping-Heng Hsieh, Ru-Yi Zheng, Yu-Shyuan Luo, Yu-Jen Huang*	EQC-23058 (p.97)
14:15 – 14:30	Influence of organic acids on the treatment of synthetic swine wastewater by fluidized granulation process *Ralf Ruffel M. Abarca, Jodrel Shem P. Balcita, Carlo S. Alfaro, Josephine G. Cuabo, Mark Daniel G. de Luna, Ming-Chun Lu*	EQC-23081 (p.120)
14:30 – 14:45	Step-dipping ruthenium-tin oxide anode (RuSn/Ti) for chloride-mediated electro-oxidation of ammonia in electronic manufacturing wastewater in the continuous flow reactor *Seto Sugianto Prabowo Rahardjo, Cing-Tong Jhang, and Yu-Jen Shih*	EQC-23049 (p.89)
14:45 – 15:00	Application of Fe0.66Cu0.33/Al(OH)3 as Catalyst in Oxalic Acid Containing System to Degrade and Mineralize Azo Dye by Visible Light Fenton Method *Cai-Sheng Lin, Wei-Zheng Li, Yao-Hui Huang*	EQC-23080 (p.119)
15:00 – 15:20	Coffee Break/Poster Session	

Session B-3 Chair: Prof. Jeyong Yoon

Co-Chair: Assoc. Prof. RA Retno Hastijanti

Time	Topic Name	EQC-No.
13:30 – 13:45	Prediction of hydroxyl radical exposure during ozonation using different machine learning methods and ozone-related parameters as input variables *Dongwon Cha, Sanghun Park, Min Sik Kim, Gyuseung Lim, Kyung Hwa Cho, and Changha Lee*	EQC-23007 (p.50)
13:45 – 14:00	Mixing Layer Height Estimation via Ceilometer Measurements and its Correlation with Ambient Ozone *Duy-Hieu Nguyen, Tereza Šedivá , Dušan Štefánik, Chih-Hsiang Liao, Chitsan Lin*	EQC-23120 (p.160)
14:00 – 14:15	A study of VOCs emission fingerprints and characteristics of light oil cracking plants in Southern Taiwan *Zhi-Ping Hsu, Chit-San Lin, Po-Yang Chen, Kit-Mui Kwong*	EQC-23053 (p.92)
14:15 – 14:30	Kaohsiung Port Area Ambient Air Background Source Monitoring Survey Plan *I-Hsin Hsu, Chitsan Lin, Chen Po-Yang, Kit-Mui Kwong, and Zhi-Ping Hsu*	EQC-23054 (p.93)
14:30 – 14:45	Chemical Characterization of Particulate Matter from Mid-Autumn Festival Activities in the Vicinity of Steelmaking Industrial Area *Chi-Fu Yeh, Yi Sung Liu, Chih-Chung Lin, Jen-Hsiung Tsai, and Jheng-Jie Jiang*	EQC-23056 (p.95)
14:45 – 15:00	Development of IoT-Based Real-Time Fire Detection and Early Warning System *Glenda S. Guanzon, Fredick Andrew P. Dimo, and Teofilo Oribell.*	EQC-23004 (p.47)
15:00 – 15:20	Coffee Break/Poster Session	

Session B-4 Chair: Assoc. Prof. Nolan C. Tolosa

Co-Chair: Asst. Prof. Ma. Theresa Austria

Time	Topic Name	EQC-No.
13:30 – 13:45	Bimetallic Nickel–Cobalt Oxide/Porous Carbon Nanocomposite as an Efficient Cathode for High-Performance Electrochemical Desalination *Po-Chang Wu, Chia-Hung Hou*	EQC-23104 (p.144)
13:45 – 14:00	Electrochemical detection of acetaminophen using reduced graphene oxide-encapsulated cobalt zeolite imidazole framework derived porous carbon (Co-ZIF-8@rGO) *Sheng-Kai Lin, Yu-Jen Shih*	EQC-23062 (p.101)
14:00 – 14:15	Catalytic ozonation performance of graphene quantum dot doped MnOOH nanorod for effective treatment of ciprofloxacin and bromate formation control in water *Thanh-Binh Nguyen,Van-Re Le, Chiu-Wen Chen, C.P. Huang, Xuan-Thanh Bui, Cheng-Di Dong*	EQC-23071 (p.110)
14:15 – 14:30	Hydrogenation of D-glucose into sorbitol over oxide-based material supported Ru catalyst *Pakpoom Athikaphan, Umaporn Chantarapratak, Jureewan Khamma, Jirawat Kongprasopsap, Arthit Neramittagapong, Sutasinee Neramittagapong*	EQC-23091 (p.130)
14:30 – 14:45	Recycling of waste ammonium sulfate as S, N-doped carbon quantum dots for the determination of tetracycline *Cheng-Yuan Ho, Ting-Wei Lee, Xin-Yu Li, Chiaying Chen*	EQC-23109 (p.149)
14:45 – 15:00	Mesoporous Carbon-Silica Composite Fabricated from Molasses and Its Adsorption Behaviours of Methylene Blue *Yuvarat Ngernyen, Channakhone Phoumixay, Koungnang Mountivongsa, Jesper T. N. Knijnenburg, and Supattra Budsaereechai*	EQC-23021 (p.63)
15:00 – 15:20	Coffee Break/Poster Session	

Session B-5 Chair: Asst. Prof. Charlimagne M. Montealegre

Co-Chair: Dr. Thi-Dieu-Hien Vo

Time	Topic Name	EQC-No.
13:30 – 13:45	Comparison of Novel Modified Biochars from Solid Waste of Grass Jelly Dessert Industry and Commercial Biochars *Chatlada Chaiwong, Jesper T. N. Knijnenburg, Supattra Budsaereechai, and Yuvarat Ngernyen*	EQC-23040 (p.80)
13:45 – 14:00	Effect of fly ash partial replacement to the fine aggregates in non-load bearing concrete hollow blocks (CHB) *Bautista, Abbey Joy A., Bautista, John Patrick B., Falguera, Mark Francis B.and Patio, Kim Russel K.*	EQC-23034 (p.74)
14:00 – 14:15	Influence of Pulverized Crab Shell as Cement Accelerating Additive in Hydration Cement *Crispin Lictaoa, Jairah May Ferma, Dianna Recto, and Reign Andrey D. Quiacos*	EQC-23035 (p.75)
14:15 – 14:30	Application of Corn Hub Fiber and Sugarcane Bagasse Ash for Clay Soil Stabilization in Road Construction *Crispin Lictaoa, Junnell Noah Xavier Beltran , Julie-Ann Rosario , Jersey Claire Tria, and Gerardo Abestilla, Edward Caezar Alimorong*	EQC-23036 (p.76)
14:30 – 14:45	Utilization of Sea Urchins' Shells and Spines as an Admixture to Cement in Geopolymer Concrete *Crispin Lictaoa, Vince Mariano, Erica Oniot, Paulo Adrian Rodriguez, and Brian Eurolfan*	EQC-23037 (p.77)
14:45 – 15:00	Morphosis: Re+Creating The Empress Palace Pension *Angelo T. Estorpe, Hansen Cyrus L. Cembrano, Jim Marcel D. Bansagan and Ar. Ma. Theresa Austria*	EQC-23097 (p.136)
15:00 – 15:20	Coffee Break/Poster Session	

Session B-6 Chair: Assoc. Prof. Yi-Kuo Chang

Co-Chair: Assoc. Prof. Crispin Lictaoa

Time	Topic Name	EQC-No.
13:30 – 13:45	Development of green emulsified industrial waste oil technology for circular economy and evaluation of cost-effective *Bo-Chih Chiang, Pei-Cheng Cheng, Yuan-Chung Lin, Heng-Yi Lin, Yao-Ting Tu, Ming-Xian Lin, and De-San Chen*	EQC-23118 (p.158)
13:45 – 14:00	High-Quality Deoxygenated Pyloritic Oil by Using Methanol as an In-Situ Hydrogen Donor Pylorisis Oil from Pyrolytic Catalysis Cracking of Waste Cooking Oil *Warangkana Khangwichian, Kitirote Wantala*	EQC-23044 (p.84)
14:00 – 14:15	Removal of paracetamol using zeolite: optimization of process parameters, isotherm and kinetic study *Alberto Lastimado Jr., Rekich Pahunang, Anamie Rabongue*	EQC-23033 (p.73)
14:15 – 14:30	Amended Ferrozine Assay for Detection of Biogenic Iron Oxide Nanoparticles in Magnetospirillum gryphiswaldense MSR-1 *Ya-Chun Zhao, Li Fen Wu, Siang Chen Wu*	EQC-23052 (p.91)
14:30 – 14:45	Activated Carbon from Sugar Palm (Arenga pinnata) Waste Products *Sheryl Dinglasan Fenol, Lorenzo Lapitan Jr., Jhon Laurence Herrera, Daeniel Zarene Mojica*	EQC-23009 (p.52)
14:45 – 15:00	Demineralization bypass of hydrochar synthesis from waste prawn exoskeleton for the production of olivary carbon particles *Symphony S. Dajay, Leaniel C. Silva, Seigfreid D. Kempis, Alexander O. Mosqueda, Raymond V.Rivera Virtudazo, Maria Cristina P. Vegafria*	EQC-23094 (p.133)
15:00 – 15:20	Coffee Break/Poster Session	

Session C-1 Chair: Prof. Su Shiung Lam

Co-Chair: Assoc. Prof. Angelo Earvin Choi

Time	Topic Name	EQC-No.
15:20 – 15:35	Effects of Magnesium oxide acid modified biochar on Cadmium adsorptio *Siraprapa Suwanree, Kaewta Jetsrisuparb, Pornnapa Kasemsiri, Prinya Chindaprasirt and Jesper T. N. Knijnenburg*	EQC-23095 (p.134)
15:35 – 15:50	Synthesis and Application of Nanosilica in Concrete Pavement Bricks *Nolan Tolosa, Achilles Espaldon, Nicole Aira Billones, Jason Capilayan, Rosalie Capilayan, and Joshua Rhenee Palma*	EQC-23116 (p.156)
15:50 – 16:05	Organic Electrode Supercapacitors for Sustainable Energy and Storage *Sheryl Dinglasan Fenol, Felicito S. Caluyo*	EQC-23010 (p.53)
16:05 – 16:20	Zeolite as an electrolyte additive for Water-Activated Metal Air Fuel Cells *Rose Marie O. Mendoza, Erison C. Roque*	EQC-23027 (p.226)
16:20 – 16:35	Photocatalytic oxidation treatment of Reactive Red 195 onto iron-cobalt catalyst: statistical modeling and optimization via Box-Behnken design *Khyle Glainmer N. Quiton, Yao-Hui Huang and Ming-Chun Lu*	EQC-23101 (p.140)
16:35 – 16:50	Assessment of green tea reductive degradation of halogenated solvents *Siang Chen Wu, Chi-Wei Wang, Li-Hsin Hsu, Chenju Liang*	EQC-23092 (p.131)
17:00 – 17:30	Closing Ceremony	

Session C-2 Chair: Prof. Florencio C. Ballesteros, Jr

Co-Chair: Asst. Prof. Glenda Guanzon

Time	Topic Name	EQC-No.
15:20 – 15:35	Adaptive Reuse of Tabacalera Ruins to Cultural Museum: The Efficiency of Using Carbon-Negative Materials on Heritage Conservation in Improving Air Quality *Josa Angela L. Saep and Arianne Joy Q. Dullas*	EQC-23088 (p.127)
15:35 – 15:50	Developing a practical tool to evaluate the cost and benefit of PM2.5 pollution control measures on air quality improvement in Ho Chi Minh City, Vietnam *Long Ta Bui, Phong Hoang Nguyen, Duyen Chau My Nguyen, Nhi Tuyet Hoang Nguyen*	EQC-23075 (p.114)
15:50 – 16:05	Development of ICP-MS hyphenated with gas exchange device- toward real-time online monitoring of PM2.5 metal contents *Yi-Chin Hsieh, Ta-Chih Hsiao, Yi-Pin Lin, Wen-Che Hou*	EQC-23106 (p.146)
16:05 – 16:20	Photoelectrocatalytic characteristics of TiO2 nanotube arrays-supported waste iron oxyhydroxide and reduced graphene oxide (FeOxrGO/TiNTA) as exemplified by organic pollutant degradation and hydrogen gas evolution *Zhi-Hao Zhang, Yu-Jen Shih*	EQC-23066 (p.105)
16:20 – 16:35	A P-Graph Model for Planning CO2 Capture and Utilization (CCU) Systems with Social Discounting *Tommie Daniel Cruz, Lawrence Belo, and John Frederick Tapia*	EQC-23039 (p.79)
16:35 – 16:50	Research of changing the angle attack and inner circle design to improve the efficiency of a three-paddle Multi-Hole Hollow Propeller Aerator *Wei-Chieh Chien, Jian-Chuan Shern*	EQC-23055 (p.94)
17:00 – 17:30	Closing Ceremony	

Session C-3 Chair: Assoc. Prof. Long Ta Bui

Co-Chair: Asst. Prof. Ralf Ruffel Abarca

Time	Topic Name	EQC-No.
15:20 – 15:35	We Need Bioerosion Research in the South China Sea *Christine Hanna Lydia Schönberg*	EQC-23057 (p.96)
15:35 – 15:50	Neo-Vernacular Tenement Paradigm Towards Sea Level Rise Coastal Resiliency at Barangay Rizal Estanzuela, Iloilo City, Philippines *Ruth Jireh Mae Bolivar, Gabriel Anghel Bibal, Jojit Gadian, Marc Nicole Miguel, and Ma. Theresa Austria*	EQC-23059 (p.98)
15:50 – 16:05	Development of a Rapid Method for Quantification of Hydroxyl Radical in the Natural Aquatic Environment *Melvin Pacquiao, Mark Daniel de Luna, Analiza Rollon, Yi-Ting Chen, Tsair-Fuh Lin*	EQC-23110 (p.150)
16:05 – 16:20	Groundwater: Agricultural and Industrial Overexploitation and Approaches for Proper Water Management *Clariz D. Santos, Hannah Mishariah R. Baylon, Jan Eric A. Labtis, and Carl Francis Z. Lacson*	EQC-23068 (p.107)
16:20 – 16:35	Application of Marine Fuel Sludge Recycling Technology *Chin-Ko Yeh, Zhang-Wen Ke, Ching-Ti Yeh and Hsueh-Chen Shen*	EQC-23084 (p.123)
17:00 – 17:30	Closing Ceremony	

Session C-4 Chair: Prof. Jin Anotai

Co-Chair: Asst. Prof. Edna Arrojado

Time	Topic Name	EQC-No.
15:20 – 15:35	Cu supported on Na-Alginate for Methyl orange dye degradation via Fenton-like reaction *Pongpanit Kongkoed, Natthaphong Lertna, Pakpoom Athikaphan, Arthit. Neramittagapong, and Sutasinee Neramittagapongand*	EQC-23093 (p.132)
15:35 – 15:50	Utilizing Fluidized-Bed Homogeneous Crystallization to Recover Bismuth as Bi2O3 from Synthetic Wastewater *Qian Lin, Yao-Hui Huang*	EQC-23079 (p.118)
15:50 – 16:05	The inhibition of chemical corrosion on dimensionally stable anode (DSA) in fluorine-contained wastewater at electrolysis process *Kai-Yang Chang, Yi-Ting Liu, Yao-Hui Huang*	EQC-23061 (p.100)
16:05 – 16:20	NiFeMn coated carbonnanotube electrocatalysts for oxygen evolution reaction of alkaline water electrolysis *Kaewta Jetsrisuparb, Kriangkrai Khwayotha and Sapphawat Kawinwisit*	EQC-23111 (p.151)
16:20 – 16:35	Paraquat removal in Fenton-like reaction by Fe/GAC catalyst packed in up-flow continuous reactor *Natthaphong Lertna, Pakpoom Athikaphan, Pongpanit Kongkoed, Shawn C. Rood, Arthit Neramittagapong, and Sutasinee Neramittagapong*	EQC-23119 (p.159)
16:35 – 16:50	Crystal facet effect of palladium decorated PdSn(200) and PdSn(101) electrodes on electrochemical nitrate reduction and selective formation of N2 *Zhi-Lun Wu, Yu-Jen Shih*	EQC-23121 (p.161)
17:00 – 17:30	Closing Ceremony	

Session C-5 Chair: Assoc. Prof. Erni Puspanantasari Putri

Co-Chair: Asst. Prof. Julinette Coo

Time	Topic Name	EQC-No.
15:20 – 15:35	Comparative Analysis and Design of A Post Disaster Temporary Shelter in The Philippines *Ian Gail Cabrera, Jonathan Cruz, Kurt Lester Ramos and Porutotage Ryan Shahen Cabangcla*	EQC-23014 (p.57)
15:35 – 15:50	"Pagkayab" Tropical Brutalism: A Vertical Public Cemetery for Tanza, Iloilo *Keisha Faith Dechaca, Angelie Lago, and Ella Marie Degillo, Ma. Theresa M. Austria, and Glenda S. Guanzon*	EQC-23082 (p.121)
15:50 – 16:05	"Pabigong": Deconstructivism for Intergenerational Care Complex in Active Aging *Mikaela A. Nulla, Jewelyn P. Remandaban, Arsen Jun L. Mucho and Ma. Theresa M. Austria*	EQC-23083 (p.122)
16:05 – 16:20	"Tambi-tambi": Deconstruction Design for Bulabog Puti-an National Park, Dingle, Philippines *Rexaneegh Mallorca, Cherie Gil Luengo, Ella Macadangdang, Ma. Theresa M. Austria, Julinette Yap Coo, and Mary Michelle L. Batayola*	EQC-23113 (p.153)
16:20 – 16:35	Impact Analysis of Spatial Crowding to the Movement of Users within a Public Market: PAGHABI, A Redevelopment of UBVAS Public Market in Bocaue, Bulacan *Pamela Julianne O. Lofamia, and Arianne Joy Q. Dullas*	EQC-23114 (p.154)
17:00 – 17:30	Closing Ceremony	

Session C-6 Chair: Assoc. Prof. Siang Chen Wu

Co-Chair: Mr. Orlean Dela Cruz

Time	Topic Name	EQC-No.
15:20 – 15:35	Introduction of The Cleaner Production Evaluation System in Vietnam *Yu-Hsiu Chen, Wen-Chi Tseng, Boi-Phung Ngo, and I-Ming Chen*	EQC-23025 (p.67)
15:35 – 15:50	WEPYRO TECH: Waste to Energy Pyro Technology *Richard D. Andres, Jason James V. Robin, Jose Florenz B. Somigao, John Robert P. Tapada, Bon Ryan P. Aniban, Jaychris Georgette Y. Onia, Nino U. Pilueta, Florante D. Poso Jr.*	EQC-23046 (p.86)
15:50 – 16:05	The Ultra-Low-Energy Vertical Farm: An Interdisciplinary Architecture Featuring Ultraviolet Glass Panels and Modern Farming in San Andres, Malate, Manila, Philippines *Ramirez, Joana Marie L., Arch. Dullas, Arianne Joy Q.*	EQC-23096 (p.135)
16:05 – 16:20	Project LV: A Case Study on Innovative and Green Design of a Single Storey Residence in the Philippines *Leiron Mark S. De Guzman*	EQC-23102 (p.141)
16:20 – 16:35	Overview of the Current Operating Practices of Leather Tanneries in Meycauayan, Bulacan, Philippines *Reynaldo L. Esguerra, Engel Ryan G. Ibarra, Rochelle L. Retamar, Prima Joy F. Margarito*	EQC-23112 (p.152)
17:00 – 17:30	Closing Ceremony	

POSTER PRESENTATION PROGRAM

[Plenary Speech]

2050 Carbon Neutrality to Overcome the Climate Crisis and Carbon Neutral Engineering

Jeyong Yoon

College of Engineering, Seoul National University Seoul, South Korea

ABSTRACT

The climate crisis is now becoming a reality. This crisis is caused by worldwide emission of greenhouse gases, and solving it will require the world to achieve carbon neutrality: meaning to emit a net-zero amount of greenhouse gases. Carbon neutrality ultimately means that fossil fuels will no longer be used, leading to a civilization-scale transition in energy. More than 140 countries have announced their plans for carbon neutrality in order to achieve this goal. The Republic of Korea was among them, and have announced carbon neutrality by 2050. In Korea, the high level of industrialization and a large manufacturing sector will make this a difficult challenge. Currently, Korea releases greenhouse gases equal to 730 megatons of CO2 per year, or 1.3% of the world's total amount. The first step to meeting the announced 2050 carbon neutrality goal will be the 2030 NDC (Nationally Determined Contribution) which details a 40% emission reduction target by the year 2030.

Meanwhile, a new engineering system is needed for the carbon neutrality and I defined it as 'Carbon neutral engineering'. Carbon neutral engineering is defined as an overall engineering system that redefines and researches theory, technology and production systems in various fields of engineering in order to achieve carbon neutrality. This is differentiated by fossil fuel-based engineering systems that do not prioritize carbon neutrality. In order to achieve carbon neutrality along with the preservation of the prosperous civilization we have built so far, we need a carbon neutral engineering system that can change the existing frame of thinking. Based on carbon neutral engineering, we can utilize a 'carbon balance', the intersection of mass and energy balance established for fossil fuels. In this talk, I will discuss in order the concept and methods of carbon neutral engineering, and application in the chemical industry.

Of course, the climate crisis cannot be solved by any one country. All of the international community must work together to collectively reduce global carbon emissions. Cooperation of Korea, Taiwan, and many other countries participating EQC3 is one part of this bigger picture. Universities especially can be in the forefront of the societal change led by carbon neutrality. The economic, social and technological fields of study in universities can come together and cooperate to develop policy and promote technological innovation regarding carbon neutrality. Our universities, Seoul National University and many University participating EQC3, can play a leading role.

I hope the bright students and advanced facilities of these universities can come together to engage in education and active research regarding carbon neutrality.

[Plenary Speech]

Oil Removal from Wastewaters

Jin Anotai* and Nonglak Boonrattanakij

Department of Environment Engineering, King Mongkut's University of Technology Thonburi, Bangkok 10140, Thailand

**Corresponding author: jin.ano@kmutt.ac.th; Tel: +662-470-9166*

ABSTRACT

Oil contamination in the wastewater is one of the most difficult pollutants to be removed. Even though oils are organic compounds, most of them are refractory and can cause smothering effect to bacteria. Soluble oils can be effectively degraded via biochemical metabolisms since the oil molecules can diffuse directly through the microbial cell membrane into the cytoplasm. As a result, this type of oil can be easily treated by biological processes either under aerobic or anaerobic condition. Nonetheless, if aeration is applied (under aerobic mode), these soluble oils can be stripped out to the gas phase due to their high volatility causing air pollution. Oil layer/sheet can also be easily removed by skimming devices since it already separates from the water phase. Both static (overflow through weir, slot, pipe, etc.) and dynamic (adsorption on oleophilic materials such as discs, belt, drum, etc.) skimmers are widely used to remove oil layer from water surface. Oil in the form of emulsions cannot pass through the microbial cell membrane like the soluble oils since their sizes are much larger. They will sorb and coat on the surface of the microbes preventing the transport of substrates in and out of the cells and the microbes will eventually die. Hence, they have to be removed by other methods.

Primary emulsions can be effectively separated via gravitational flotation using grease trap since their rising velocity, which can be described by Stokes' law as shown below, is high enough to move upward through the water column within an acceptable time period. Installation of plate or tube modules inside the grease trap can significantly increase the removal efficiency of the primary emulsions. Secondary emulsions; however, have much smaller sizes and sequentially lower rising velocities than the primary emulsions. It will take too long time for them to rise up to the water surface. As a result, it is impractical to use an ordinary grease trap to separate the secondary emulsions. Several physical and chemical processes are needed to accelerate their rising velocity. Coalescence (increasing oil droplet size), flotation (decreasing oil density), centrifugation (increasing acceleration rate), and heating (decreasing water viscosity) can be applied to intensify the rising velocity of oil droplet. Apart from that, coagulation/sedimentation and filtration with special membrane are also found to be effective and are worth for consideration for secondary emulsion removal. Stabilized emulsions; however, cannot be effectively separated by most methods mentioned above due to their surface charge and tiny nano-scale size..

KEYWORDS

Coalescence; Demulsifier; Flotation; Surfactant; Primary emulsions; Secondary emulsions; Stabilized emulsions

[Plenary Speech]

WEEE management from a circular economy perspective: The Case of the Philippines

Florencio C. Ballesteros, Jr.*, Louanne Grace de Sales

Environmental Engineering Graduate Program, University of Philippines-Diliman, Quezon City 1800, Philippines

**Corresponding author: fcballesteros@up.edu.ph*

ABSTRACT

Endocrine disrupting compounds continue to be a health risk as a result of mismanagement of Persistent Organic Pollutants such as PBDE and PFOS commonly used as flame retardants in electronic equipment. The burgeoning problem of increasing e-waste generation coupled with intensive imports of second-hand electronic equipment only exacerbates this problem. Concomitant to the mismanagement of WEEE or e-waste is the health risk from the exposure to hazardous substances present in such materials. Moreover, the informal sector characterized by low economic status and without regard to safe e-waste handling bears the brunt of the problem. This investigation found lead levels in human samples in the study area that are significantly higher than the threshold concentration set in WHO guidelines. To address the problem, interventions were put in place including provision for appropriate e-waste processing technology, training on proper dismantling and recycling processes and, providing suitable protective equipment. Supplementing such measures are market economics, intensive Information and Education Campaign, enactment of local ordinances and regulatory support to ensure sustainability. This presentation documents the BAT/BEP experience in e-waste recycling communities in the Philippines.

KEYWORDS

PBDE; Persistent Organic Pollutants; electronic waste; health risk

[Plenary Speech]

Microwave Processing of Waste for Circular Waste Management

Su Shiung LAM

Pyrolysis Technology Research Group, Higher Institution Centre of Excellence (HICoE),Institute of Tropical Aquaculture and Fisheries (AKUATROP), Universiti Malaysia Terengganu, 21030 Kuala Nerus, Terengganu, Malaysia

**Corresponding author: mailto:karthik@frontier-lab.com*

ABSTRACT

Microwave processing involves the use of microwave radiation as a heat source in an inert environment that can break down and convert waste materials to produce useful liquid oil, gases,and char products. This technique has been applied for recovering the energy and chemical value of various types of waste materials, comprising forestry waste, furniture waste, fruit waste,waste cooking oil, agricultural waste, palm oil waste, etc. This technique shows advantages in providing a fast heating, relatively shorter process time and lower energy consumption, representing a method that is potentially faster and more energy efficient compared to that shown by the method commonly performed using conventional heating source. The technique produces liquid oil product that can potentially be re-used as fuel for power generation, hence representing and promoting a circular approach for waste management, and the oil product is potentially cleaner with promising features to also be used as feedstock for bioplastic production. The technique also produces solid products such as biochar and activated carbon that can be refined for use as catalyst in pyrolysis process, which is also a potential route for circular waste management. The solid products also possess beneficial features for application in waste treatment. Our findings show that microwave processing shows potential as a promising approach with improved heating performance and generation of useful products with desirable properties for circular waste management. These have led to outputs such as joint research with international partners, patent filing, company licensing, journal publications, awards and industrial partnership for prototype development, distribution and application.

KEYWORDS

Microwave pyrolysis; liquid oil; biochar; energy

[Plenary Speech]

Microplastics Pollution in the Marine Environment

Chang-Mao Hung[1,2], Chiu-Wen Chen[1], and Cheng-Di Dong[1,2*]

[1] *Department of Marine Environmental Engineering, National Kaohsiung University of Science and Technology, Kaohsiung City, Taiwan*
[2] *Institute of Aquatic Science and Technology, College of Hydrosphere Science, National Kaohsiung University of Science and Technology, Kaohsiung City, Taiwan*

**Corresponding author: cddong@nkust.edu.tw; Tel: +886-7-361-7141 ext 23762*

ABSTRACT

Globally, synthetic organic polymer litter and debris have profound impacted the marine environment because of long-term persistent properties, widespread use, and short life-cycle product. Residue polymer pollution has become a key marine environmental issue of public concern due to its voluminous production and recalcitrant nature in marine environments. Micro- and nano-plastics particles are legitimate mechanisms for the absorption, accumulation, transport, and uptake of a wide variety of contaminants, such as hydrophobic organic species, e.g., polycyclic aromatic hydrocarbons, phthalates, and nonylphenol, dissolved organic matters (DOMs), metals, and complex microbial constituents in shallow seawater and/or deeper sediments and ultimately cause long-term damages to the receiving bodies of environments. In addition, microplastics (MPs) may be laden with pollutants and thus exhibit ecotoxicity upon uptake through food chains, particularly in the case of sensitive and restricted marine biota. This study will provide an insight into the research on the distribution of MPs in the marine environment, it is critical to also understand the concentration and origin of pollutants related to MPs, to assess the impact of MPs on the marine environment and develop well-informed prevention and management strategies.

KEYWORDS

Ecotoxicity; Marine; Microplastics; Pollution; Polymer; Sediment

[Plenary Speech]

Energy-efficient desalination and resource recovery using advanced electrochemical separation technologies

Tsai-Hsuan Chen and Chia-Hung Hou*

Graduate Institute of Environmental Engineering, National Taiwan University, Taipei 10617, Taiwan

**Corresponding author: chiahunghou@ntu.edu.tw; Tel: +886-2-33664400*

ABSTRACT

Advanced electrochemical desalination technologies, inspired by energy storage devices (e.g., supercapacitors and batteries), are emerging technologies to separate ions from water. Membrane capacitive deionization (MCDI) technology is of interest in energy-efficient and low-carbon process by using nanoporous carbon electrodes with ion exchange membranes. Over the last 3 years, we have been focusing on scale-up of MCD stacks to reclaim an effluent of municipal wastewater treatment plant and to desalinate wastewater in high-tech industries. The MCDI prototypes are market-ready and fit-for-purpose as a low-energy approach for low-salinity desalination (e.g., TDS < 4000 mg/L). Noteworthy, redox-flow battery desalination (FBD) with the use of redox-active electrolytes can not only offer unlimited salt removal operation for continuous desalination but also show the high charge efficiency over a wide salinity working range. FBD process provide a promising direction for seawater desalination, brine concentration, and zero-discharge technologies. Furthermore, our group has developed various electrochemical technologies that can be used for resource recovery from wastewaters. For example, the NO_3^- selectivity can be significantly enhanced by using hydrophobic anion exchange membrane in MCDI. In battery deionization (BDI), intercalation-type materials (e.g., nickel hexacyanoferrate) exhibit great opportunities for cation selectivity, such as selective capture of ammonium ions from wastewaters.

KEYWORDS

Capacitive deionization; battery deionization; low-energy desalination; wastewater reclamation; resource recovery

[Plenary Speech]

Applications of Advanced Technology in Real Wastewater Treatment

Ping-Heng Hsieh, Ru-Yi Zheng, Yu-Shyuan Luo, Yu-Jen Huang*

Ever-Clear Environmental Engineering Corporation, Taichung 40755, Taiwan

**Corresponding author: yujenhuang@ever-clear.com.tw*

ABSTRACT

In developing countries, the rapid urbanization and industrialization come with huge water pollution issues in the past decades. To keep pace with economic development and ensure environment sustainability, local governments are reviewing and updating their policies for handling and treatment of wastewater. For example, before 1993, in Taiwan the industrial discharged standard of COD was 200 mg/L. With the rapid development of industries, water body pollution became one emerging problem and in 2000 Taiwan EPA decided to improve the COD standard to 100 mg/L. This announcement caused huge challenges to industries; therefore, the development of novel and advanced water treatment technologies is urgently required. In this investigation some practical applications using advanced technologies are revealed and discussed. These technologies cover biological and chemical treatment technologies, such as anaerobic technology, biocarrier (MBBR/IFAS) technology, and advanced oxidation process (AOP), etc. Through this presentation, we would like to share our experience in advanced technology applied in modern water treatment challenges and illustrate the strong water treatment technology demand for future technology development direction.

KEYWORDS

Advanced Treatment; Biocarrier; AOP; Real Wastewater

[Plenary Speech]

Developing Innovation Based on Local Wisdom, Towards a Zero Carbon Emission City Case Study: Surabaya, Indonesia

RA Retno Hastijanti

The University of 17 Agustus 1945 Surabaya, Indonesia

ABSTRACT

Local wisdom is basic knowledge gained from living in balance with nature. It is related to culture in the community which is accumulated and passed on. This wisdom can be both abstract and concrete, but the important characteristics are that it comes from experiences or truth gained from life. The wisdom from real experiences integrates the body, the spirit, and the environment. It emphasizes respect for elders and their life experiences. Moreover, it values moral more than material things. Indonesia is a country of diversity, home to numerous different ethnic groups, languages, cultures, and religions. However, a common language and the national motto of `Unity in Diversity' helps to bind the 17.500 islands and their inhabitants together. In Indonesia, every ethnic has its own local wisdom. They have their own unique culture and life guidance according to their beliefs to achieve common prosperity.

Surabaya is the second-most populous city in Indonesia, with 2,874,314 inhabitants recorded in the chartered city limits in the 2020 census. Surabaya has been one of the most important and busiest trading city ports in Asia. Due to the busyness and density of the functions of the city of Surabaya, pollution is unavoidable. In the last 10 years, Surabaya has been trying to turn into a low-pollution city. Various efforts from the Surabaya city government will not succeed if they are not supported by the community. To achieve this, the City of Surabaya has developed various innovations based on local wisdom, so that in the future it can achieve a Zero Carbon Emission City.

KEYWORDS

Surabaya, Innovation Based on Local Wisdom, Zero Carbon Emission

[Plenary Speech]

MEMBRANE BIOREACTOR: RECENT ADVANCES AND TREATMENT PERFORMANCE

BUI Xuan Thanh

Key Laboratory of Advanced Waste Treatment Technology, Ho Chi Minh City University of Technology (HCMUT), Vietnam National University Ho Chi Minh (VNUHCM), Linh Trung Ward, Thu Duc City, Ho Chi Minh City, Vietnam
Faculty of Environment and Natural Resources, Ho Chi Minh City University of Technology (HCMUT), 268 Ly Thuong Kiet Street, District 10, Ho Chi Minh City, 700000, Vietnam

**Corresponding author: bxthanh@hcmut.edu.vn (X.-T. Bui)*

ABSTRACT

Recently, membrane bioreactor (MBR) has become an advanced technology for water and wastewater treatment. There are several advantages compared to conventional biological treatment processes such as activated sludge process, trickling filter, oxidation ditch, bio-filter, rotating biological contactor, wetland, etc. Although many advantages of MBR such as higher loading rate, longer sludge retention time, good treated water quality, less footprint, better removal of micro pollutants, etc. are clearly observed in recent research works, membrane fouling still remains an its drawback. Since then, MBR has been developed and upgraded with many modifications for fouling alleviation. Fouling was controlled by a number of methods such as using various membrane configurations, operating conditions, addition of various flocculants/media into membrane tank, use of special microbial species, applying different physical and/or chemical cleanings. Further, MBR technology are not merely advantageous for organic and nutrient removal, but also likely promote a higher biodegradation efficiency of micro pollutants. The removal of micro pollutants in MBRs is better due to the relatively long sludge retention time, which leads to the development of distinct microbial communities in the reactor compared to other conventional processes. This review focus on the recent development of MBR and micro pollutants removal.

KEYWORDS

Membrane bioreactor, micro-pollutant, operating condition, membrane fouling

Application of Calcium-based Chemical Oxo-Precipitation (Ca-COP) Process to Remove Boron from Flue Gas Desulfurization Wastewater

Nicolaus Nezha Nunez Mahasti, Yao-Hui Huang*

Department of Chemical Engineering, National Cheng Kung University, Tainan, Taiwan 701, R.O.C.

**Corresponding author: yhhuang@mail.ncku.edu.tw*

ABSTRACT

Chemical oxo-precipitation (COP) is an effective method to recover boron as perborate salts precipitation under the assistance of hydrogen peroxide. Barium has been developed as an excellent precipitation agent in the boron removal from the boric acid solution. However, the implementation in the real case is limited by the hazardous sludge production and high residual dissolved barium concentration. This study aims to apply calcium as an alternative precipitant in the COP system (Ca-COP) to prevent the generation of hazardous by-products. Flue gas Desulfurization (FGD) wastewater that contained 652 mg/L of boron was used as a wastewater source. Various operating parameters, including pHi, the initial molar ratio of calcium ($[Ca]_0$ / $[B]_0$) and hydrogen peroxide ($[H_2O_2]_0$ / $[B]_0$) were introduced to obtain the optimal boron removal efficiency. A Multistep Ca-COP system with a gradual dosing method was also tested to enhance the removal efficiency of boron. The final residual boron concentration reached 2.5 mg/L, or reaching the permissible effluent standard under the pH = 10.5 – 11.0; $[H_2O_2]_{Total}$ / $[B]_0$ = 6.0; and $[Ca]_{Total}$ / $[B]_0$ = 2.5. From Raman analysis, besides the main compound of calcium perborate (CaPB), other metal impurities of metal oxide, metal carbonate, and metal hydroxide have also existed in the solid product.

KEYWORDS

Chemical Oxo-Precipitation, Boron, Perborate salts, multi-step Ca-COP, Flue Gas Desulfurization wastewater, calcium perborate

Bioswale Design Optimization to Maximize the Efficiency of Reducing Surface Water Runoff

Lady Lyn Escarieses[1], Rico Rhen C. Aguilar[2], Raquelle N. Alcantara[2], Sarah Jane A. Aquino[2], Mary Ann Pauline I. Piedra[2], Florante D. Poso Jr.[3,*]

[1]*Faculty, Department of Civil Engineering, Far Eastern University – Institute of Technology, Metro Manila, Philippines*
[2]*Student Researchers, Department of Civil Engineering, Far Eastern University - Institute of Technology, Metro Manila, Philippines*
[3]*Program Director, Department of Civil Engineering, Far Eastern University – Institute of Technology, Metro Manila, Philippines*

**Corresponding author: fdposo@feutech.edu.ph; Tel: +63 9688793570*

ABSTRACT

The practice of stormwater management is evolving and rapidly emerging, driven by need, and will benefit from improvements in innovative solutions. It also plays an important role in maintaining sanitation and livability in urban areas. Low impact development (LID) is one method of managing stormwater that aims to control runoff as close to its source as possible to reduce the effects of increased runoff and stormwater pollution. Through site grading, plants, soils, and other natural processes that absorb and filter runoff onsite, LID methods assist in maintaining natural hydrologic cycles. The USEPA's StormWater Modeling Tool was one of the models reviewed for modeling Storm Control Measures (SCMs). This study presented the theoretical framework of the systematic algorithm for the design and planning of low-impact development (LID) practice using the storm-water management model (SWMM). Manning's (n) and the percentage area of Midtown Village Park were taken into consideration as 2 characteristics that were independent variables. SWMM simulations of design storms were performed and compared during high-intensity rainfall events to assess the effectiveness of the LID system in terms of runoff volume reduction, total infiltration, as well as peak flow mitigation. The research used the 26% area Bioswale and 24-hour design storm for the comparison between pre-development (without bioswale) and post-development (with bioswale) conditions. Based to the simulation, the stormwater runoff decreases while the infiltration increases. Before the installation of Bioswale, the stormwater runoff in the sub catchment was 5.58 inches and after converting the 26% of the study area into bioswale, the total runoff was decreased to 4.16 inches. The infiltration also increased from 4.08 inches to 5.56 inches. Although bioswales are effective in reducing surface water runoff, the researchers recommend the use or combinations of other LID practices to obtain a flood free environment.

KEYWORDS

Bioswale; Infiltration; Low Impact Development; Runoff; Stormwater Management

Sustainable Drainage System: Assessment of The Optimum Lid Practices to Minimize the Storm Water Runoff

Lady Lyn E. Escarieses[1], Mico V. Buenconsejo[2], James Bryan R. Galang[2], Jose Patricio R. Lagrata[2], Roshel Ann T. Marcelino[2], Florante D. Poso Jr.[3,*]

[1]*Faculty, Department of Civil Engineering, Far Eastern University – Institute of Technology, Metro Manila, Philippines*
[2]*Student Researchers, Department of Civil Engineering, Far Eastern University - Institute of Technology, Metro Manila, Philippines*
[3]*Program Director, Department of Civil Engineering, Far Eastern University – Institute of Technology, Metro Manila, Philippines*

**Corresponding author: fdposo@feutech.edu.ph; Tel: +63688973570*

ABSTRACT

Low Impact Development is a green infrastructure approach to help mitigate surface runoff that arises due to climate change and from an increasing impervious surface area caused by urbanization. This study aims to determine which LID control is best suited in Brgy. San Rafael, San Jose Del Monte, Bulacan, Philippines. Using Storm Water Management Model (SWMM), a hydraulic model of the area was created to apply the LID and simulate a runoff. The data used in SWMM for the runoff simulation is the monthly rainfall amount of the year 2020. This study has used three LID combinations namely, Bioretention Cell and Bioswale, Bioswale and Permeable Pavement, and Bioretention Cell and Permeable Pavement. Based on the simulation using SWMM, the existing drainage system has a high total flood volume with total flood volume of 243.511. The results showed that the most effective combination with total flood volume of 50.884 was the combination of all the LID practices. The findings shows that both Bioretention Cells and Bioswale are primarily used in parking lot islands, traffic islands, and driveway runoff. The same result was recorded for Permeable Pavement, which is used mainly on roadways and parking lot islands. In contrast, the least effective combination was Bioretention and Bioswale. By combining the three LID parameters, Bioretention Cell, Bioswale and Permeable Pavement, a total flood volume of 50.884 liters was accumulated. Also, considering the total flood volume that the SWMM calculated, the combination of the three LID parameters alone has the lowest total flood volume collected compared to Bioswale alone. In the final analysis, the combination of Permeable Pavement, Bioretention Cell, and Bioswale is the best combination out of the three LID controls mentioned.

KEYWORDS

Bioretention Cell, Low Impact Development, Total Flood Volume, Permeable Pavement, Storm Water

Development of IoT-Based Real-Time Fire Detection and Early Warning System

Glenda S. Guanzon[1,*], Fredick Andrew P. Dimo[2], and Teofilo Oribello[2]

[1]*Faculty, Computer Engineering Department, University of San Agutsin, Iloilo City, 5000 Philippines*
[2]*Student, Computer Engineering Department, University of San Agutsin, Iloilo City, 5000 Philippines.*

**Corresponding author: gguanzon@usa.edu.ph*

ABSTRACT

Fire accidents occur unexpectedly, and they cause damages, loss of property, and even loss of lives if not mitigated immediately. Monitoring devices can reduce the impact of fire accidents by prompting the concerned parties to respond fast. This study aims to develop an IoT-based Real-Time Fire Detection and Early-Warning System which detects the possible occurrence of fire accidents. The system is composed of an ESP32 microcontroller with Wi-Fi module, sensors (i.e. flame, smoke, and temperature), a buzzer, a power supply, and a Blynk cloud platform. The system was constructed using the prototyping method and experimental set-up used for evaluating the system. The system was evaluated for accuracy level and notification response time. The sensors were used to gather data continuously until they detected possible signs of fire accidents in the environment. Early warning messages were sent to the concerned parties when the sensors were triggered. The status of the system was monitored using the Blynk cloud platform and mobile application. The system implementation results showed that the mean accuracy levels for smoke and temperature monitoring are 95.10% and 100%, respectively. While, the mean response times for flame monitoring and real-time notification are 1.139 seconds and 0.897 seconds, respectively. Hence, the system has proven to be highly accurate and functional based on its evaluation results.

KEYWORDS

IoT-based Fire Detection, ESP32 Microcontroller, Blynk cloud platform, Real-time early warning system

Effectiveness of Chrysopogon Zizanioides in Reducing Lead Content in Water

John Manuel B. Vergel[1], Kim Kelly R. Ang[2], Vincent Karl R. Cabie[2], Louis Geoffrey G. Eusebio[2], Sun M. Valerio[2], Florante D. Poso Jr.[3,*]

[1]*Faculty, Department of Civil Engineering, Far Eastern University – Institute of Technology, Metro Manila, Philippines*
[2]*Student Researchers, Department of Civil Engineering, Far Eastern University - Institute of Technology, Metro Manila, Philippines*
[3]*Program Director, Department of Civil Engineering, Far Eastern University – Institute of Technology, Metro Manila, Philippines*

**Corresponding author: fdposo@feutech.edu.ph; Tel: +63 9688793570*

ABSTRACT

Heavy metal contamination could come from a variety of sources. Examples include agricultural runoffs, industrial wastewater and even natural resources causing several health and environmental risks. This study focuses on the Chrysopogon Zizanioides (Vetiver Grass) and its capabilities of filtering heavy metals. The main objective of the study is to determine the effectiveness of Chrysopogon Zizanioides in reducing the amount of Lead in contaminated water. The study gathered data from previous research on Chrysopogon Zizanioides and its results in absorbing heavy metal content, specifically lead content, from its environment. Statistical treatment was used to analyze the relationship among the variables. The maximum value of the combined lead content absorbed by the shoots and roots is 69.13% while the optimum value is 57.57%. Majority of the lead absorption came from the roots. As the amount of initial lead content increases, the percentage of the lead absorbed decreases and approaches the 54% mark. Hence, it can be inferred that the percentage of lead absorbed by Chrysopogon Zizanioides will not be less than 54% even if the initial amount increases. This value can be considered as the value of the absorption capacity of Chrysopogon Zizanioides. The two main parts of the Chrysopogon Zizanioides, the roots and shoots, have varying quantities of lead absorbed after the analysis. The roots, being the most exposed to the soil have accumulated an average of 52.97% initial lead content. The shoots on the other hand, have absorbed an average of 4.59% initial lead content. Although the findings showed positive results on the use of vetiver grass in absorbing lead in water, the researchers would like to recommend investigating further the use of Chrysopogon Zizanioides as natural coagulant using other methods of analysis and testing.

KEYWORDS

Chrysopogon Zizanioides; Heavy Metals Filtration, Lead Filtration, Phytoremedation Mechanisms, Vetiver plant filtration

Recovery of Struvite from Swine Wastewater using Fluidized Bed Homogeneous Crytallization Process

The-Anh Luu, Xuan-Hong Nguyen, Gia-Cuong Nguyen, Van-Giang Le*

Central Institute for Natural Resources and Environmental Studies, Vietnam National University, Hanoi 111000, Viet Nam.

**Corresponding author: levangiangcres@vnu.edu.vn; Tel: +84-034-227-7497*

ABSTRACT

Resource recovery in wastewater treatment is the major challenge for achieving sustainable development. Further than only treatment, the recovery and reuse of nitrogen and phosphorus as a slow release fertilizer from actual swine wastewater was performed in this study. The development of a novel technique of converting soft sludge into hard particles using homogeneous granulation process in a fluidized bed reactor helps address the recovery. Under conditions of pH 8.5 ± 0.2, an Mg:P ratio of 1.2, total suspended solids < 100 mg/L, and a 25 m/h up-flow velocity, the removal of N and P reached 70% and 95%, respectively. XRD and SEM-EDS analysis confirmed that N and P were crystallized as struvite with a purity greater than 68.3% and an average particle size of 0.88 mm. The increase in total suspended solids resulted in not only decreases in the removal efficiency and struvite purity but also an irregular morphology in the struvite crystals. Furthermore, increasing the magnesium concentration significantly reduced the crystal size of the pellets. The optimal up-flow velocity should be 1.5–2.4 times the minimum fluidization velocity (12.75 m/h). A cost-benefit estimation of actual swine wastewater treatment indicated a profit of approximately 0.345 USD per m^3-actual swine wastewater. Fluidized-bed homogeneous granulation was proven to be a promising technology for recovering N and P from swine wastewater.

KEYWORDS

Struvite; Phosphate; Nitrogen recovery; Fluidized bed crystallization; Swine wastewater.

Prediction of hydroxyl radical exposure during ozonation using different machine learning methods and ozone-related parameters as input variables

Dongwon Cha[1], Sanghun Park[2], Min Sik Kim[3], Gyuseung Lim[1], Kyung Hwa Cho[4], and Changha Lee[1,*]

[1]*School of Chemical and Biological Engineering, Institute of Chemical Process (ICP), Seoul National University, Seoul 08826, Republic of Korea*
[2]*Department of Environmental Engineering, Pukyong National University, Busan 48513, Republic of Korea*
[3]*Department of Environmental Engineering, Jeonbuk National University, Jeonju 02792, Republic of Korea*
[4]*School of Urban and Environmental Engineering, Ulsan National Institute of Science and Technology (UNIST), Ulsan 44919, Republic of Korea*

**Corresponding author: leechangha@snu.ac.kr; Tel: +82-2-880-8630*

ABSTRACT

Determination of oxidant exposure values during the ozonation process is critical in order to measure the extent of micropollutant oxidation in the target water. While it is somewhat possible to determine ozone (O_3) exposure using in-situ sensors in large-scale water treatment plants, realistic hindrances make it challenging to accurately calculate hydroxyl radical ($^{\bullet}OH$) exposure in the field. To solve this problem, prediction of $^{\bullet}OH$ exposure using empirical modeling can be a viable option. In this study, instantaneous O_3 demand (IOD) and O_3 exposure were used as additional input parameters alongside basic water characteristic parameters and ozonation experiment conditions for $^{\bullet}OH$ exposure prediction. User-defined response surface methodology (RSM) as well as various machine learning methods were used to develop models with different input parameter combinations for the prediction of $^{\bullet}OH$ exposure values. Model training and validation results showed that models developed using O_3 exposure as an additional input parameter generally showed better prediction accuracy compared to models that did not. IOD was determined not to be as important as a potential input parameter when compared with O_3 exposure. Additional comparison of predictive abilities between machine learning methods as well as sensitivity analysis were conducted for further discussion.

KEYWORDS

Ozonation; Oxidant exposure; Instantaneous ozone demand (IOD); Machine learning; Modeling

Adsorptive Removal of Ibuprofen from Aqueous Solution with Chrysanthemum-based Activated Carbon: Solid Waste of Beverage Industry

Chaiwat Rattanet[1], Jesper T. N. Knijnenburg[2], Supattra Budsaereechai[3,*], and Yuvarat Ngernyen[1,*]

[1]*Biomass & Bioenergy Research Laboratory, Department of Chemical Engineering, Faculty of Engineering, Khon Kaen University, Khon Kaen, 40002, Thailand.*
[2]*Biodiversity and Environmental Management Division, International College, Khon Kaen University, Khon Kaen, 40002, Thailand*
[3]*Department of Mechanical Engineering, The project to establish the Faculty of Engineering and Industrial Technology, Chaiyaphum Rajabhat University, Chaiyaphum, 36000, Thailand*

**Corresponding author: nyuvarat@kku.ac.th and pla.supattra.cpru@gmail.com; Tel: +668-1-288-9649*

ABSTRACT

Activated carbon derived from solid waste of beverage industry (chrysanthemum) was used as an adsorbent for the removal of a nonsteroidal anti-inflammatory drug (ibuprofen) from contaminated water. The milled and sieved chrysanthemum powder was activated with 50 wt% $ZnCl_2$ for 24 h (impregnation weight ratio of 1:2 for raw material and chemical) and carbonized at 500 ℃ for 1 h under N_2 atmosphere. The produced activated carbon had a high specific surface area of 728 m^2/g and total pore volume of 0.48 cm^3/g with average pore size of 2.65 nm, which were responsible for its excellent adsorption ability. Batch adsorption studies of ibuprofen were performed with contact time 10 – 1200 min at concentration 30, 40 and 50 mg/L. The effects of pH (2 – 12) and temperature (303 – 333 K) were also investigated. The contact time to reach equilibrium was 600 min for all initial concentrations. The adsorption kinetics were best described by the pseudo-second order and intraparticle-diffusion models. The adsorption isotherm in the applied concentration range (20 – 100 mg/L) was well represented by the Langmuir model with a maximum ibuprofen adsorption capacity of 288 mg/g. The adsorption of ibuprofen on chrysanthemum activated carbon was endothermic and spontaneous and the optimum pH for adsorption was 2. Thus, this study describes an efficient adsorbent from bio-based industrial waste for treatment of ibuprofen contaminated water.

KEYWORDS

Activated carbon; Chrysanthemum; Chemical activation; Ibuprofen; Adsorption

Activated Carbon from Sugar Palm (Arenga pinnata) Waste Products

Sheryl Dinglasan Fenol[1,*], Lorenzo Lapitan Jr.[2], Jhon Laurence Herrera[2], Daeniel Zarene Mojica[3]

[1]*College of Engineering and Information Technology, Cavite State University, Cavite, Philippines*
[2]*Sugar Palm Research, Information, and Trade (SPRINT) Center, Cavite State University, Cavite, Philippines*
[3]*College of Agriculture, Forestry, Environment and Natural Resources, Cavite State University, Cavite, Philippines*

**Corresponding author: sdfenol@cvsu.edu.ph; Tel: +63-976-277-7278*

ABSTRACT

The research project aims to produce high-value materials from sugar palm waste products like husk and fiber. Activated carbons have many known applications like air purification, decaffeination, gold purification, metal extraction, water purification, medicine, sewage treatment, air filters in gas masks and respirators, and filters in compressed air. Activated carbon is also the main material for fuel cells, batteries, and supercapacitors. The removal of the calcium oxalate crystals in sugar palm husk that can cause intense pain and swelling if they come in contact with the skin or mouth was also observed. The sugar palm waste product isarbonized and activated at 600℃ with three different carbonization time: 35, 40, and 45 minutes. The optimized time based on the result of the surface area test is 45 minutes whichresulted in a surface area of ~3000 m /g for sugar palm husk and ~2200 m/g for sugar palm fiber. The activated carbon from sugar palm husk and fiber can compete with the commerciallyavailable activated carbon, which has a surface area of 900-2000 m/g. Having 0% moisture and the absence of oil in water means it can be useful as an air and water filter. The results of the research project imply that it is possible to convert a waste product into a high-value product. Since there are many known uses of activated carbon, it is recommended to explore its uses to develop new products that can be distributed in the market.

KEYWORDS

activated carbon, surface area, kaong fiber, kaong husk, filter

Organic Electrode Supercapacitors for Sustainable Energy and Storage

Sheryl Dinglasan Fenol[1,2,*], Felicito S. Caluyo[2]

[1]*College of Engineering and Information Technology, Cavite State University, Cavite, Philippines*
[2]*School of Graduate Studies, Mapua University, Intramuros, Manila, Philippines*

**Corresponding author: sdfenol@cvsu.edu.ph; Tel: +63-976-277-7278*

ABSTRACT

Supercapacitors have an advantage including high power density. Activated carbon is a principal material for electrodes of supercapacitors because of its relatively low cost and very high specific surface area. This material can be produced from organic waste like coffee grounds. Renewable energy is important in sustaining power consumption specifically in rural areas where commercial electricity is not available. Developing an energy storage device that will minimize the consumption of renewable and commercially available energy using organic materials will also minimize e-waste. The main objective of the study is to produce supercapacitors from organic electrodes. Specifically, it aims to: develop electrodes from activated carbon produced from coffee grounds; evaluate the materials and electrochemical properties of the electrodes; and test the performance of the supercapacitors. The study produced supercapacitors from coffee grounds which were processed to become an activated carbon that serves as the electrodes. The study produced a supercapacitor with high energy density, and capacity and used a simple process of manufacturing the supercapacitor. The activated carbon produced from coffee grounds compared to other raw materials like coconut husk, coconut shell, corncob, rice hull, and would have the highest surface area that makes it a suitable material for supercapacitor electrodes.

KEYWORDS

activated carbon, coffee grounds, electrode, potential, supercapacitors

Citral Oil Nanoemulsion for Antimicrobial Kinetic of *Escherichia Coli* and *Staphylococcus Aureus*

Muhammad Imran[1], Chih-Huang Weng[2,*], Yu-Jie Chien[1], and Yao-Tung Lin[1,3,*]

[1] Department of Soil and Environmental Sciences, National Chung Hsing University, Taichung 40227, R.O.C, Taiwan
[2] Department of Civil Engineering, I-Shou University, Kaohsiung 84008, R.O.C, Taiwan
[3]Department of Civil and Environmental Engineering, University of Delaware, Newark, DE 19716, USA

**Corresponding author: yaotung@nchu.edu.tw (Y.T. Lin), chweng@isu.edu.tw (C.H. Weng)*
Tel: +886-4-2285-2137

ABSTRACT

Citral, a common essential oil, has antimicrobial properties that are effective against many microbes. Citral oil is prone to oxidative degradation, resulting in the loss of antimicrobial activity under typical storage conditions. Hence, nanoemulsion technology that can effectively hydrophilize, microencapsulate, and safeguard this molecule is substantial. The present study used citral oil to fabricate nanoemulsions to meet potential alternatives to maintain stability and antimicrobial activity. High hydrophilic-lipophilic balance and homogenization speed resulted in smaller size particles. Moreover, adding different surfactant ratios in nanoemulsion formulations of citral oil could increase their stability. The formulation with an oil and surfactant ratio of 3:2 resulted in the long-term stability of citral nanoemulsion. Maximal emulsion dosage (570 ppm) significantly reduced *Escherichia coli* and *Staphylococcus aureus* colonies six hours after application. Gram-negative bacteria are more susceptible than Gram-positive bacteria to applying citral nanoemulsion. Among antifungal activity, the germination rate and germ tube length of *Neoscytalidium dimidiatum* were significantly reduced with the increasing concentration and larger particle size of citral nanoemulsion. The shortest germ tube length (4.9 µm) of *N. dimidiatum* was observed with a higher emulsion concentration (2,500 ppm) and larger particle size (400 nm). Therefore, the environmental-friendly citral oil nanoemulsion is highly recommended as an efficient disinfectant against food-borne and plant pathogens in pertinent industries.

KEYWORDS

Citral oil nanoemulsion, antimicrobial, *Escherichia coli*, *Staphylococcus aureus*, *Neoscytalidium dimidiatum*

Correlation of Harmful Algal Bloom Occurrence with Water Quality and Climate Characteristics in Malampaya Sound, Taytay, Palawan, Philippines

Lutgardo B. Alcantara[1,*], Lota A. Creencia[1], John Roderick V. Madarcos[1], Karen G. Madarcos[1], Joel D.C. Sumeldan[1], Cristobal B. Cayetano[1], Arlene L. Avillanosa[1], Victoria Cheung[2]

[1]*College of Fisheries and Aquatic Sciences, Western Philippines University, Puerto Princesa City, Palawan, Philippines*
[2]*School of Biological and Marine Science, University of Plymouth, Plymouth, United Kingdom*

*Corresponding author: * lutgardo.alcantara@gmail.com; Tel: +639177418122*

ABSTRACT

It is well understood that in the last few decades, the Philippines has experienced an increase in the frequency and spatiality of paralytic shellfish poisoning due to harmful algal blooms (HABs). Despite this, the understanding of the effects of various water quality characteristics and climate factors at different spatial and temporal patterns in predicting the occurrence of HABs is still incomplete. The current research aims to understand the correlation of water quality characteristics and climate factors with the occurrence of HABs and to develop a predictive model. To accomplish these, we took seawater samples from June 2019 to March 2021 in Malampaya Sound Protected Landscape and Seascape in Palawan and analyzed the phosphorus (P), lead (Pb) content and salinity in the laboratory. We sourced the climate data from the National Aeronautics and Space Administration satellites such as sea surface temperature (SST), chlorophyll-*a* (Chl-*a*), rainfall, wind direction, and wind speed. Results showed that the presence of Chl-*a* in seawater detected by satellite remote sensing was very strongly correlated with the occurrence of HABs. On the contrary, the occurrence of HABs has a strong negative correlation with SST, Pb and wind direction. The environmental factors which favor the occurrence of HABs tend to occur during the dry season of the northeast monsoon and are influenced by Chl-*a*, SST, wind speed, ocean surface current, rainfall, salinity, Pb and P. The model can predict 87.4 – 89.5% of the variance in HABs occurrence. The result of this study contributes to a deeper understanding of the HABs phenomenon to predict and mitigate its sudden occurrence in the future.

KEYWORDS

HABs; Chlorophyll-*a*; wind; SST; water quality; climate

Climate change awareness and risk perceptions in the coastal marine ecosystem of Palawan, Philippines

Lutgardo Alcantara[1], Lota Creencia[1], Karen Madarcos[1,*], John Roderick Madarcos[1], Jean Beth Jontila[1], Fiona Culhane[2]

[1]College of Fisheries and Aquatic Sciences, Western Philippines University, Puerto Princesa City, Philippines
[2]School of Biological and Marine Science, University of Plymouth, Plymouth, United Kingdom

**Corresponding author: karengmadarcos@gmail.com; WhatsApp: +639617283721*

ABSTRACT

Understanding coastal communities' awareness and risk perceptions of climate change impact is essential in developing effective risk communication tools and mitigation strategies to reduce the vulnerability of these communities. In this study, we examined coastal communities' climate change awareness and risk perceptions of climate change impact on the coastal marine ecosystem, sea level rise impact on the mangrove ecosystem and as a factor affecting coral reefs and seagrass beds. The data were gathered by conducting face-to-face surveys with 291 respondents from the coastal areas of Taytay, Aborlan and Puerto Princesa in Palawan, Philippines. Results showed that most participants (82%) perceived that climate change is happening and a large majority (75%) perceived it as a risk to the coastal marine ecosystem. Local temperature rise and excessive rainfall were found to be significant predictors of climate change awareness. Sea level rise was perceived by most participants (60%) to cause coastal erosion and to affect the mangrove ecosystem. On coral reefs and seagrass ecosystems, anthropogenic drivers and climate change were perceived to have a high impact, while marine livelihoods had a low impact. In addition, we found that climate change risk perceptions were influenced by direct experiences of extreme weather events (i.e., temperature rise and excessive rainfall) and climate-related livelihood damages (i.e., declining income). Climate change risk perceptions were also found to vary with household income, education, age group and geographical location. The results suggest that addressing poverty and effectively communicating climate change risks can improve climate change awareness and risk perceptions.

KEYWORDS

Climate change awareness, risk perception, exposure, experience, impact, policy

Comparative Analysis and Design of A Post Disaster Temporary Shelter in The Philippines

Ian Gail Cabrera[1,*], Jonathan Cruz[2], Kurt Lester Ramos[2] and Porutotage Ryan Shahen Cabangcla[2]

[1*] *Faculty of Civil Engineering Department, College of Engineering, Adamson University, Ermita, Manila 1000, Philippines*
[2] *Department of Civil Engineering, Adamson University, Manila 1000, Philippines*

**Corresponding author: iangailcabrera@yahoo.com ; Contact: +639755102349*

ABSTRACT

Residents who lived in a government-provided temporary shelter had difficulties because the temporary shelter was not designed with consideration of their preferences and shelter standard. Nonprobability purposive sampling method was used to gather responses from the residents and professionals in Tacloban City, Cagayan de Oro City, and Surigao City who are victims of super typhoons and experienced living in Temporary Shelters provided by the government. Statistical treatment weighted mean and mode are employed. Under the important factors, temporary shelter in Tacloban City had the lowest mean value as compared to the temporary shelter in Cagayan de Oro City and Surigao City, but all of these factors were interpreted as 'important and somewhat important'. In addition, problems encountered by professionals in the construction process of temporary shelters were ranked and discovered. Overall, important factors to be prioritized and problems in temporary shelter that needs to be addressed were determined and resulted that temporary shelter in Tacloban City has the most problems followed by temporary shelter in Cagayan de Oro City, then Surigao City. The new design of temporary shelter can endure a typhoon with 260 kph winds. In the event that another typhoon strikes the same region of the Philippines, it is acceptable to state that those who would occupy the temporary shelter will be secure. After the Structural analysis, gathered data shows that there are no failed members based on the STAAD model that has been generated.

KEYWORDS

Benzothiophene; Temporary shelter, Shelter standard, Construction process, STAAD model, preference

Using heterogeneous catalytic ozonation for removing paraben-contaminated water

Apiladda Pattanateeradetch[1], Chainarong Sakulthaew[2], Athaphon Angkaew[1], Yao-Tung Lin[3], Chanat Chokejaroenrat[1,*]

[1]*Department of Environmental Technology and Management, Faculty of Environment, Kasetsart University, Bangkok 10900, Thailand*
[2]*Department of Veterinary Technology, Faculty of Veterinary Technology, Kasetsart University, Bangkok 10900, Thailand*
[3]*Department of Soil & Environmental Sciences, National Chung Hsing University, Taichung 402, Taiwan*

**Corresponding author: chanat.c@ku.ac.th ; Tel: +668-9893-1017*

ABSTRACT

Personal care products such as parabens have been reported to cause water contamination, particularly in poorly maintained public swimming pools. Because our previously discovered metal ferrite nanocomposites were proved to enhance photocatalytic activity, we used either a ternary $CuFe_2O_4/CuO/Fe_2O_3$ nanocomposite (CF) or CF/g-C_3N_4 (CFM; CF calcining with melamine) as an ozone activator in this research. With this robust treatment technology, ozone supply could be minimized while still ensuring its security to discharge. Results showed that both CF and CFM were able to dramatically enhance ozonation without the use of any additional simulated light. Although CFM had outstanding magnetic separation capabilities, its degradation efficiency was relatively lower than that of CF owing to probable self-agglomeration that lowered its electron capture capacity. Varying BP degradation rates were observed in both synthetic wastewater and real discharge water because of the consequence of producing secondary active radicals. BP degradation was mostly driven by $^1O_2$ and $^{\bullet}O_2^-$, which resulted from two ozone interactions: (1) $^{\bullet}OH$ from indirect ozonation, and (2) O_3 adsorption that occurs on the CF≡Cu(I)–OH and CF≡Fe(III)–OH surface. Treated water of 50% revealed more than 80% cell viability and had no effect on the young tip of *Ceratophyllum demersum* L. These results proved that our synthesized material can significantly enhance ozonation and treated waters were non-toxic, suggesting that they may successfully serve as catalysts for ozonation.

KEYWORDS

$CuFe_2O_4/CuO/Fe_2O_3$ nanocomposites; Enhanced ozonation; Melamine-assisted calcination; Paraben removal; Singlet oxygen

Efficient removal of steroid hormones by activation of oxidant with a metal ferrite under visible light irradiation

Kitipong Poomipuen[1], Chanat Chokejaroenrat[2], Yao-Tung Lin[3], Chainarong Sakulthaew[1,*]

[1*] *Department of Veterinary Technology, Faculty of Veterinary Technology, Kasetsart University, Bangkok 10900, Thailand*
[2] *Department of Environmental Technology and Management, Faculty of Environment, Kasetsart University, Bangkok 10900, Thailand*
[3] *Department of Soil & Environmental Sciences, National Chung Hsing University, Taichung 402, Taiwan*

Corresponding author: cvtcns@ku.ac.th

ABSTRACT

Steroid hormone is one of the emerging contaminants which were frequently detected in natural receiving water. These compounds can pose risks to the aquatic ecosystem and humans via potential biological activity. Our objective is to remove steroid hormones contaminated in water by using $MnFe_2O_4$/g-C_3N_4 (MnF) as a catalyst in photocatalysis. We synthesized MnF by co-precipitation and calcination methods. The effect of initial oxidants (peroxymonosulfate; PMS, persulfate; PS, hydrogen peroxide; H_2O_2) dosage, initial pH, anions, water matrices and scavenging were evaluated for four steroid hormones (estrone; E1, 17β-estradiol; E2, estriol; E3, methyltestosterone; MT) removal. The cytotoxicity of untreated and treated water were tested with Eker Leiomyoma Tumor-3 cell (ELT3) and Mouse Sertoli TM4 cell (TM-4). Our results showed that MnF can enhance the degradation performance of steroid hormones under visible light coupled with oxidants. Complete removal of three estrogens was achieved within 30 min in PMS/MnF/Vis system (k_{obs} 4.75 - 7.19 x 10^{-2} min^{-1}). However, almost 80% removal of MT was achieved at 150 min in PS/MnF/Vis system (k_{obs} = 7.43 x 10^{-3} min^{-1}). At acidic pH (pH=3) showed the highest degradation performance. The singlets oxygen ($^1O_2$) generated from interaction of metal ions and oxygen vacancy in PMS activation was the main reactive species. At 25%-50% untreated and treated water showed significant effect on cell viability of ELT-3 cell at 75-98% and TM-4 cell at 79-92%. In conclusion, the photocatalytic of steroid hormones in the presence of MnF presents a highly efficient for treating emerging organic contaminated water.

KEYWORDS

Advance oxidation process; Cytotoxicity; Emerging contaminants; Graphitic carbon nitrile nanocomposites; Manganese ferrite; Steroid hormone.

Recovery of cobalt and copper in the presence of complexing agents using fluidized-bed homogeneous granulation process

Nonglak Boonrattanakij, Suthinee Puangsuwan, Anabella C. Vilando*, Ming-Chun Lu

Graduate School, College of Engineering and Architecture, Bicol State College of Applied Science and Technology, Naga City, Philippines,4400

**Corresponding author: acvilando@astean.biscast.edu.ph; Tel: +63 (54) 4720414 loc 145*

ABSTRACT

Industrial processes release copper and cobalt into the environment, which poses a serious health concern. This study investigated the effects of complexing agents on the ability of the fluidized bed homogeneous granulation process (FBHGP) to recover both individual and a combination of copper and cobalt ions from simulated waste streams. In copper-based solutions, 99% copper removal and 95% granulation efficiency were reached. The remaining soluble copper in the solution changed the removal and granulation efficiencies by 4%. Cobalt-based solutions had 99% removal and 99% granulation efficiency. The elimination and granulation efficiencies were 95% and 86%, respectively, for copper-based solutions when EDTA was present, and 95% and 91%, respectively, for cobalt-based solutions. Citrate was added to the copper-based solution, which resulted in an 83% removal rate and a 54% granulation efficiency at 0.1 MR citrate to copper. When the MR was larger than 0.1, no copper phosphate precipitate occurred. When citrate was added to cobalt-based solutions, 96% of the cobalt was removed and 92% of the granulation was efficient. In cobalt solutions, 99% removal and 98% granulation efficiency were achieved in the presence of chloride ions, compared to 99% removal and 91% granulation efficiency in copper solutions. Copper and cobalt solutions containing chloride ions reached 99% removal and 95% granulation efficiency, and cobalt solutions attained 99% removal and 95% granulation efficiency. As the MR of the complexing agents to metal increased and the concentration of chloride ions rose, the granule sizes shrank. The peaks of cobalt phosphate hydrate ($Co_3(PO_4)_2 8H_2O$) closely matched the peaks on the XRD pattern. Copper and cobalt have been successfully recovered by FBHGP from the waste discharges of synthetic metals.

KEYWORDS

Copper phosphate; Cobalt phosphate; Ethylenediaminetetraacetic acid; Citrate; Supersaturation; Chloride ions

Treatment of Wastewater Containing Imidacloprid Pesticide by Electro-Fenton Process

Jia-Zih Wang[1], Chart Chiemchaisri[2], Ming-Chun Lu[1,*]

[1]*Department of Environmental Engineering, National Chung Hsing University, Taichung City, 40227, Taiwan*
[2]*Department of Environmental Engineering, Kasetsart University, Bangkok 10900, Thailand*

**Corresponding author: mmclu@nchu.edu.tw; Tel: +886-4-22840441 ext 537*

ABSTRACT

Imidacloprid (IMD) is an insecticide used as an alternative to organic chlorine insecticides. Even though IMD is less toxic to mammals, it is not degraded completely in conventional wastewater treatment technologies. Therefore, the application of advanced oxidation processes (AOPs) is recommended as an alternative treatment to mitigate the effects of IMD in water. Electro-Fenton process is one of the AOPs that uses iron as the catalyst and H_2O_2 as the oxidant to produce hydroxyl radicals, which can oxidize pollutants effectively. The experimental parameters in this study were initial pH, catalyst concentration, H_2O_2 concentration, different type of catalyst, current density and type of reactor. Sulfate-based Fe^{2+} catalyst at the operating parameters of 0.375 mM IMD, pH 2.5, 74.96 mM H_2O_2, 45.66 mM Fe^{2+}, 1.5A had a COD removal efficiency of 65.9% and a TOC removal efficiency of 38.3%. When Fe^{3+} was applied, 94.8% COD removal and 61.9% TOC removal were achieved at 0.375 mM IMD, pH 2.5, 74.96 mM H_2O_2, 9.14 mM Fe^{3+}, and 1.5A. Therefore, it can be seen that using sulfate-based ferric iron as a catalyst had a higher efficiency. Furthermore, sulfate-based iron has a higher efficiency than chlorlide-based one for COD and TOC removal. The oxidation intermediates were detected by LC-MS to find the reaction pathways of IMD degradation. Results showed that chloronicotinic aldehyde, chloronicotinic acid and 1-(6-chloro-3pyridilmethyl)-imidazolidin-2-ona were the oxidation intermediates. Additionally, based on the valuation of the Start Growth Time, the toxicity of the reaction solution decreased as the concentration of hydrogen peroxide increased. Whereas the toxicity of the reaction solution using Fe^{3+} as catalyst is lower than that using Fe^{2+}. The toxicity variation can be also approved by the COD and TOC removal efficiency.

KEYWORDS

Imidacloprid; advanced oxidation processes; electro-Fenton process

Assessing Strategies for Mitigating Greenhouse Gas Emissions from Soils A Systematic Review

Cherrie Lyn Villanueva

Department of Civil Engineering, Feati University, Sta. Cruz Manila, 1003, Philippines

**Corresponding author: villanuevacherrielyn8@gmail.com*
Tel: +632 917 5760459/ +632 945 8005087

ABSTRACT

Soils are a major source of greenhouse gas emissions, contributing an estimated 25– 30% of global emissions of carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O). This review assesses the current strategies for mitigating these emissions, including soil management practices, biochar, and organic fertilizers, in terms of their ability to reduce emissions of CO_2, CH_4, and N_2O, as well as their potential for long- term sustainability. Additionally, this research identifies the potential challenges and opportunities associated with each strategy and discusses gaps in current knowledge that need to be addressed in future research. The findings of this review indicate that soil management practices, biochar, and organic fertilizers are all effective strategies for reducing emissions of CO_2, CH_4, and N_2O from soils, and further research is needed to identify the most effective and sustainable strategies.

KEYWORDS

Soil, Greenhouse Gas, Mitigation, Carbon Dioxide, Methane, Nitrous Oxide, Biochar, Fertilizers, Organic Matter, Climate Change

Mesoporous Carbon-Silica Composite Fabricated from Molasses and Its Adsorption Behaviours of Methylene Blue

Yuvarat Ngernyen[1,*], Channakhone Phoumixay[2], Koungnang Mountivongsa[2]
Jesper T. N. Knijnenburg[3], and Supattra Budsaereechai[4,*]

[1]*Biomass & Bioenergy Research Laboratory, Department of Chemical Engineering, Faculty of Engineering, Khon Kaen University, Khon Kaen, 40002, Thailand.*
[2]*Faculty of Engineering, National University of Laos, Vientiane, Lao PDR.*
[3]*Biodiversity and Environmental Management Division, International College, Khon Kaen University, Khon Kaen, 40002, Thailand*
[4]*Department of Mechanical Engineering, The project to establish the Faculty of Engineering and Industrial Technology, Chaiyaphum Rajabhat University, Chaiyaphum, 36000, Thailand*

**Corresponding author: nyuvarat@kku.ac.th and pla.supattra.cpru@gmail.com; Tel: +668-1-288-9649*

ABSTRACT

Mesoporous carbon-silica composites were synthesized using molasses as carbon source and tetraethyl orthosilicate (TEOS) as silica source through a simple sol-gel method. The weight ratio of molasses to TEOS was varied from 0.3 to 1.8 and the resulting composites were characterized by nitrogen adsorption-desorption analysis, Fourier transform infrared spectroscopy (FTIR) and thermogravimetric analysis (TGA). The surface area of composites greatly increased with increasing molasses/TEOS ratio from 0.3 to 0.8 but decreased for higher ratios. The composite with the optimal ratio of 0.8 presented a BET surface area of 144 m^2/g, total pore volume of 0.35 cm^3/g with high mesopore volume of 83% and pore diameter of 9.71 nm. The FTIR spectra confirmed the appearance of surface functional groups that contained Si and C. Furthermore, TGA results indicated that the optimal composite had a high thermal stability with a residual weight of 30% at 450 –700 ℃ under air atmosphere. The optimal composite was further evaluated as an adsorbent for the removal of methylene blue (MB) from aqueous solution. The effects of adsorption time (1 – 22 h) and initial MB concentration (2 – 200 mg/L) were investigated by batch experiments. Adsorption equilibrium was achieved with 14 h of contact time and the adsorption kinetics were well described by the pseudo-second order kinetic model. The adsorption isotherm was best described by and Langmuir isotherm model with a maximum adsorption capacity of 157 mg/g. These results suggest that mesoporous carbon-silica composite from molasses can be used as a potential adsorbent for dyeing wastewater treatment.

KEYWORDS

Carbon-silica composite; Molasses; TEOS; Methylene blue; Adsorption

Copper recovery from treatment of simulated copper-iron wastewater using fluidized bed homogeneous crystallization reactor

Jayson Sime D. Jeremias[1], Maria Lourdes P. Dalida[1], Ming-Chun Lu[2,*]

[1]Department of Chemical Engineering, University of Philippines-Diliman, Quezon City 1800, Philippines
[2]Department of Environmental Engineering, National Chung Hsing University, Taichung 40227, Taiwan*

**Corresponding author: mmclu@nchu.edu.tw*

ABSTRACT

Electroless plating wastewater effluents contain Cu-EDTA complex which has high solubility in water solutions making it difficult to recover copper using readily available resource technologies. These complexes are destroyed first using Fenton process producing treated solutions with small concentrations of iron that may interfere on copper recovery. The purpose of this study was to confirm the influence of trace amount of iron ions resulting from a Fenton pre-treatment on copper removal, crystallization, and recovery as copper salts using Fluidized Bed Homogeneous Crystallization (FBHC) process. Several process parameters were varied such as initial copper and iron concentrations, effluent's pH, and metal and precipitant inlet flowrate and molar ratio (MR). The optimum conditions include effluent pH of 6.5, inlet flowrate of 15 mL min^{-1}, and CO_3^{2-}/Cu^{2+} MR of 1.5 with variable copper concentrations of 3.15 – 9.44 mM and iron concentrations of 0.36 – 1.08 mM. % Copper removal was not affected by addition of iron ions while increase in copper crystallization ratio was observed with increasing amount of iron. Superior copper removal and crystallization ranging from 93% – 99% and 80% – 98%, respectively were recorded. The characterization of the high-density spheroidal crystals obtained allowed the identification of the precipitates as carbonate-containing copper insoluble salts. The FBHC's ability to obtain high purity spheroidal solid salts enables resource recovery and catalyzes strategies for circular economy practices.

KEYWORDS

Copper; Iron; Fluidized bed reactor; Homogeneous crystallization; Metal salts recovery

A green and sustainable fruit waste valorization model: Optimal green extraction of phytochemicals and antioxidant activity from agricultural residue using a response surface methodology

Ying-Chen Chen[1], Chih-Huang Weng[2], Jun-Lin Wu[3], Huey-Ling Lin[4], Jenn-Wen Huang[5], Yao-Tung Lin[1,*]

[1]*Department of Soil and Environmental Sciences, National Chung Hsing University, Taichung, 402, Taiwan.*
[2]*Department of Civil Engineering, I-Shou University. Kaohsiung, 840, Taiwan.*
[3]*Department of Computer Science and Engineering, National Chung Hsing University, Taichung, 402, Taiwan.*
[4]*Department of Horticulture, National Chung Hsing University, Taichung, 402, Taiwan.*
[5]*Department of Plant Pathology, National Chung Hsing University, Taichung, 402, Taiwan.*

**Corresponding author: nchu.yaotung@gmail.com; Tel: +886-4-2284-0373#3105*

ABSTRACT

Passion fruit peel is a by-product containing high amounts of phytochemicals, such as phenolic acids, flavonoids, and anthocyanins. However, its most excellent application possibility has yet to be fully demonstrated due to the limitation of the present extraction methods. In this study, ultrasonic-assisted extraction (UAE) was applied with response surface methodology (RSM) to obtain optimum conditions for preparing passion fruit peel extract (PFPE). The extraction of bioactive compounds (total phenolic compound and total flavonoid content) with antioxidant activity (DPPH assays) from PFPE was using RSM based on Box-Behnken design (BBD). The effect of ethanol (EtOH) concentration (X1: 20-80%), extraction temperature (X2: 30-70 °C), liquid-solvent ratio (X3: 1:10-1:30 g/mL), extraction time (X4: 10-90 min), and ultrasonic power (X5: 247-380W) were determined in the extracting process. An optimum condition of PFPE was obtained, i.e., X1: 39%, X2: 30 °C, X3: 1:13 g/mL, X4: 10 min, X5: 179 W. By this optimization method, PFPE via UAE demonstrated excellent output of total phenolic content (TPC), total flavonoid compounds (TFC), antioxidant ability, and gallic acid content with 717.30 GAE/g, 733.27 QE/g, 90.16%, and 84.3 ppm respectively, which is superior to the existing extracting method. The findings paved the way for extracting, purifying, and optimizing polyphenols from wasted-fruit resources using RSM in UAE for application in the medicinal and functional food industry.

KEYWORDS

Fruit peel waste, Ultrasonic-assisted extraction, Response surface methodology, Phenolic compounds, Antioxidants

Evaluation of various natural weeds and reaction conditions for reductive degradation of 1,3-dinitrobenzene

Xuyen Thi Hong Luong[1], Yu-Shan Chen[1], Chenju Liang[1,*], Yao-Tsung Chen[2]

[1]*Department of Environmental Engineering, National Chung Hsing University, 145 Xingda Road, Taichung 402, Taiwan, R.O.C.*
[2]*Apollo Technology CO., LTD. 6A New Design Building, No. 22, Sec. 3, Zhongshan N. Rd., Zhongshan Dist., Taipei 104, Taiwan*

**Corresponding author*: cliang@nchu.edu.tw; *Tel: +886-4-2284-0441*

ABSTRACT

1,3-Dinitrobenzene (1,3-DNB), one of nitroaromatic organic pollutants, has two nitro functional groups (-NO_2) with a +III nitrogen oxidation state and strong electronegativity, bound to the benzene ring and is hence prone to be reductively degraded by gaining electrons. Weeds containing rich polyphenols can supply electrons and act as natural reducing agents. This study investigated the potential of various weeds to reductively remove 1,3-DNB, and the Taguchi L9 Orthogonal experimental design method was used to explore the optimum operational parameters. According to the analyzed characteristics of weeds, including total phenol content, antioxidant capacity, metal chelating capacity, and reducing capacity, and also environmental adaptability, *Sphagneticola trilobata* weed containing 11.93 mg-GAE/g-weed was selected for further 1,3-DNB degradation experiments. The results of Taguchi's Orthogonal experiments showed that the optimum reaction conditions for the degradation of 1,3-DNB in the aqueous phase using *Sphagneticola trilobata* were pH 3, weed dose of 10 g/L, reaction time of 14 d, and initial 1,3-DNB of 0.5 mM. According to the ANOVA, the weed dose was the most significant factor in the experiment (Contribution = 43.69%) and 1 mg of 1,3-DNB degraded required 120 mg of dry weeds. This research revealed that weeds exhibited the potential of degrading 1,3-DNB in the aqueous phase, and may provide new insights into the development of weeds for the remediation of nitroaromatic compounds in the environment.

KEYWORDS

Nitroaromatic compounds; 1,3-dinitrobenzene; Polyphenol; Weeds; Explosives; Taguchi Orthogonal method

Introduction of The Cleaner Production Evaluation System in Vietnam

Yu-Hsiu Chen[1,2], Wen-Chi Tseng[2], Boi-Phung Ngo[2], and I-Ming Chen[2*]

[1]*Department of Resource Engineering, National Cheng Kung University, Tainan, Taiwan 70101, R.O.C.*
[2]*Department of Environmental Resources and Management, Chia-Nan University of Pharmacy and Science, Tainan, Taiwan 71710, R.O.C.*

**Corresponding author: imchen@mail.cnu.edu.tw; Tel: +886-6-266-4911#6400*

ABSTRACT

Cleaner production (CP) has increasingly been used all over the world. However, each country has adapted evaluation system to the situation and needs of its industry. By its own situation, the executive unit was developed as a different set of cleaner production guidelines. After many reports on the results of the application of cleaner production methods in each country, there are many positive results. It shows that the effective application of cleaner production methods is effective and beneficial for businesses, the country, and the natural environment. Cleaner production guidance tools in Vietnam are still in the early stage of systematic development. The primary result of running CP in Vietnam is restrained by lack of detailed guidelines for industry and fewer accompanying case studies. That brings the necessity of CP concept and/or knowledge to entrepreneurs and investors, and the benefits to businesses and individuals. Currently, the main CP Centers/Organizations in Vietnam includes two associations, Vietnam National Cleaner Production Center (VNCPC) and The Sustainable Production and Consumption Office (SCP). VNCPC was founded in 1998 from a unit under Hanoi University of Technology, then has grown into a business unit called the Vietnam National Cleaner Production Center, as well as SCP was established based on Decree 98/2017/ND-CP and Decision No.889/QD-TTg with the functions and duties of advising the Ministry of Trade and Development. Together with the collaboration of Ministry of Industry and Trade (MOIT), Department of Industry and Trade, Consulting units of Vietnam Cleaner Production Center Co.Ltd.; Cat Hung Joint Stock Company; EPRO Consulting Joint Stock Company; Viet Tri Tue Consulting Company, Cleaner Production Offices, and Industrial promotion centers, the CP is running in the primal stage to ensure the country been following up the worldwide trends of green aspect. Vietnam is increasingly integrated with the global economy, so disseminating and promoting the concepts of Cleaner Production to enterprises is one of the urgent tasks that will not only bring advantages in the edge competition between international markets, but also help to solve the painful persistent environmental problems in Vietnam.

KEYWORDS

Cleaner production, Evaluation system, Guidelines, Vietnam National Cleaner Production Center, The Sustainable Production and Consumption Office

Eco-Print Batik: Plant-Based Recycling Innovation in Indonesia

Erni Puspanantasari Putri[1,*], Bonifacius Raditya Sri Pramana Putra[2], and Agatha Hannabel Avnanta Puteri[1]

[1]*Department of Industrial Engineering, Universitas 17 Agustus 1945 Surabaya, Surabaya City 60118, Indonesia*
[2]*Department of Informatics Engineering, Universitas 17 Agustus 1945 Surabaya, Surabaya City 60118, Indonesia*

**Corresponding author: erniputri@untag-sby.ac.id; Tel: +62-856-0815-2712*

ABSTRACT

Indonesian batik was designated by UNESCO as a Masterpieces of the Oral and Intangible Heritage of Humanity. The techniques, symbolism, and culture of making hand-dyed batik on cotton and silk have become integrated into the lives of the Indonesian people. The tradition of batik itself is carried out from generation to generation. Batik is done by Indonesians in various regions from childhood into adulthood. In addition, since childhood, babies have been carried in batik cloth, and when they die, they are usually covered with batik cloth. Batik is usually made with wax using a cant. But there are also stamped batiks that use tools such as stamps. Almost the same as making stamped batik, making eco-printed batik uses natural stamps from leaves and plants, which are later affixed to cloth and steamed until the shape appears. Besides being environmentally friendly, this eco-printed batik also has an unusual style because it can be adapted to leaves or plants according to consumer demand, as well as the uniqueness of the motifs. There are two coloring techniques in the eco-print batik process. That is the iron-blanket technique and the pounding technique. The pounding technique has a slightly different process and method of dyeing cloth than the iron-blanket technique. The first difference is in the iron-blanket technique, which involves rolling the cloth using a pipe to bring out the color of the leaves on the cloth, while in the pounding technique, the leaves are hit on the cloth using a wooden mallet. The second difference is that in the iron blanket technique, drying is done by steaming the cloth for 2 hours, while in the pounding technique, the drying process is done by exposing the cloth directly to the sun. In general, the leaves of trees that exist in nature are used to produce beautiful batik motifs. But not all of these leaves can be used. The three criteria for leaves that can be used for eco-print batik are: (i) leaves produce sharp colors; (ii) the leaves used have a certain thickness (not too thin or too thick); and (iii) the leaves of these plants have non-slippery leaf surfaces. Some types of leaves that meet these criteria are jatropha leaves, African wood leaves, pongporang or lanang leaves, teak leaves, guava leaves, cherry leaves, star fruit leaves, ink leaves or mangsi leaves, purple leaves, berry leaves, or mulberry leaves.

KEYWORDS

Eco-print; Batik; Innovation; Recycle; Plant-based

Hypo Sludge and Seawater as Partial Replacements to Cement and Freshwater in the Production of Concrete Hollow Blocks

Rose Daianne D. Bernardino[1], Lisette Jasper R. Dupalco[1], Earl Tristan M. Serna[1], Jerome Jordan F. Famadico[1,*]

[1]*Department of Civil Engineering, College of Engineering, Adamson University, Ermita, Manila 1000, Philippines*

**Corresponding author: jerome.jordan.famadico@adamson.edu.ph; Tel: +639272013838*

ABSTRACT

Due to the abundance of generated industrial wastes, shortage of freshwater supply and significant industrial growth, the investigation of a potential replacement for materials is explored and experimented with the aim to discover a sustainable material which incorporates a greater strength and fewer environmental impacts. This study aims to utilize hypo sludge and seawater as partial replacements to cement and freshwater in concrete hollow blocks (CHB). Specifically, this study examines the effects of hypo sludge and seawater to the physical and mechanical properties of CHB. Percentage replacements of 0%, 5%, 10%, and 15% of sludge to cement were considered. Moreover, 100% and 50% replacement to freshwater was used in the design mix of CHB. After 28 days of curing, CHB samples were tested in accordance with the ASTM standards in order to determine its density, water absorption and compressive strength and to compare these properties to the conventional CHB. Results show that gradual increase of the water absorption is notable with the samples as the replacement of hypo sludge increases. The maximum compressive strength acquired by the CHB was 4.413 MPa which is greater than that of the conventional CHB. Additionally, it was found that there is a significant difference in the results when hypo sludge and seawater were utilized as partial replacements to cement and freshwater, respectively. The optimum value was obtained at CHB samples with 5% hypo sludge replacement and 50% seawater. These aforementioned findings suggest a strong potential on the use of hypo sludge as a sustainable substitute material for CHB production.

KEYWORDS

Concrete hollow blocks; Hypo sludge; Seawater; Sustainable material; Cement replacement

Metals in brackish and marine water fish, its spatial distribution and human health implications: The case in PPC, Philippines

Maria Mojena G. Plasus[1], Ronnel C. Nolos[2,3,4], Alejandro Felipe B. Gorospe[2], Allaine T. Baaco[1,5,] Chitsan Lin[6] and Delia B. Senoro[2,3,7,*]

[1]College of Fisheries and Aquatic Sciences, Abba Building, Western Philippines University, Sta. Monica, Puerto Princesa City, Palawan 5300, Philippines
[2]Resiliency and Sustainable Development Laboratory, Yuchengco Innovation Center, Mapua University, 658 Muralla St., Intramuros, Manila 1002, Philippines
[3]Mapua-MSC Joint Research Laboratory, Marinduque State College, Boac, Marinduque 4900, Philippines
[4]Department of Environmental Science, College of Natural and Allied Health Sciences, Marinduque State College, Boac, Marinduque 4900, Philippines
[5]College of Agriculture, Forestry and Environmental Sciences, Western Philippines University, San Juan, Aborlan, Palawan 5302, Philippines
[6]Department of Marine Environmental Engineering, National Kaohsiung University of Science and Technology, Kaohsiung 81157, Taiwan
[7]School of Civil, Environmental and Geological Engineering, Mapua University, 658 Muralla St., Intramuros, Manila 1002, Philippines

** Corresponding author: dbsenoro@mapua.edu.ph ; Tel.: +63-2-8251-6622*

ABSTRACT

Fish is an important source of protein in human meals around the world. However, the fish that we are eating may be contaminated with toxicants such as metals and metalloids (MMs) which may pose health risks to the consumers. Information on MMs content in fishes, and the potential spatial distribution scenario would provide knowledge to the community to create strategies and protect the human health. Hence, this study assessed and determined the health risk levels of the MMs in both brackish and marine water fish (BMF) in Puerto Princesa City (PPC) , Palawan Province, Philippines. The PPC has existing abandoned open mine pit near PPC coastline and the local population called it the “pit lake”. The concentrations of As, Ba, Cu, Fe, Mn, Hg, and Zn in fishes were analyzed using portable Olympus Vanta X-ray Fluorescence (pXRF). The potential spatial distribution of MMs concentration in BMF was described using the Geographic Information System (GIS) ArcGIS Desktop 10.8.1_ArcPro2.8. Fishes were sampled from fishing boat landing sites and nearby seafood markets. Results revealed that the concentrations of MMs in marine fish are generally higher than the brackish water fish. Elevated concentration of Hg in fishes was recorded at the southeast area where fish landing sites are located compared to other sampling sites. It was recorded that Hg concentration in marine water fish meat was higher than the brackish water fish meat. The Mn concentration in marine water fish exceeded the permissible limits set by international bodies. Further, this paper elaborates the non-carcinogenic, and carcinogenic risks of these fishes to the PPC population and tourists, with respect to the MMs content in fish meat for food safety. Also, it described the probable spatial distribution of MMs concentration in fishes within the PPC. Additional studies on other commercial fishes and land-based products in the province is recommended to ensure food safety to the consumers.

KEYWORDS

Brackish and marine environment; fish; carcinogenic; health risks; metals; XRF

Water Hyacinth as A Geonet Material for Soil Slope Protection

Ivan Karl B. Camacho[1], Shiela B. Galsim[2], Ryan D. Pandapatan[3], Rachelle S. Santos[4], Florante D. Poso Jr.[5,*]

[1] *Faculty, Department of Civil Engineering, Far Eastern University – Institute of Technology, Metro Manila, Philippines*

[2 3 4] *Student Researchers, Department of Civil Engineering, Far Eastern University - Institute of Technology, Metro Manila, Philippines*

[5] *Program Director, Department of Civil Engineering, Far Eastern University – Institute of Technology, Metro Manila, Philippines*

**Corresponding author: fdposo@feutech.edu.ph; Tel: +63 9688793570*

ABSTRACT

In the Philippines, water hyacinth is considered as an invasive aquatic plant that affects the biodiversity of marine life when left unmanaged. As it multiplies easily the citizens from the City of Las Piñas uses the dried water hyacinth stalks as raw materials for their products. It is also known that soil erosion has been frequent in the country and with different geosynthetics available at hand, the researchers from this study chose geonet that is made from dried water hyacinth as the material to be used to prevent soil erosion and to provide soil stability and support onto slopes. This study investigates the physical and mechanical properties of the geonet made from dried water hyacinth stalks and to specifically determine its tensile strength and average elongation at break using the ASTM D4595 through its before and after exposure to the environment. As the geonet has a standard measurement of 20 by 30 centimeters, with a squared mesh opening of 1.5 inches, and a 1.5-millimeter diameter of thread that was prescribed by the Department of Science and Technology – Philippine Textile and Research Institute (DOST – PTRI). The findings of this study indicates that the average elongation at break results of the non – exposed geonet is 16.4% while the exposed geonet has a result of 16.15% which are both greater than the required percent elongation of the Department of Public Works and Highways (DPWH) standard which is 15%. These results illustrate how the geonet made from dried water hyacinth stalks can help lessen soil erosion and be used as an alternative material for soil slope protection as it has a high tensile strength, which averages at 8.4 kN/m. Despite the fact that the measurement of the geonet made is relatively compact to cover slopes, the researchers recommend constructing different measurements of geonet that are also made from dried water hyacinth stalks to determine its durability as a geonet in various measurements.

KEYWORDS

Water Hyacinth; Geosynthetics; Soil Erosion; Soil Stability; Geonet

Philippines Abaca as Sustainable Cellulose Fibre Insulation

Tomas U. Ganiron, Jr*, Chandler Mathew E. Lopez, John Kyle G. Moton, and John Carlo C. Paleracio

Department of Civil Engineering, Adamson University, 900 San Marcelino St, Ermita, Manila, 1000 Metro Manila

**Corresponding author: tomas.ganiron.jr@adamson.edu.ph Tel: +639690133830*

ABSTRACT

This study developed a thermal insulation board made of sustainable abaca fibres (AB) as main material and natural rubber latex (NRL) as binder with no chemical additives in contrast to conventional materials used for a standard thermal insulation board. The objective of this study is to find the optimum ratio between 1:4, 1:5 and 1:6 mix ratio of the Abaca - Natural Rubber Thermal Insulation Board (ANRTIB) when it comes to the physical, mechanical, and thermal properties of the board. The tests included are density test, thickness swelling test, water absorption test, internal bond test, modulus of rupture test and thermal conductivity test in accordance with the ASTM C 209. In the results for the physical properties, it was shown that when the ratio of the NRL increases, the thickness swelling and water absorption results decreases. For the mechanical properties, when the ratio of the NRL increases, the results of internal bond and bending strength also increases. For the thermal property, when the ratio of the NRL increases, the thermal conductivity result decreases. The results showed that mix ratio 1:6 is the optimum ratio and has the best results among all of the mix ratios, which has the result of 0.052 W/m.K which passed the standard of the thermal conductivity test. The results showed that by increasing the binder of the Abaca - Natural Rubber Thermal Insulation Board (ANRTIB) which is the NRL, there is a positive effect on the physical, mechanical and thermal properties of the thermal insulation board.

KEYWORDS

Abaca fibres: Natural rubber latex; Insulation board; Thermal insulation board

Removal of paracetamol using zeolite: optimization of process parameters, isotherm and kinetic study

Alberto Lastimado Jr.[1], Rekich Pahunang[2,*], Anamie Rabongue[2]

[1]Engineering Graduate School, Western Mindanao State University, Zamboanga City 7000, Philippines
[2]Department of Environmental Engineering, Western Mindanao State University, Zamboanga City 7000, Philippines.

**Corresponding author*: pahunang.rekich@wmsu.edu.ph*; Tel: +6*39497874849

ABSTRACT

Paracetamol is a commonly used non-prescription analgesic and antipyretic. Its hazardous toxicity significantly threatens aquatic organisms and even the ecosystem. This research explores the elimination of paracetamol from an aqueous solution using acid-salt modified zeolite (ASMZ), created by chemically modifying natural zeolite with nitric acid and sodium chloride. The modified zeolite was characterized using SEM analysis for the morphological structure and FTIR analysis for the functional groups. The effects of experimental parameters such as ASMZ dosage, pH, and contact time were optimized using a central composite design of the response surface methodology. Results show that acetaminophen removal reached 71.33% at 0.40 g of ASMZ, pH 4, and 60 minutes of contact time. The adsorption isotherm studies were adequately described by the Langmuir model and the Freundlich model due to their insignificant correlation coefficient values of $R^2 = 0.9709$ and $R^2 = 0.9799$, respectively. The pseudo-second-order kinetics best described the adsorption kinetics, with $R^2 = 0.986$ indicating the chemisorption of paracetamol onto AZMZ. This research exhibited considerable removal characteristics for the degradation of paracetamol, a pollutant found in aquatic environments, using ASMZ, a simple, reliable, and cost-effective adsorption technique.

KEYWORDS

Paracetamol; Adsorption; Chemical modification; Modified Zeolite; Response Surface Methodology (RSM)

Effect of fly ash partial replacement to the fine aggregates in non-load bearing concrete hollow blocks (CHB)

Bautista, Abbey Joy A, Bautista, John Patrick B, Falguera, Mark Francis B.* and Patio, Kim Russel K.

Civil Engineering Department, Adamson University, 900 San Marcelino Ermita, Manila.

**Corresponding author: mark.francis.falguera@adamson.edu.ph; Tel: +639277384830*

ABSTRACT

Concrete hollow block is a construction material that is mostly used across the world. It is a composite material made out of water, cement, fine aggregate (sand). However, the manufacturing process of raw materials used in concrete hollow blocks such as cement and aggregate causes environmental influences (emission of greenhouse gases and dust) and significantly consumes energy and natural resources. Replacing any of these materials by industrial waste material can have a positive impact on the environment as it diminishes the problem of waste disposal and reduces the intensive use of energy and natural resources (aggregate mining). In addition, it reduces the amount of emission of gases. There are plenty of industrial wastes that can be used in concrete as either replacement of aggregate or cement. Hence, this project has focused on evaluating the opportunity of using one of these waste materials which is the fly ash as a partial replacement material for fine Aggregate. Fly ash is generally considered as a waste material that is produced as a by-product of coal combustion process. The physical and chemical properties of fly ash are similar to cement, which allows it to be used in concrete hollow blocks. The primary aim of this research is to investigate the Effects in compressive strength and water absorption Fly Ash as a partial replacement for fine aggregates in Concrete Hollow Blocks. Fine aggregates were replaced with four percentages (0%, 5%, 10%, 15%) of fly ash by weight. Test results indicate that it passed in Philippine National Standard however it did not meet the ASTM standard.

KEYWORDS

PNS, ASTM, Compressive Test, Water Absorption Test, Fly Ash

Influence of Pulverized Crab Shell as Cement Accelerating Additive in Hydration Cement

Jairah May Ferma, Dianna Recto, Reign Andrey D. Quiacos and Crispin Lictaoa*

Department of Civil Engineering, Adamson University, Manila 1000, Philippines

**Corresponding author: crispin.lictaoa@adamson.edu.ph; Tel: +632-917-1861874*

ABSTRACT

This study aims to determine the influence of a pulverized crab shell as cement accelerating additive in hydration cement. Many construction companies use calcium chloride as their set additive for faster work. To test whether the crab shell's ability to speed up setting time, researchers add pulverized crab shells to cement. In addition to the setting time, the researchers perform a number of tests, including the compressive strength test, split tensile strength test, flexural strength test, slump test, and density test. These tests will be used to create 81 specimens total, 54 cylindrical samples and 27 rectangular samples, following the tests, the studies showed that pulverized crab shell can serve as cement accelerating additive in hydration cement, which effectively accelerates the setting time of concrete. As a result, specimens containing 2% pulverized crab shell have initial and final setting times of 70 minutes and 228 minutes, respectively, while specimens containing 4% crab shells achieve initial and final setting times of 60 minutes and 230 minutes. The sample with 6% has initial and final setting times of 40 and 70 minutes, respectively. This demonstrates unequivocally that adding pulverized rab shells to the concrete sample has a significant impact on the setting time because the final setting time lowers as the amount of pulverized crab shell addition increases. Since the pulverized crab shell has a composition of calcium carbonate the use of it in concrete helps to improve workability. It also shows that when the amount of pulverized crab shells increases, it also increases the density of the concrete.

KEYWORDS

Crabs Shell, Calcium Carbonate, Accelerating Additive, Hydration, Cement

Application of Corn Hub Fiber and Sugarcane Bagasse Ash for Clay Soil Stabilization in Road Construction

Junnell Noah Xavier Beltran, Julie-Ann Rosario, Jersey Claire Tria, Gerardo Abestilla, Crispin Lictaoa* and Karen Galoso

Department Department of Civil Engineering, Adamson University, Manila1000, Philippines

**Corresponding author: crispin.lictaoa@adamson.edu.ph Tel+063-9171861874*

ABSTRACT

The type of soil such as clay becomes part of road construction which could possibly interfere the stability and strength of road pavements, hence soil stabilization is conducted to develop and support the demand of road-way projects. Nowadays, innovation is vital and an illustration of this is an agricultural waste which can be turned into an eco-material. This study evaluates the behaviour of clay soil with the use of agricultural waste specifically the corn husk fiber (CHF) and sugarcane bagasse ash (SCBA) to which are inevitable in the country as we tend to grow many into this kind of crops. This study also provides quantitative analysis and statistical information on the effect of the clay soils both physical and mechanical properties. Several combination of CHF with SCBA with percentages 25-75, 50-50, and 75-25 were used in the study. These percentages were compared with the control sample of physical, and mechanical properties of the clay soil. Moisture content, specific gravity, atterberg limit and shrinkage limit obtained a result of 27.29%, 2.06%, 33.62%, 21.56%, 12.06%, 31.21%, respectively to which it gives impact to the physical properties of the mixture as well as its mechanical properties and which obtained a result for optimum moisture content (OMC) and maximum dry density (MDD) of 19.8%, 15.33%, respectively, and gave a compaction parameter result of 12.062%. Higher concentrations of SCBA were found to be more effective than higher concentrations of CHF for both the physical and mechanical characteristics of clay soil samples. Result showed that at 9% with 75% CHF and 25% SCBA was the best percentage combined with clay soil.

KEYWORDS

Soil Stabilization, Corn Husk Fiber (CHF), Sugarcane Bagasse Ash (SCBA), Clay Soil

Utilization of Sea Urchins' Shells and Spines as an Admixture to Cement in Geopolymer Concrete

Vince Mariano, Erica Oniot, Paulo Adrian Rodriguez, Albert Griño, Crispin Lictaoa* and Brian Eurolfan

Department of Civil Engineering, Adamson University, Manila 1000, Philippines

**Corresponding author: crispin.lictaoa@adamson.edu.ph; Tel: +632-917-1861874*

ABSTRACT

Sea urchins are tiny, spiky, spherical invertebrates that live in kelp forests. Without urchins to graze on the reef, algae took over, making it difficult for corals to get enough light. In this study sea urchins were used as an admixture component to ordinary cement and fly-ash based on geopolymer. Combinations of sodium silicate and sodium hydroxide are one of the common multi-compound activators, which in geopolymer gives an exceptional strength. Sea urchins' is considered calcium carbonate and determined as calcite main type. The tests performed include fineness, setting time, compressive strength, split-tensile strength, and flexural bond strength test. Data showed that highest compressive strength with the incorporation of 15% and 10% attained by fly-ashed geopolymer and ordinary concrete were 16.855MPa and 6.34 MPa respectively, the split-tensile strength test with the incorporation of 10%attained by fly-ashed geopolymer and ordinary concrete were 7.775 MPa and 5.461 MPa respectively, while the highest flexural strength obtained by fly-ashed geopolymer and ordinary concrete with the incorporation of 10%were 2.407MPa and 1.646 MPa respectively. Results have shown that utilizing pulverized sea urchins as an admixture to fly-ashed based geopolymer and ordinary concrete can be used for lean concrete, road pavement and lightweight concrete.

KEYWORDS

Sea Urchins, Echinoderms, Admixture, Cement, Ordinary Concrete, Geopolymer Concrete

Experimental study on the bubble size from multi-hole Venturi jet at different temperatures and salinity

Ming-Yu Sun, Jian-Chuan Shern*, Yi-An Liao

Department of Marine Environmental Engineering, National Kaohsiung University of Science and Technology, Kaohsiung, Taiwan 71710, R.O.C.

**Corresponding author: jcshern@nkust.edu.tw; Tel: +886-9-22804217*

ABSTRACT

The multi-hole Venturi jet is an aeration device that operates by accelerating water flow as it passes through a smaller diameter pipe, resulting in a reduction in pressure and the creation of a negative pressure zone. This causes air to be compressed into the pipe and compressed, thereby mixing with the water flow. The present study aims to investigate the impact of varying levels of varying salinity and temperature levels on the size of bubbles produced by the multi-hole Venturi jet. The study's findings reveal that the bubbles' size decreases with an increase in salinity and temperature. Additionally, it was observed that the size of the bubbles decreases rapidly when the salinity is increased from 5‰ to 10‰, with a significant inflection point occurring at a salinity level of 8‰. The reduction in bubble size is believed to be influenced by a variety of factors, including internal and external pressure, surface tension, and viscous shear stress. Therefore, this study takes into account the physicochemical properties of water bodies under different salinity and temperature conditions, as possible factors affecting the size of the bubbles. The downsizing phenomenon of bubbles is likely due to the interplay between factors such as viscous shear stress, surface tension, and internal and external pressure, which ultimately results in the observed bubble size reduction.

KEYWORDS

Venturi jet; bubble size; salinity; temperature; surface tension; viscosity

A P-Graph Model for Planning CO2 Capture and Utilization (CCU) Systems with Social Discounting

Tommie Daniel Cruz, Lawrence Belo, and John Frederick Tapia*

Department of Chemical Engineering, De La Salle University – Manila, 2401, Taft Avenue, Malate, Manila, Philippines

**Corresponding author: john.frederick.tapia@dlsu.edu.ph; Tel: 524-4611 loc 218*

ABSTRACT

With the continuous global dependence on fossil fuels, climate change mitigation measures focused on greenhouse gas reduction require urgent development until renewable energy is fully mature to achieve and maintain net zero emissions. One of these mitigation technologies involves the collection or capture of CO_2 from emission sources, such as fossil fuel-fired power plants, and utilizing it to produce valuable products. By converting captured CO_2 into profitable, long-lasting products, its utilization in various chemical, food, and beverage sectors enables the long-term delay of CO_2 emissions. This promising technology is known as CO_2 capture and utilization (CCU). To optimally design and implement these CCU systems on a large scale, it is important to consider certain factors such as CO_2 quality requirements, CO_2 flow rate demands, and social discounting. This study developed a P-graph approach for source-sink matching that considers these factors. The use of P-graph allows the generation of different optimal and near-optimal pathways for CO_2 utilization networks. Apart from the inclusion of social discounting in CCU systems, the use of P-graph in constraining concentration is also a novel strategy that has not yet been applied in past works regarding P-graph modelling. This approach opens a wide variety of applications where certain intensive properties of the flow, like temperature and concentration, can be compared with that of another stream or a quality stipulation. The P-graph framework was then tested on an illustrative case study involving eight sources and four utilization facilities. With the use of the model, the highest demands of all utilization facilities were selected to limit the discounted CO_2 emissions. These results confirmed the significance of CO_2 utilization in mitigating climate change.

KEYWORDS

CO_2 capture and utilization; Social discounting; Low carbon energy systems; P-graph; Source-sink matching

Comparison of Novel Modified Biochars from Solid Waste of Grass Jelly Dessert Industry and Commercial Biochars

Chatlada Chaiwong[1], Jesper T. N. Knijnenburg[2], Supattra Budsaereechai[3,*], and Yuvarat Ngernyen[1,*]

[1]*Biomass & Bioenergy Research Laboratory, Department of Chemical Engineering, Faculty of Engineering, Khon Kaen University, Khon Kaen, 40002, Thailand.*
[2]*Biodiversity and Environmental Management Division, International College, Khon Kaen University, Khon Kaen, 40002, Thailand*
[3]*Department of Mechanical Engineering, The project to establish the Faculty of Engineering and Industrial Technology, Chaiyaphum Rajabhat University, Chaiyaphum, 36000, Thailand*

**Corresponding author: nyuvarat@kku.ac.th and pla.supattra.cpru@gmail.com; Tel: +668-1-288-9649*

ABSTRACT

In this research, biochars were prepared from grass jelly leaves (solid waste of dessert industry) and modified by acid (H_3PO_4) and alkaline ($ZnCl_2$) treatment. The biomass was pyrolyzed at 500, 600 and 700 ℃ for 1 h to obtain biochar, which was subsequently soaked in 30 wt% H_3PO_4 or $ZnCl_2$ at room temperature for 24 h with weight ratio of 1:3. Three commercial biochars produced from bamboo, eucalyptus and cassava were also used for comparison. The grass jelly biochar surface area increased with pyrolysis temperature, from 2.3 to 2.6 and 5.7 m^2/g for pyrolysis temperatures 500, 600 and 700 ℃, respectively. Modification with H_3PO_4 was more effective than $ZnCl_2$ in enhancing the surface area, resulting in surface areas of 30, 63 and 111 m^2/g, respectively. In contrast, the surface area of all three commercial biochars (except for H_3PO_4 modification of bamboo biochar) decreased after acid and alkaline treatment. The grass jelly-based biochar with highest surface area was further characterized by Scanning Electron Microscope-Energy Dispersive X-ray spectroscopy (SEM-EDX), thermogravimetric analysis (TGA), Fourier Transform Infrared spectroscopy (FTIR), moisture and ash content and bulk density. The SEM image confirmed the high porosity of the biochar and EDX analysis indicated that C (80.7%) and O (14.2%) were the major elements of the biochar with small amounts of organic species such as Ca (1.9%), Si (1.3%), Fe (0.8%), P (0.7%) and Cl (0.5%). The H_3PO_4-treated biochar exhibited a low moisture content (5.69 wt%) and high bulk density (0.34 g/cm^3) which lie within standard specifications of powder activated carbon (< 15% and 0.3 – 0.35 g/cm^3, respectively). However, the high ash content of 26.61 wt% was higher than the standard (< 10 wt%). The results of this study can be used to operationalize acid and alkali-impregnation as post-processing treatment for biochars.

KEYWORDS

Biochar; Grass Jelly; Pyrolysis; H_3PO_4 modification; $ZnCl_2$ modification

Removal of dibenzothiophene sulfone using iron-manganese oxide magnet derived from a water purification plant sludge

Zheng-Hong Chen[1], Yi-Lun Li[2], Angelo Earvin Sy Choi[3], Maegan Gwyneth Alcaraz[3], Meng-Wei Wan[2,*]

[1]*Department of Resource Engineering, National Cheng Kung University, Tainan 701, Taiwan*
[2]*Department of Environmental Engineering and Science, Chia Nan University of Pharmacy and Science, Tainan 71710, Taiwan*
[3]*Department of Chemical Engineering, De La Salle University, Manila 1004, Philippines*

**Corresponding author: peterwan@mail.cnu.edu.tw; Tel: +886-6-2664911 ext 6318*

ABSTRACT

In recent years, economy of countries around the world has rapidly developed. The growth of industrial processes has led to a significant increase in reliance on fossil fuels. Sulfur-containing impurities in fossil fuels cannot be completely removed during the manufacturing process. As a result, they react with oxygen during combustion to produce sulfur oxides that are discharged with the exhaust gas into the atmosphere, contributing to the worsening of organic pollution. Carbon dioxide and sulfur dioxide emissions may also result in the formation of acid rain, which is harmful to humans as it increases the risk of disease. Therefore, the effective removal of sulfur dioxide has become a major challenge faced by industrially developed countries.

In this study, 24-hour adsorption equilibrium studies were performed using model oil containing dibenzothiophene sulfone (DBTO). Sludge from a water purification plant was used to create iron-manganese oxide magnets as an adsorbent. This was compared with other adsorbents, specifically activated clay and acidic alumina. Adsorption studies showed that the maximum adsorption capacity of iron-manganese oxide magnet, activated clay, and acidic alumina is 2.9 mg/g, 11.87mg/g, and 4.95mg/g, respectively. From the starting DBTO content of 500 ppm, this was reduced to 483 ppm, 381.3 ppm, and 450.5 ppm by iron-manganese oxide magnet, activated clay, and acidic alumina, respectively. Results showed that the synthesized iron-manganese oxide magnet adsorbents did not perform better than activated clay and acidic alumina. Despite this, it shows the ability to be used as a sulfur adsorbent and puts value in the reusing of water treatment sludge.

KEYWORDS

Adsorption; Desulfurization; Isotherm; Water Treatment Plant Sludge

A study on oxidative desulfurization using ferrate prepared from drinking water treatment sludge

Zheng-Hong Chen[1], Ming-Jie Xiao[2], Angelo Earvin Sy Choi[3], Micah Haboc[3], Meng-Wei Wan[2,*]

[1]*Department of Resource Engineering, National Cheng Kung University, Tainan 701, Taiwan*
[2]*Department of Environmental Engineering and Science, Chia Nan University of Pharmacy and Science, Tainan 71710, Taiwan*
[3]*Department of Chemical Engineering, De La Salle University, Manila 1004, Philippines*

**Corresponding author: peterwan@mail.cnu.edu.tw; Tel: +886-6-2664911 ext 6318*

ABSTRACT

In this study, hexavalent iron oxidant, prepared from iron and manganese-containing sludge from water purification plants, was applied to model sulfur oil under mixing-assisted oxidation desulfurization (MAOD). By establishing an economical and safe oil desulfurization technology, this study seeks to address the issue of high recycling costs and to improve the quality of regenerated oil products. Ultimately, the study supports the establishment of a circular economy in waste management and promotes the recycling of waste oil products.

Dibenzothiophene (DBT) was used as a model fuel oil in a MAOD process that utilizes high shear force (emulsification head), phase transfer agent or PTA (tetraoctylammonium bromide or TOAB), and oxidant (Fe(VI)) in a phase-transfer reaction to produce low-sulfur oil products and achieve resource recycling and clean energy production. In the experiment, the study explores the effects of various ratios in Fe(VI) preparation, FeO_4^{2-}/S molar ratio, pH regulation, mixer speed, reaction time, and reaction temperature on desulfurization efficiency.

In the preparation of Fe(VI) oxidant, nitric acid dissolution tests (1M-7M) were conducted. From the results, using 2M HNO_3 was used to obtain 17,700 ppm and 12,500 ppm of iron and manganese ions, respectively. NaOCl and NaOH ratios (100 mL:100 g, 100 mL:200 g, 200 mL:100 g, 200 mL: 200 g) were found to synthesize Fe(VI) with the following respective concentrations: 624.8 ppm, 1476.1 ppm, 745.98 ppm, and 597.93 ppm. It was found that 200 mL NaOCl with 100 g NaOH is the optimal concentration for Fe(VI) production. Lastly, two KOH concentrations (11M and 23M) were tested and it was found that a better yield of 658.32 ppm was obtained using 11M KOH.

In the MAOD process, the effect of pH levels (3-12) on desulfurization efficiency was also tested using glacial acetic acid and the optimal level was found to be pH 5. Using 50 mL of 500 ppm DBT solution, the FeO_4^{2-}/S molar ratio was also varied from 2:1 to 12:1 and the highest yield was observed using the molar ratio of 9:1. Test results for mixing speed (3400-6000 rpm) showed that 3,400 rpm produced the highest sulfur conversion. For the mixing time (5-60 minutes) and temperature (40 ℃ -70 ℃), the optimal conditions for high desulfurization efficiency were 30 minutes and 40 ℃, respectively. Overall, these conditions were applied to reach the highest oxidation efficiency of 81.8 %.

KEYWORDS

Ferrate; Mixing-assisted Oxidation Desulfurization; Water Treatment Plant Sludge

A chromium adsorption study using m-phenylenediamine modified iron-manganese oxide magnet prepared from drinking water treatment sludge

Yu-Ting Chen[1], Ming-Jie Xiao[1], Yi-Lun Li[1], Zheng-Hong Chen[2], Meng-Wei Wan[1,*]

[1]*Department of Environmental Engineering and Science, Chia Nan University of Pharmacy and Science, Tainan 71710, Taiwan*
[2]*Department of Resource Engineering, National Cheng Kung University, Tainan 701, Taiwan*

**Corresponding author: peterwan@mail.cnu.edu.tw; Tel: +886-6-2664911 ext 6318*

ABSTRACT

In recent years, rapid technological advancements and vigorous industrial and commercial development have brought about a diverse range of material benefits. However, this has also led to significant environmental hazards, with heavy metal pollution being a major concern. Consequently, the treatment of heavy metals in water has become an urgent concern that needs to be addressed.

Research has shown that modifying the surface of an adsorbent with m-Phenylenediamine results in good adsorption capacity and affinity for heavy metals such as chromium. To increase its applicability, this study uses drinking water treatment sludge to prepare ferromanganese oxide magnetic particles and modifies the surface using m-phenylenediamine. For adsorption batch experiments, different concentrations of cadmium solutions were prepared and the adsorption capacity before and after modification was observed.

Qualitative analysis of the adsorbent using Fourier Transform Infrared Spectroscopy (FTIR) revealed that the absorption peak of the modified particles was enhanced, indicating successful adsorbent modification. Magnetization was analyzed using Superconducting Quantum Interference Vibration Magnetometer (SQUID VSM), which facilitated external magnetic field recovery. The Langmuir and Freundlich isotherms showed that the maximum adsorption capacities of magnetic particles and magnetic particles with m-phenylenediamine were 86.2 mg/g and 93.4 mg/g, respectively. Furthermore, the Freundlich isotherm n values were greater than 1, which is favorable for heavy metal adsorption. The kinetic adsorption model was found to fit a pseudo-second-order kinetic model, describing the adsorption mechanism through chemical adsorption.

KEYWORDS

Adsorption; Chromium; m-Phenylenediamine; Isotherm; Water Treatment Plant Sludge

High-Quality Deoxygenated Pyloritic Oil By Using Methanol As An In-Situ Hydrogen Donor Pylorisis Oil From Pyrolytic Catalysis Cracking Of Waste Cooking Oil

Warangkana Khangwichian[1,*], Kitirote Wantala[1,2]

[1] *Department of Chemical Engineering, Faculty of Engineering, Khon Kaen University, Khon Kaen, 40002, Thailand*

[2] *Research Center for Environmental and Hazardous Substance Management (EHSM), Khon Kaen University, Khon Kaen, 40002, Thailand*

**Corresponding author: K_warangkana@kkumail.com; Tel: +66 6-4064-6976*

ABSTRACT

The aim of the work is to upgrade pyrolysis oil (PO) from the pyrolytic catalysis cracking process (PCC) to reduce acidity and oxygen contents by using an *in-situ* hydrodeoxygenation process using a methanol donor in the hydrodeoxygenation process. The reaction condition was tested at various nickel loading (0, 3, 6, 9, and 12 wt%) on HZSM-5 (SiO_2/Al_2O_3 = 40) and using temperatures at 230 °C and times 6 h. to study the effect of different nickel loading in the reaction. The prepared catalyst through the incipient wetness impregnation (IWI) method. Moreover, nickel (Ni^0), reduced from the former catalysts, was also studied. The reduced oxidation state of Ni (II) to get nickel (Ni^0), Where the hydrogen atoms on the nickel atoms were first absorbed when the H_2 was first split apart. The fracture of the nickel-oxygen link was followed by the migration of hydrogen atoms, which led to the final dehydration of H_2O and the formation of nickel-metal. was operated via a horizontal tube furnace at a temperature of 550 °C for 5 h under an atmospheric of 10% H_2 mixed with 90% N_2. The physical and chemical properties of the catalysts were characterized by TGA, XRF, N2 adsorption-desorption, XRD, FTIR, XPS, XANES, XAS, FE-SEM, and EDS. The analysis of upgrading oil products by many techniques such as Viscosity (ASTM D445 D240), Density (ASTM D1480-07), and HHV by calculated from the elemental analysis CHNO. In addition, FTIR, CHNO, GC-MS, and TGA were also applied to investigate. The best upgrading oil was distilled following (ASTM D86) to separate bio-gasoline, bio-kerosene, and bio-diesel. The acidity, Viscosity, Density, HHV, and total acid number (TAN) (ASTM D664) were done to compare bio-fuel before and after upgrading. The result of the work was optimal Ni loading was about 12% giving the lowest oxygen content was 82% compared with raw material pyrolytic oil from pyrolytic catalysis cracking (PCC) in upgrading oil products.

KEYWORDS

Waste cooking oil, In-situ hydrodeoxygenation, Acidity, Bio-oil, Renewable Energy, catalysts, Upgrading oil.

A Comparative Assessment Of Morphological Properties And Chemical Composition Of Microplastics In River Marikina And San Juan Rivers In The Philippines Using Microscopy And Ftir Analysis

Leonard Francis M. Manlangit[1], Mary Jean N. Omaña[2], Moises M. Ribon[3], Ephraim-V C. Viray[4], Lesly Ann Pauline A. Manaoat, Donamel M. Saiyari[1,2*], Ramir M. Cruz

[1]*Department of Civil Engineering, College of Engineering, Polytechnic University of the Philippines, Sta. Mesa, Manila, 1016 Philippines*
[2]*Environment and Biotechnology Division, Industrial Technology and Development Institute, Department of Science and Technology, Bicutan, Taguig City, 1631 Philippines*

[*]*Corresponding author: dmsaiyari@itdi.dost.gov.ph; Tel: +63-2-83837-750 to 69*

ABSTRACT

Microplastics (MPs) are small plastic fragments with a diameter of up to 5mm. During previous years, these particles have dramatically grown and been discovered in a wide range of environments globally, particularly in aquatic ecosystems. Due to its existence and potential dangers, this study aimed to determine MPs' abundance, chemical composition, and morphological properties in the Marikina and San Juan Rivers in the Philippines. After collecting five-liter water samples from the selected water bodies, samples were subjected to sieve analysis of various sizes. Samples were digested to eliminate organic materials, and salt solutions were added for the density separation process. This study utilized Attenuated Total Reflectance Fourier Transform Infrared (ATR-FTIR) spectroscopy to identify chemical properties and ImageJ to determine MPs' size and shape. Polypropylene (PP) was found as the most abundant type of plastic in all water bodies. Furthermore, fragments and fibers were the most prevalent types of microplastics discovered. Overall, this study provides important insights into the presence and characteristics of microplastics in the urban rivers in the Philippines.

KEYWORDS

FTIR, Microscopy, Microplastics, Urban rivers

WEPYRO TECH: Waste to Energy Pyro Technology

Richard D. Andres [1], Jason James V. Robin [1], Jose Florenz B. Somigao [1], John Robert P. Tapada [1], Bon Ryan P. Aniban[2], Jaychris Georgette Y. Onia[3], Nino U. Pilueta[4], Florante D. Poso Jr.[5]

[1]*Student Researchers, Department of Civil Engineering, Far Eastern University - Institute of Technology, Metro Manila, Philippines*
[2]*Faculty, Department of Civil Engineering, Far Eastern University - Institute of Technology, Metro Manila, Philippines*
[3]*Program Director, Department of Mechanical Engineering, Far Eastern University – Institute of Technology, Metro Manila, Philippines*
[4]*Program Director, Department of Computer Engineering, Far Eastern University – Institute of Technology, Metro Manila, Philippines*
[5*]*Program Director, Department of Civil Engineering, Far Eastern University – Institute of Technology, Metro Manila, Philippines*

** Corresponding author: fdposo@feutech.edu.ph; Tel: +63 9688793570*

ABSTRACT

Solid waste management has been a major issue in developing countries such as the Philippines, as the nation goes to the improvement of living, economic growth, industrialization, and increase in population. Another major issue is the lack of electricity in the Philippines, particularly in the provinces. The Philippines' plan for full electrification of all households becomes difficult due to its topography, and geography. This study aims to provide an alternative solution for both issues by innovating through Waste-to-Energy. Waste-to-Energy is one of the alternative solutions in response to the worsening municipal solid waste in the world and source of electrical energy. A prototype would be built up and known as WEPyro Tech or Waste-to-Energy Pyro Technology, an alternative solid waste management machine and micro-electricity supply for rural communities. Instead of burning the waste or dumping it in the landfills, it will be processed in the prototype to lessen its environmental impact. This is possible using air filter bags and crushed mussels which lessen the air pollution produced during the incineration process of the waste as it builds up heat. The build-up heat would be absorbed by the thermoelectric converter, convert heat to electricity, and stored in a battery.

KEYWORDS

Heat to energy; Incinerator prototype; Waste; Waste to energy; Waste incinerator

Effects of Environmental Anions on Molybdenum Disulfide Nanosheets in the Aquatic System

Ting-Wei Lee and Chiaying Chen*

Department of Environmental Engineering, National Chung Hsing University, Taichung City 402, Taiwan

**Corresponding author: chiayingchen@nchu.edu.tw; Tel: +886-4-22840441#541*

ABSTRACT

The remarkable properties of molybdenum disulfide (MoS_2) nanosheets allow them a promising material for water treatment and purification. During the treatment process, MoS_2-based materials will inevitably interact with environmental substances, such as ionic species. Previous studies show that MoS_2 nanosheets can be oxidized and release soluble Mo ions by cations with a higher reduction potential of cations. However, the influence of inorganic anions on the stability of MoS_2 nanosheets is still lacking. In this work, the impacts of anionic species (e.g., chloride, nitrate, sulfate, bicarbonate, and phosphate) on the chemical stability of MoS_2 nanosheets were studied under dark ambient and sunlight irradiation conditions. The results demonstrated that the oxidative dissolution of MoS_2 nanosheets was accelerated in the presence of anions. The electrochemical analysis revealed that nucleophilicity and basicity of anions are the governing factors of their influence on MoS_2 nanosheets. The reactive radicals generated by the photochemical reaction of nitrate ions may further oxidize MoS_2 nanosheets. Additionally, the dissolution-promoting effect of anions on MoS_2 nanosheets also occurred under environmentally relevant conditions. The findings provide insights for evaluating the durability of MoS_2 used for aquatic applications and improve the understanding of the environmental fate of emerging two-dimensional materials.

KEYWORDS

Molybdenum disulfide; Anions; Durability; Transition-metal dichalcogenide

Application of nano zero-valent iron coated Carboxymethyl Cellulose on removal of wastewater contained Congo Red dye

Phuong-Thao Nguyen[1,2], Ngoc Minh-Thu Vuong[2,3], Thi Dieu-Hien Vo[4], Thi Kim-Quyen Vo[5], Huu-Vinh Nguyen[1,2], Pham Hong-An Nguyen[1,6], Thi Thuy-Hoa Le[1,6], Thi Tuyet-Nhung Hoang[6], Xuan-Thanh Bui[1,2,*]

[1]*Key Laboratory of Advanced Waste Treatment Technology & Faculty of Environment and Natural Resources, Ho Chi Minh University of Technology (HCMUT), 268 Ly Thuong Kiet Street, District 10, Ho Chi Minh City, Vietnam.*
[2]*Vietnam National University Ho Chi Minh City (VNU-HCM), Linh Trung Ward, Ho Chi Minh City 700000.*
[3]*Faculty of Chemical Engineering, Ho Chi Minh University of Technology (HCMUT), 268 Ly Thuong Kiet Street, District 10, Ho Chi Minh City, Vietnam.*
[4]*Faculty of Environmental and Food Engineering, Nguyen Tat Thanh University, Ho Chi Minh City 700000, Viet Nam*
[5]*Faculty of Biology and Environment, Ho Chi Minh City University of Food Industry (HUFI), 140 Le Trong Tan street, Tay Thanh ward, Tan Phu district, Ho Chi Minh City 700000, Viet Nam.*
[6] *Faculty for High quality training, Ho Chi Minh City University of Technology and Education, Ho Chi Minh City 700000, Viet Nam*

**Corresponding author: bxthanh@hcmut.edu.vn; Tel: +84-965-376-073*

ABSTRACT

In light of the dizzying speed of development of industries, notably the textile industry, it is absolutely essential to safeguard the environment by treating textile dyeing sewage. Applying nanotechnology, especially nano zero-valent iron encapsulated carboxymethyl cellulose (nZVI-CMC), was considered less expensive and provided exceptional efficiency in textile wastewater decolorization. In this study, Congo Red dye (CR) was used as artificial wastewater, and evaluated the treatment performance by different composition ratios of CMC-nZVI. At the initial CR concentration of 500 mg/L, decolorization efficiencies increased with the increase of CMC concentration. They reached 100% removal efficiency at the CMC concentration of 0.4% within 10 seconds after adding CMC-nZVI to the CR solution. The optimal decolorization was observed at the concentration of Fe of 0.1% and 0.3%, with the CR removal efficiency of nearly 90%. A low and unstable removal efficiency at 0.6% of Fe was caused by the effect of the high density of Fe in the mixture. Even though numerous methods have been probed, the core principle of dye decolorization is breaking down the chromophore groups (-N=N-), which account for the color of the dye, into N-H bonds. Through this work, there will be a multi-dimensional perspective of the influences and the efficiency in CR treatment of CMC-nZVI. Hence, applying CMC-nZVI will become a potential key to solving the issues caused by the decolorization of dye wastewater.

KEYWORDS

Carboxymethyl cellulose; nano zero-valent iron; decolorization; Congro red; wastewater treatment

Step-dipping ruthenium-tin oxide anode (RuSn/Ti) for chloride-mediated electro-oxidation of ammonia in electronic manufacturing wastewater in the continuous flow reactor

Seto Sugianto Prabowo Rahardjo[1,2], Cing-Tong Jhang[1], and Yu-Jen Shih[1,*]

[1]*Institute of Environmental Engineering, National Sun Yat-Sen University, Kaohsiung, Taiwan 80424, R.O.C.*
[2]*Department of Aquaculture, Brawijaya University, Malang City, Indonesia.*

**Corresponding author: mcdyessjin@gmail.com, yjshih@mail.nsysu.edu.tw; Tel: +886-7-525-2000-4429*

ABSTRACT

The electrochemical ammonia oxidation faces challenges in high concentration chemical oxygen demand (COD) due to the competition between NH_3 and organic carbon on the electroactive sites. The study aims to treat optoelectronics wastewater by chloride-mediated electrolysis in the continuous flow reactor. A highly stable RuSn/Ti anode was synthesized through a wet impregnation method. The experiment conditions for assessing electrode sensitivity included time retention (7 – 30 min), pH (5 – 11), current density (5 – 30 mA cm^{-2}), and chloride concentration (500 – 2000 mg L^{-1}). Among the procedures of step-dipping, the RuSn/Ti anode, which was deposited with the first layer of SnO_2, followed by three RuO_2 layers, exhibited the best durability. The continuous ammonia electrolysis was extended for 10 days, and the electrode performance maintained a steady high removal efficiency. The optoelectronics wastewater contained 634 NH_3-mg L^{-1}, 6700 COD-mg L^{-1}, and 2920 Na-mg L^{-1} under pH 4. By adjusting the pH to 11, applying the current density of 60 mA cm^{-2} and 10000 mg L^{-1} NaCl removed the NH_3 and COD up to 72% and 58%, respectively. The result indicated that the COD greatly consumed the electrolytic Cl_2 to restrain the oxidation of NH_3. Consequently, the continuous flow reactors built up in series significantly improved the removal of NH_3 and COD up to 95% and 89%, respectively, under optimal conditions.

KEYWORDS

Ammonia; Chemical oxygen demand; Continuous flow reactor; Electro-chlorination; Optoelectronic wastewater

Application of Fluidized Bed Homogeneous Crystallization for Simultaneous Recovery of Fe and Cu as Particles from Wastewater

Laurencia Wiryana Effendi, Nicolaus Nezha Nunez Mahasti, Yao-Hui Huang*

Department of Chemical Engineering, National Cheng Kung University, Tainan, Taiwan 701, R.O.C.

*Corresponding author: yhhuang@mail.ncku.edu.tw

ABSTRACT

The mixture of copper and iron often results in materials with favorable properties. The mining process along with the material production processes involving these metals produces hazardous wastewater. In this study, the highly advanced Fluidized Bed Homogeneous Crystallization (FBHC) process was applied to treat iron and copper-containing synthetic wastewater. The initial iron copper particles were successfully synthesized and recovered from wastewater with $[Fe]_0$:$[Cu]_0$ of 2:1, the total metal concentration of 3 mM, at effluent pH = 7.5 ± 0.5, with the upflow velocity (U) of 1.76 m/h. Agglomerates hardening process is a crucial step for initial particle synthesis which requires slow and steady flow. The SEM analysis reveals the spherical particle densified crust and fluffy core. The particle formation mechanism which includes the formation of the nucleus, attachment of precipitate flakes, and densification of particles was proposed after microscopic observation. The initial particles synthesized were used to initiate treatment at the operating condition pH =7.5 ± 0.5, $[Fe]_0$:$[Cu]_0$ of 2:1, the total metal concentration of 3mM, $[CO_3^{2-}]_0$:$[M]_0$ = 1.2:1, and upflow velocity (U) of 28.66 m/h which results in the total metal removal of 99% and crystallization ratio of 90% and 88% for iron and copper respectively. The treatment provided advantages in terms of simultaneous metal recovery, waste volume reduction, easier pollutant separation, and the possibility to upcycle the waste particles into catalysts.

KEYWORDS

Fluidized Bed Homogeneous Crystallization; Metal recovery; Iron copper particle; Upflow velocity; Crystallization ratio

Amended Ferrozine Assay for Detection of Biogenic Iron Oxide Nanoparticles in *Magnetospirillum gryphiswaldense* MSR-1

Ya-Chun Zhao, Li Fen Wu, Siang Chen Wu*

Department of Environmental Engineering, National Chung Hsing University, Taichung, Taiwan 40227, R.O.C.

**Corresponding author: wusc@nchu.edu.tw; Tel: +886-4-22840441 ext 521*

ABSTRACT

Heavy metals have contaminated farmlands for years in Taiwan. The area of chromium (Cr) contaminated farmland was 36 ha, and the Cr concentration ranged from 12.5 ppm to 19,800.0 ppm. Among the developed chromium remediation technologies, bioremediation had several characteristics, including eco-friendly and cost-effective. The *Magnetospirillum gryphiswaldense* strain MSR-1 could biomineralize membrane-bounded Fe_3O_4 nanoparticles within cells called the magnetosome. The magnetosome chain(s) enables MSR-1 to move along with magnetic field (magnetotaxis). Furthermore, MSR-1 utilized magnetosomes as a protective shield against heavy metal stress by incorporating the heavy metal into magnetosomes. Additionally, MSR-1 have proved to reduce Cr(VI) to Cr(III) in previous results. The easy separation, metal tolerance, and Cr-reducing characteristics of MSR-1 make it a potential biomaterial for bioremediation.

To maintain MSR-1 cells on a regular basis, it is important to monitor both the cell yield and the magnetosome contents. Common methods for measuring magnetosome content include transmission electron microscope, magnetic response, inductively coupled plasma optical emission spectroscopy, atomic absorption spectroscopy, and the ferrozine assay. However, except for the ferrozine assay, the above-mentioned methods either require expensive instruments and further maintenance or additional equipment. Ferrozine is a compound that chelates with the ferrous ion and forms a stable magenta solution. The colored solution can be easily detected with a spectrophotometer at a wavelength of 562 nm. However, the accuracy of the ferrozine assay for measuring biogenic iron oxide nanoparticles and the experimental details are still unknown.

Here, we amended the ferrozine assay for iron oxide nanoparticles by controlling the heating volume at 0.4 ml and digest the samples at 100 ℃ for 10 minutes. The recovery of the amended ferrozine assay in Fe_2O_3 nanoparticles is 87.96% relative to the known concentration stock solution (2.5 ppm). Next, we apply the amended ferrozine assay to analyze magnetosomes derived from MSR-1. The assay successfully reveals the difference of iron contents between magnetosome-containing (1.165 ppm) and magnetosome-deficient (0.163 ppm) samples and achieved good proportional correlation as the increasing MSR-1 cell density. The assay further helps us examine the effects of centrifugation on magnetosome-containing samples compared to magnetic separation. The detected residual magnetosomes in centrifugation-derived samples reveals that the magnetic separation still the suitable method to collect magnetosomes. Based on the results, we expect that the amended ferrozine assay will aid researchers who are engaged in magnetotactic bacteria studies and facilitate the development of the bioremediation technology of MSR-1 in the future.

KEYWORDS

Chromium removal; magnetotactic bacteria; *Magnetospirillum gryphiswaldense* MSR-1; ferrozine assay

A study of VOCs emission fingerprints and characteristics of light oil cracking plants in Southern Taiwan

Zhi-Ping Hsu*, Chit-San Lin, Po-Yang Chen, Kit-Mui Kwong

Department of Marine Environmental Engineering, National Kaohsiung University of Science and Technology, Kaohsiung, Taiwan 71710, R.O.C.

**Corresponding author: f111184110 @nkust.edu.tw; Tel: +886-9-3617141*

ABSTRACT

With the development of petroleum processes and science and technology growing faster and faster, the fugitive emission of air pollutants cannot be ignored, especially the issue of volatile organic compounds (VOCs). Therefore, in this study, VOCs were sampled and analyzed in two light oil cracking plants in a southern petrochemical plant with different ages, and helped to identify the sources of fugitive emissions and odors, and maintain the air quality in the plant. In this study, four times sample collections were designed from Light Oil Cracker Plant A (opened in 2013) and Light Oil Cracker Plant B (opened in 1983), and a total of 47 samples were collected and analyzed, more than 53 compounds were found. As the result, the average concentration of fugitive emission for Plant B is more than Plant A, it is about 20 times. The average concentration of TVOCs for the different processes is Low-temperature process in Plant B (1896±3220.97 ppb) > Butadiene process in Plant B (194.3±115.394 ppb) > Low-temperature process in Plant A (77.93±48.14 ppb) > Cracking process in Plant B (66.1±58.83 ppb) > Gasoline hydrogenation process in Plant A (25.96±14.19 ppb) > Cracking process in Plant A (13.55±7.58 ppb). In addition, naphthalene and BTEX compounds were detected in four sample collections in this study, and their concentrations were suspected to be higher, which are toxic compounds that affect human health and the environment. It is recommended that the plants should be collated with each other to double-check the process equipment components and reduce the fugitive emission, protecting operators and residents health.

KEYWORDS

Petroleum processes, volatile organic compounds, benzene, naphthalene, emission fingerprint

Kaohsiung Port Area Ambient Air Background Source Monitoring Survey Plan

I-Hsin Hsu*, Chitsan Lin, Chen Po-Yang, Kit-Mui Kwong, and Zhi-Ping Hsu

Department of Marine Environmental Engineering, National Kaohsiung University of Science and Technology, Kaohsiung, Taiwan 71710, R.O.C.

**Corresponding author: ctlin@nkust.edu.tw; Tel: +886-9-39904043*

ABSTRACT

The world recognizes marine transport as an important driving force for international trade and economic development. In recent years, affected by the epidemic, the volume of ship transport has increased significantly, and the pollution emitted by the engines of ships during navigation and docking, as well as the pollution emitted by the engines of loading and unloading equipment and carrying vehicles is becoming increasingly serious. As the largest international port in Taiwan, Kaohsiung is close to heavy industrial, petrochemical and storage facilities, and the pollution emitted by the port cannot be ignored. This study's sampling days of volatile organic compounds (VOCs) were 2 days, and the sampling time points were 8 a.m. and 8 p.m., respectively. This study aimed to understand the temporal and spatial distribution and variation trend of VOCs in different time periods in the port area, and to explore their correlation and pollution sources. Sampling points are described as follows: E1 is adjacent to the port of Kaohsiung, a port entry area, mainly for sightseeing and leisure activities; E2 is adjacent to the second port of Kaohsiung and the heavy industrial area of Kaohsiung, all of which are potential stationary sources of pollution. The E2 station is also affected by several mobile sources of pollution, such as vessels entering and leaving the two ports, container ships berthing, trucks, and large and medium operating equipment rented by nearby carriers in the terminal loading area. The results showed that 37 VOCs compounds (concentrations greater than detection limits) were detected, including 13 harmful air pollutants (UAT) and 24 photochemical precursor compounds (PAMs). Detected compounds can be divided into five categories, including C_2-VOC (ethylene + acetylene + ethane), Alkane, Alkene, Aromatic hydrocarbons, Ketone, etc. In addition, Naphthalene (NAP) is detected in both port stations. The average concentration of NAP in post-flag security is 74.53 ppbv and that in neutral safety is 57.77 ppbv. The average concentration is higher in day than at night. It is suggested that more vessels, fuels or operating conditions, such as fishing boats and their operating conditions, should be sampled and analyzed in the future.

KEYWORDS

Volatile organic compounds; Spatiotemporal distribution; Special industrial complex; Principle components analysis; Ozone formation potential

Research of changing the angle attack and inner circle design to improve the efficiency of a three-paddle Multi-Hole Hollow Propeller Aerator

Wei-Chieh Chien, Jian-Chuan Shern*

Department of Marine Environmental Engineering, National Kaohsiung University of Science and Technology, Kaohsiung, Taiwan 71710, R.O.C.

**Corresponding author: jcshern@nkust.edu.tw; Tel: +886-9-22804217*

ABSTRACT

The porous three-paddle hollow propeller aerator is a new type of aeration equipment invented by Professor Jian-Chuan Shern of National Kaohsiung University of Science and Technology. This invention uses centrifugal force to fling air out of the holes of the hollow propeller paddles into the water body to increase the concentration of dissolved oxygen in the water. To meet the conditions of the aquaculture pond, the experiment was conducted by adding sea salt to the water salinity of 33 ‰ to simulate the actual aquaculture pond to investigate the aeration efficiency and the best energy-saving operation conditions of the aerator in seawater and freshwater.

The experiments were conducted in a rectangular tank, divided into two groups, and optimized for (1.) the angle of attack of the paddle blades (35°~75°) and (2.) the radius of curvature of the inner chamfer (0 mm, 10 mm and 20 mm). The results showed that the angle of attack of 70° was the best angle of attack for the hollow propeller, and the aeration capacity was 63.952 m3/hr in (freshwater 0‰) and 65.658 m3/hr in (seawater 33‰). While the minimum angle of attack 35° also at 1300 rpm, its aeration is only 51.185m3/ hr. The study shows that the aeration increases with the angle of attack. Although the design of the inner chamfered curvature does not significantly improve the aeration efficiency, the result of the aeration rate per kWh is the most economical and efficient aeration at a radius length of 20mm. Therefore, it is recommended to use 70° and 75° angles of attack for aeration of extremely anoxic water bodies regardless of cost; for long duration aeration, it is recommended to use 40°~60° angles of attack and maintain the best operating conditions between 850~1050 rpm.

KEYWORDS

angle attack; internal chamfering radius; hollow propeller aerator; aeration efficiency

Chemical Characterization of Particulate Matter from Mid-Autumn Festival Activities in the Vicinity of Steelmaking Industrial Area

Chi-Fu Yeh[1,*], Yi Sung Liu [2], Chih-Chung Lin[3], Jen-Hsiung Tsai[4], and Jheng-Jie Jiang [5]

[1*] *Hwa-Ying Environment Technical Consultants Co., Ltd., Kaohsiung 81463, Taiwan*
[2]*Kuen-Ting Entech Co., Ltd., Taichung 40464, Taiwan*
[3]*Department of Environmental Science and Engineering, National Pingtung University of Science and Technology, Pingtung, 91201, Taiwan*
[4] *Department of Environmental Science and Engineering, National Pingtung University of Science and Technology, Pingtung, 91201, Taiwan*
[5] *Department of Environmental Engineering, Chung Yuan Christian University, Taoyuan 320314, Taiwan*

**Corresponding author: wastonyeh@gmail.com; Tel: +886-7-716-7002*

ABSTRACT

The study aimed to investigate the chemical characterization of atmospheric particulates collected in the vicinity of a steelmaking industrial area during Mid-Autumn Festival in southern Taiwan. $PM_{2.5}$ samples were collected in a sampling campaign from September 28th to October 5th, 2020. Samples were divided into previous, during, and after the festival. $PM_{2.5}$ samples were determined for a total of 27 metallic elements by ICP-AES and ICP-MS. The experimental results revealed that the $PM_{2.5}$ mass concentrations were in the order of during, after, and previous festivals. The highest mean concentrations of Al, As, Ba, Ca, Cu, K, Mg, Na, and Sr were observed during the festival period. The aforementioned metallic elements were related to firework activity. In addition, high Al, Ba, Ca, Fe, Mg, and Pb concentrations were observed during the festival period, showing that these elements could be related to charcoal barbecue activity. High concentrations of Cr, Fe, Mn, Mo, Pb, W, and Zn were observed during the previous or after festival periods. This result demonstrated marker elements of ion and steel production emission. Enrichment factors (EF_c) confirmed that the main contributors of As, Ba, Cu, K, Mg, and Na originated from firework activity during the festival period. High EF_c (>1,000) of Mo, Pb, Sb, Se, Sn, W, and Zn were detected in this study, showing the severe anthropogenic pollution in this area.

KEYWORDS

Atmospheric particulates; Metallic elements; Firework; Barbecue; Enrichment factors

We Need Bioerosion Research in the South China Sea

Christine Hanna Lydia Schönberg[1,2]

[1]*Department of Oceanography, National Sun Yat-sen University, Kaohsiung, Taiwan 80424, R.O.C.*
[2]*School of Engineering, University of Western Australia, Crawley, Perth, WA 6009, Australia*

**Corresponding author: cschoenberg@mail.nsysu.edu.tw; Tel: +886-7-525-2000 ext. 5114*

ABSTRACT

The South China Sea is neighbouring the Coral Triangle and represents an important habitat for coral reef ecosystems. As elsewhere, the local coral reefs are significantly impacted by human use and environmental change. Disturbance causes the coral reef dynamic equilibrium to move from positively calcifying to eroding, which in turn causes structural, diversity and socioeconomic losses. Bioerosion is the direct counterpart to biological calcification and has bioindicator function, but funding and research effort is biased towards calcifying organisms. In the South China Sea, it is hardly understood at all. This distorts and limits our ability to recognize trends, compare between studies and generalize, thereby hindering progress in reef management. We need to generate standardized, comparable datasets across a wide range of species, locations and times. We need to build our knowledge about local bioeroders and provide high quality species descriptions for reliable identification. We need to include bioerosion into our monitoring strategies so that we can recognize shifts towards erosion earlier and understand the drivers. We also need to know how bioerosion can slow or jeopardize restoration efforts. In short: We need bioerosion research in the South China Sea.

KEYWORDS

Southeast Asia; Bioerosion; Coral degradation; Research need

Feasibility Study of Real 1,4-Dioxane Wastewater Treatment Combining with Biological and Chemical Oxidation Technology

Ping-Heng Hsieh, Ru-Yi Zheng, Yu-Shyuan Luo, Yu-Jen Huang*

Ever-Clear Environmental Engineering Corporation, Taichung 40755, Taiwan

**Corresponding author: YuJenHuang@ever-clear.com.tw; Tel: +886-4-22550168 ext 401*

ABSTRACT

The U.S. EPA has classified 1,4-dioxane as a likely human carcinogen by all routes of exposure. In recent years, many researches have focused on 1,4-Dioxanewhich is one recalcitrant pollutant and ineffectively removed during conventional wastewater treatment processes. Therefore, in this study the combinations of different biological and chemical oxidation technologies is surveyed and explored to propose the optimum treatment process.

In this lab scale study, real raw 1,4-Dioxane wastewater is taken from the plant and the COD is 7164±1553 mg/L and 1,4-Dioxane concentration is 710 to 1220 mg/L. In the biological feasibility study, conventional activated sludge and EColos technology as secondary treatment are tested parallelly and biological tertiary treatment using BioNET is also tested. EColos is one MBBR/IFAS biological technology developed and patented by Ever-Clear. From the results it is found that effluent COD of activated sludge is 365±264 mg/L and effluent COD of EColos system is 160±102 mg/L, which indicates EColos has better performance of COD removal than conventional activated sludge. However, the both effluent 1,4-Dioxane concentrations of EColos and activated sludge system can not achieve 28.6 μg/L issued by USEPA and the concentrations are in the range of 9.31 to 65.8 mg/L. Therefore, the selection of tertiary treatment is considered of BioNET and Fenton technology and the results show that with Fenton technology treatment 1,4-Dioxane concentration can be lower than the detection limit (QDL is 0.002 mg/L). These study demonstrates different combinations of treatment technologies in 1,4-dioxane removal efficiency.

KEYWORDS

1,4-Dioxane; EColos; BioNET; Fenton reaction.

Neo-Vernacular Tenement Paradigm Towards Sea Level Rise Coastal Resiliency at Barangay Rizal Estanzuela, Iloilo City, Philippines

Ruth Jireh Mae Bolivar*, Gabriel Anghel Bibal,
Jojit Gadian, Marc Nicole Miguel, and Ma. Theresa Austria

Department of Architecture, University of San Agustin, Iloilo City 5000, Philippines

**Corresponding author: rbolivar@usa.edu.ph*

ABSTRACT

Sea levels in the Philippines are rising faster than the world average, increasing the risk of higher storm surges, which are expected to affect 14% of the population and 42% of coastal inhabitants. Iloilo City's coastline is one of the areas most affected by sea level rise (SLR). This study aims to propose a design solution to enhance the resiliency of the coastal community of Barangay Rizal Estanzuela against rising sea levels and mitigate their vulnerability through architectural interventions. The paper outlines the proposed design model of resilient tenement housing that can withstand the effects of sea level rise, and changing climatic conditions. The physical, health, social, and urban deterioration issues in the community were identified through site post-occupancy evaluation and government policies and law reviews. Surveys, focus group discussions, and interviews with the residents were undertaken regarding their practices in responding to the effects of sea level rise. Using the comparative case study approach, design guidelines for sea level rise were extracted. Findings revealed that houses in this community are vulnerable to existing problems. Many households in the area recognized the significance of improving housing conditions as a coping technique to combat the effects of sea level rise. As architecture cannot be separated in its environmental context, it is vital to consider the cultural background, geographical location, and climate-specific design solutions. A paradigm shift is urgently needed to use vernacular architecture principles and recent technological advances in the construction industry to meet the demands of modern lifestyles while minimizing environmental impact. The proposed model considers the traditional "Bahay Kubo" as a nostalgic inspiration retrofitted with diverse local materials in constructing a tenement that is truly Filipino. To prevent damage, the structure was elevated, and mechanical systems were positioned above the expected sea level as an effective robust option.

KEYWORDS

Sea Level Rise; Resilience; Coastal Community; Tenement; Neo-Vernacular Architecture

Optimizing Mineral Medium Components for Enhancing Benzene Biodegradation by *Acinetobacter guillouiae*: Effect of growth rate on degradation efficiency

Yu-Wen Hsiao, Siang Chen Wu*

Department of Environmental Engineering, National Chung Hsing University, Taichung, Taiwan 40227, R.O.C.

**Corresponding author: wusc@nchu.edu.tw; Tel: +886-4-22840441 ext 521*

ABSTRACT

In situ bioremediation is a promising approach for cleaning up contaminated sites, but its success depends on the availability of suitable biological agents and nutrient supply. Mineral medium composition can be an important factor in determining the growth and degradation capability of cells, and thus affecting the bioremediation efficiency. However, the effect of mineral medium compositions on the biodegradation efficiency is rarely studied. In this study, we aimed to estimate the effect of applied major salts, trace elements, and vitamins on the cell growth and its contaminant biodegradation. To do this, we statistically analyzed the medium receipts for culturing general bacteria and identified the most commonly used compounds. We then applied 64 combinations of mineral medium with varied major salts, trace elements, and vitamins to Acinetobacter guillouiae, a bacteria known for its ability to degrade benzene and phenol. We measured the specific growth rate of the bacteria under each condition and analyzed the effect of major salt, trace elements, and vitamins on its growth rate using the three-way ANOVA method. Our results showed that the major salts magnesium, potassium, and hyposulfite, as well as the trace elements manganese, molybdenum, zinc, cobalt, and iron, enhanced the bacteria's specific growth rate in 1.4 to 1.5 times higher.

In a follow-up study, we selected three specific mineral media that allowed us to culture Acinetobacter guillouiae with low (Sup04), medium (Sup50), and high (Sup18) growth rates. We substituted the carbon source with benzene and evaluated the bacteria's ability to degrade benzene in each medium. By applying a three-half-order kinetic model, our results showed that the high-growth-rate medium (Sup18) had a higher k1 constant (0.021 hr-1) compared to the medium and low-growth-rate media (0.015 hr-1 and 0.009 hr-1, respectively), indicating that the Acinetobacter guillouiae had a higher degradation capability while it had a higher specific growth rate. Moreover, our results showed that addition of yeast extract to the mineral medium only enhanced the k1 constant in the Sup50 medium (0.015 to 0.021 hr-1), suggesting the boost of biodegradation capacity by adding yeast extract is medium-dependent. These findings provide important insights into the relationship between bacterial growth rate and contaminant degradation efficiency and can inform the design of optimal mineral media for bioremediation applications.

KEYWORDS

Benzene biodegradation; bioremediation; *Acinetobacter guillouiae*; mineral medium; three-half-order kinetic model

The inhibition of chemical corrosion on dimensionally stable anode (DSA) in fluorine-contained wastewater at electrolysis process

Kai-Yang Chang, Yi-Ting Liu, Yao-Hui Huang*

Department of Chemical Engineering, National Cheng Kung University, Tainan, Taiwan 70101, R.O.C.

**Corresponding author: yhhuang@mail.ncku.edu.tw; Tel: +886-6-275-7575*

ABSTRACT

Dimensionally stable anode (DSA) is widely applied in electrochemistry field for decades due to its stability and insolubility. DSA is consisted of noble metal oxides layer coated on titanium-based material. Electrodeposition is an environmentally-friendly method to recover metal from heavy metal-contained industrial wastewater. Fluoride, commonly found in silicon etching rinse bath, copper melting, and metallurgical plant wastewater, is a corrosive compound that can damage IrO_2 and Ta_2O_5 active layer in DSA. In this study, boric acid, aluminum ion, and iron ion were investigated as a complexing agent to prevent corrosion as anodic protection of DSA for service life-prolonging. Accelerate lifetime test (ALT) method was applied to quantify the service life under high current density. In the presence of 4 mM of boric acid, anodic service life was expanded to over 500 hours compared to the unprotected system (160 hours) under the current density of 3 A/cm^2 within 4 mM fluoride in 2 M sulfuric acid solution. Compared to the other complexing agents, boric acid could reach the higher current efficiency of 92.5% in the process of copper electrodeposition.

KEYWORDS

Dimensionally Stable Anode; Electrodeposition; complexing agent; fluoride; Accelerate lifetime test

Electrochemical detection of acetaminophen using reduced graphene oxide-encapsulated cobalt zeolite imidazole framework derived porous carbon (Co-ZIF-8@rGO)

Sheng-Kai Lin, Yu-Jen Shih*

Institute of Environmental Engineering, National Sun Yat-Sen University, Kaohsiung, Taiwan 80424, R.O.C.

**Corresponding author: mcdyessjin@gmail.com, yjshih@mail.nsysu.edu.tw; Tel: +886-7-525-2000-4429*

ABSTRACT

Compared to the conventional chromatography, the electrochemical method has several merits, including rapid response time, low cost, and simplicity as portable device in the determination of pharmaceutical pollutants in the environment. Composite of zeolite imidazolate framework and reduced graphene oxide, Co-ZIF-8@rGO, and its derived carbon material were synthesized for electrochemical sensing of acetaminophen (AP). The composite electrode present cubic crystallites of Co-ZIF-8 wrapped in a single-layer graphene film. Voltammetry results showed that the Co-ZIF-8@rGO had an oxidative current response for AP at a working potential of +0.5 V (vs. Hg/HgO). The highly porous Co-ZIF-8@rGO(800) formed by heating the composite at 800℃ in argon atmosphere significantly improved the faradaic current AP oxidation. The effective area A_{ECSA} followed Co-ZIF-8(800) (1.21cm^2) > ZIF-8@rGO(800) (0.81cm^2) > GCE (0.27cm^2), indicating that the modification with Co and rGO increased the active sites. The numbers of electron transfer for AP oxidation on GCE, ZIF-8(800), and Co-ZIF-8@rGO(800) were estimated to be 0.62, 0.32, and 2.17, respectively. It is expected that the Co-ZIF-8@rGO(800) altered the sensing mechanism of AP on the GCE substrate. The peak current of sensing AP against concentration using differential pulse voltammetry (DPV) mode had a high linearity in the region of below 100 μM, which the calibration slope was 0.2372 μA/μM with a correlation coefficient of 0.9962. Consequently, Co-ZIF-8@rGO(800) has a high recovery in quality assurance in the detection of trace AP.

KEYWORDS

Acetaminophen; Differential pulse voltammetry; Electrochemical sensors; Metal Organic Frameworks; Reduced graphene oxide

The aeration effect of hollow propeller aerator with different number of paddles and multiple holes in water

Guo-Zhan Hong, Jian-Chuan Shern*

Department of Marine Environmental Engineering, National Kaohsiung University of Science and Technology, Taiwan 71710, R.O.C.

**Corresponding author: jcshern@nkust.edu.tw ; Tel: +886-9-22804217*

ABSTRACT

This study is discussed the aeration intensity in water of the hollow propeller aerator invented by professor Jian-Chuan Shern. The hollow propeller aerator uses the centrifugal force when rotating at high speed to throw out air through the hollow stainless steel pipe, shear force cut it into countless microbubbles through the rotation of the propeller, and push the bubbles to deeper water with the thrust of the propeller, so as to increase the dissolved oxygen in the whole water. This experiment is going to find out the relationship between different number of propeller paddles and holes and the change of aeration rate at different rpm. This study results show that the optimized number of propeller is 5 paddles, 80 holes/paddle. At 1400 rpm, the freshwater (salinity 0‰) aeration rate is 109.901 m3/h, the oxygen transmission 32.970 kg/hr, and number of bubbles per hour are 3.280×109. Saltwater (salinity 33‰) aeration rate is 110.96 m3/hr, the oxygen transmission 33.288 kg/hr, and number of bubbles per hour are 2.217×1014. At the best operating rpm for freshwater (850 rpm) and seawater(1050 rpm), in this range, allowing for both economic power savings and water aeration benefits. This type of aerator can transmit oxygenated freshwater or seawater to the deeper water due to the rapid rotation of the propeller, which increases the dissolved oxygen of 1 metric ton of anoxic fresh water (salinity 0‰) to 68.731% saturation and anoxic saltwater (salinity 33‰) to 69.621% saturation, and the bubbles generated are very small, with low buoyancy and long water-stayed time. It can be used in aquaculture ponds, sewage treatment ponds and various places where gas needs to be dissolved into liquid. It is a very excellent aerator with a wide range of uses.

KEYWORDS

hollow propeller aerator; centrifugal force; dissolved oxygen; aeration rate

Fluidized Bed Homogeneous Crystallization (FBHC) : A novel method for recovery of tungsten as iron(III) oxytungstate from synthetic wastewater

Yao-Chang Chuang, Yao-Hui Huang*

Department of Chemical Engineering, National Cheng Kung University, Tainan, Taiwan 701, R.O.C.

**Corresponding author: yhhuang@mail.ncku.edu.tw*

ABSTRACT

Tungsten is a transition metal with unique physicochemical properties. It is one of the unsubstituted compounds used in metalworking, mining, and semiconductor process that is potentially contained in the discharged wastewater. In this study, the application of Fluidized-Bed homogeneous crystallization (FBHC) to recover tungsten from synthetic wastewater ($[W]_0$ = 500 mg/L) as iron(III) tungstate pellets were investigated. $[Fe^{3+}]$ was chosen as a precipitant to granulate dissolved tungsten without any seed added. Various operating parameters, including pH and an initial molar ratio of $[Fe]_{in}/[W]_{in,}$ were tested to obtain the optimum total tungsten removal efficiency (TR) and crystallization ratio (CR). The total removal efficiency of tungsten reached 95% at the optimal pH value of 3.0±0.1, molar ratio of $[Fe]_{in}/[W]_{in}$ =1.0 with the corresponding crystallization ratio of 90%. XRD analysis revealed that the particle after calcination(700^{o}C) is orthorhombic iron tungstate (Fe_2WO_6). SEM image of the surface morphology revealed that the diameter of iron tungstate particles is around 0.1-0.2 mm.

KEYWORDS

Tungsten, Fluidized-bed homogeneous crystallization, crystallization ratio, total removal efficiency, Iron(III) tungstate

The recovery of sulfur as ZnS particles from sulfide-contained wastewater using fluidized bed homogeneous crystallization technology

Hsu-Hua Chang [1], Po-Lin Liao, Yao-Hui Huang*

Department of Chemical Engineering, National Cheng Kung University, Tainan, Taiwan 70101, R.O.C.

**Corresponding author: yhhuang@mail.ncku.edu.tw; Tel: +886-6-275-7575*

ABSTRACT

Sulfide wastewater that is anthropogenically generated from industrial activities is highly corrosive, hazardous, and harms the natural ecosystem. This study uses a novel fluidized-bed homogeneous crystallization (FBHC) method to remove sulfide ions from an aqueous solution. Zinc is used as a precipitant to crystallize ZnS homogeneously in the FBHC reactor to reduce the sludge, which is commonly produced in a conventional chemical precipitation process. The optimal pH value, $[Zn^{2+}]_0/[S^{2-}]_{0\,M}$ ratio, sulfide cross-sectional surface loading (L, kg-S/m^2.hr), and hydraulic retention time (HRT) for the system are established, to optimize the sulfur removal efficiency. The maximum crystallization ratio and the total removal efficiency for sulfur are 97.7% and 98.8%, respectively, at pH = 5.4, a $[Zn^{2+}]_0/[S^{2-}]_{0\,M}$ ratio of 1, a cross-sectional surface loading of 2.2 kg-S/m^2.hr, and an HRT number of 6 with an initial sulfur concentration of 320 mg/L. The solid products are collected and identified as zinc sulfide (wurtzite) using X-ray diffraction (XRD), Fourier-transform infrared spectroscopy (FTIR), and X-ray photoelectron spectroscopy (XPS).

KEYWORDS

Fluidized-bed homogeneous; crystallization; Zinc sulfide; Hydraulic retention time; Cross-sectional surface loading; Crystallization ratio

Photoelectrocatalytic characteristics of TiO2 nanotube arrays-supported waste iron oxyhydroxide and reduced graphene oxide (FeOxrGO/TiNTA) as exemplified by organic pollutant degradation and hydrogen gas evolution

Zhi-Hao Zhang, Yu-Jen Shih*

Institute of Environmental Engineering, National Sun Yat-Sen University, Kaohsiung, Taiwan 80424, R.O.C.

**Corresponding author: yjshih@mail.nsysu.edu.tw; Tel: +886-7-525-2000#4429*

ABSTRACT

This research recycled waste iron oxide from a Fenton-fluidized-bed reactor (Fenton-FBR) of real wastewater treatment plant to synthesize a type II heterojunction on TiO_2 nanotube array by wet impregnation method. Incorporating rGO in the FeO_xrGO/TiNTA further enhanced the electrochemical surface area and the transportation of charge carriers during photoelectrocatalysis (PEC) reaction. Characterization showed that the waste iron oxide was crystalline clusters consisting of mineral goethite nanoparticles (αFeOOH NPs) with a visible-light responsive bandgap. Properties of the photoanode were examined by photo-to-current conversion efficiency and transient photocurrent density. PEC degradation of azo dye pollutants, accompanied by hydrogen gas evolution, was demonstrated in a dual-chamber divided cell using a solar-simulating illumination (300 W Xe-arc lamp, wavelength = 350 – 780 nm). 2%wt of iron oxide in $FeO_{2.0}$rGO/Ti has been optimized which the photocurrent density and applied bias photon-to-current efficiency (ABPE%) were 1.9 mA cm^{-2} and 0.88%, respectively. The decolorization and TOC removal from RB5 solution achieved 99.9% and 63%, respectively, at a working potential of +1.0 V. The H_2 yield rate was 3.985 μmol cm^{-2} h^{-1} in the cathode chamber, resulting a total faradaic efficiency ($\eta_{tot}=\eta_{dye}+\eta_H$) of 95%. The interference test of scavengers indicated clearly that h^+ and *HO•* were the primary reactive species. The band structure analysis suggested that E_g of waste iron oxide αFeOOH and TiNTA were 2.01 eV and 3.14 eV, respectively. The Mott-Schottky method established tha conduction band E_{CB} and valence band E_{VB} of αFeOOH and TiNTA were -0.45 V 、1.56V and -0.23 V 、2.91V vs. NHE, respectively.

KEYWORDS

Fluidized-bed Fenton; Goethite; Heterojunction; Hydrogen evolution; Reduced graphene oxide

Lignin Synthesis from Black Liquor and Bio-crude Oil Production Using Hydrothermal Liquefaction

Nakarin Duangkaew[1,*], Carl Francis Lacson[1,2], Nurak Grisdanurak[2,3], Sutasinee Neramittagapong[4,5]

[1]*Center of Excellence in Environmental Catalysis and Adsorption, Thammasat University, Pathum Thani 12121, Thailand*
[2]*Department of Environmental and Sanitary Engineering, College of Engineering, National University, Manila 1008, Philippines*
[3]*Department of Chemical Engineering, Faculty of Engineering, Thammasat University, Pathum Thani 12121, Thailand*
[4]*Reseach Center for Environmental and Hazardous Substance Management (EHSM), Khon Kaen University, Khon Kaen 40002, Thailand*
[5]*Department of Chemical Engineering, Faculty of Engineering, Khon Kaen University, Khon Kaen 40002, Thailand*

**Corresponding author: gnurak@engr.tu.th.; Tel: +668-9-455-8560*

ABSTRACT

The kraft black liquor, a main by-product of the pulp and paper process, is commonly used as fuel in the evaporator to increase energy efficiency. Furthermore, black liquor has also the potential for producing valuable chemicals, such as lignin. The objective of this investigation was to assess the feasibility of utilizing lignin extracted from black liquor by acidification and lignin conversion to crude oil via hydrothermal liquefaction. The study evaluated the influence of several parameters, including solvent ratio, reaction time, and temperature, on the hydrothermal liquefaction of the lignin and its further depolymerization into higher-monomer phenolic compounds and hydrocarbons. The findings further revealed that the highest yield of bio-crude oil was obtained using lignin extracted from black liquor under a hydrogen atmosphere. In addition, the optimal solvent ratio, reaction time, and temperature were found to be 50/50 %v/v (ethanol-to-water ratio) with a 30-minute reaction time at 275 °C. Overall, the lignin extracted from black liquor has a high potential of producing crude oil (by hydrothermal liquefaction) containing high yields of phenolic compounds and traces of hydrocarbons about 81.52% and 6.57%, respectively.

KEYWORDS

Pulp; paper; acidification; depolymerization; phenolic compounds, hydrocarbons

Groundwater: Agricultural and Industrial Overexploitation and Approaches for Proper Water Management

Clariz D. Santos[1], Hannah Mishariah R. Baylon[1], Jan Eric A. Labtis[1], and Carl Francis Z. Lacson[1,2,*]

[1]*Department of Environmental and Sanitary Engineering, National University - Manila, Manila 1008, Philippines*
[2] *Center of Excellence in Environmental Catalysis and Adsorption, Faculty of Engineering, Thammasat University, Pathum Thani 12120, Thailand*

**Corresponding author: cfzlacson@national-u.edu.ph*

ABSTRACT

The depletion of groundwater is a critical issue due to increasing global demand for water and renewable resources. This review focused on uncontrolled groundwater use in industry and agriculture and further proposed strategies for sustainable management to preserve the environment and resources. Effective management is necessary to prevent overexploitation and ensure a stable water supply. Additionally, the study highlighted sensitive issues surrounding groundwater protection, particularly in urban areas experiencing rapid growth and high-water demand. To address these challenges, governments must develop long-term strategies for managing groundwater resources while considering public use and promoting innovation. Groundwater management also requires the development of suitable technology to efficiently manage resources. Finally, this paper encouraged development of the development of most appropriate plan which chiefly relies on available resources as a critical factor commonly determining the effectiveness of the strategy.

KEYWORDS

water management; water strategies; public utilization; sustainable urban development; sustainable management

Benefits and Challenges in Shifting from Chemical to Natural Coagulants in Drinking Water Treatments

Angelie Jade J. Alonzo[1], Vanette M. Alboleras[1], Luis Miguel A. Agoncillo[1] and Carl Francis Z. Lacson[1,2,*]

[1]*Department of Environmental and Sanitary Engineering. College of Engineering, National University, Manila 1008, Philippines*
[2]*Center of Excellence in Environmental Catalysis and Adsorption, Faculty of Engineering, Thammasat University, Pathum Thani 12120, Thailand*

**Corresponding author: cfzlacson@national-u.edu.ph*

ABSTRACT

Coagulation plays a crucial role in water treatment processes worldwide, typically utilizing chemical or synthetic coagulants. However, these kinds of coagulants have harmful effects on human health and the environment prompting the search for better alternatives. Recent studies have shown the effectiveness of natural or bio-coagulants in clarifying potable water. In comparison to traditional chemicals, natural coagulants offer substantial advantages in water treatment. This review examines the benefits of natural coagulants regarding their effectiveness, cost, impact on human health and the environment, and further potential application in water treatment. Although natural coagulants are acknowledged for their efficiency and effectiveness, the adoption and implementation of natural coagulants are limited by the lack of thorough testing and feasibility studies on aspects such as cost-effectivity, scalability, and sustainability. Therefore, to adeptly apply the natural coagulants, additional investigations are required to thoroughly understand these variables and corresponding effects.

KEYWORDS

Coagulation; Synthetic coagulant; Bio-coagulant; Cost-effectivity; Scalability; Sustainability

Rainwater Harvesting: its Water Quality, Health Impacts, and Treatment Technologies in Drinking Water.

Decerie Dawn Guardiano[1], Joshua Philip Rosario[1], Klein Kenneth Bartolome[1], and Carl Francis Z. Lacson[1,2,*]

[1]*Department of Environmental and Sanitary Engineering, National University - Manila, Manila 1008, Philippines*
[2]*Center of Excellence in Environmental Catalysis and Adsorption, Faculty of Engineering, Thammasat University, Pathum Thani 12120, Thailand*

**Corresponding author: cfzlacson@national-u.edu.ph*

ABSTRACT

Rainwater harvesting (RWH) is becoming a popular alternative source of water in semi-arid (or dry) regions worldwide. This is due to the insufficient conventional sources of water in these regions, which leads to high demand and compromised water quality. However, RWH is not without its drawbacks. These include issues such costs and water contaminants in the harvested rainwater. These contaminants can pose a potential threat to human health, which should be identified. This review paper focused on identifying the primary pollutants found in harvested rainwater and their sources. The literature review revealed that hydrocarbons, solid particles, sediments, and heavy metals like lead, copper, and zinc have been the contaminants in RWH. It is noteworthy how the rainwater is collected (e.g., through roofs, drains, and tanks) which could be the source of rainwater contamination. To produce clean and safe drinking water from harvested rainwater, various treatment methods can be utilized. However, implementing these treatment technologies can be challenging, as they require standard procedures and larger volumes of water to be economical. Thus, this paper provides a comprehensive overview of RWH, its challenges, and solutions for improving the quality of harvested rainwater.

KEYWORDS

water quality; heavy metals; hydrocarbons; water treatment; drinking water;

Catalytic Ozonation Performance Of Graphene Quantum Dot Doped Mnooh Nanorod For Effective Treatment Of Ciprofloxacin And Bromate Formation Control In Water

Thanh-Binh Nguyen[1,*], Van-Re Le[1], Chiu-Wen Chen[1,2], C.P. Huang[3], Xuan Thanh Bui[4,5], Cheng-Di Dong[1,2]

[1]Institute of Aquatic Science and Technology, National Kaohsiung University of Science and Technology, Kaohsiung, 81157, Taiwan.*
[2]Department of Marine Environment Engineering and Science, National Kaohsiung University of Science and Technology, Kaohsiung, 81157, Taiwan.
[3]Department of Civil and Environmental Engineering, University of Delaware, Newark, 19716, DE, USA
[4]Key Laboratory of Advanced Waste Treatment Technology & Faculty of Environment and Natural Resources, Ho Chi Minh City University of Technology (HCMUT), 268 Ly Thuong Kiet Street, District 10, Ho Chi Minh City 700000, Viet Nam.
5Vietnam National University Ho Chi Minh (VNU-HCM), Thu Duc city, Ho Chi Minh City 700000, Vietnam

**Corresponding author: ntbinh179@nkust.edu.tw; Tel: +886-7-3617141 ext. 23560*

ABSTRACT

A catalyst GQDs@MnOOH was successfully synthesized by attaching graphene quantum dots (GQDs) on the surface of MnOOH nanorods to boost catalytic ozonation of antibiotic, exemplified by ciprofloxacin (CIP). The result demonstrated that the GQDs@MnOOH/O_3 system had the greatest CIP removal effectiveness, followed by MnOOH/O_3 and O_3 only. The 0.02 mM CIP was degraded with 99.9% efficiency in 30 min in the presence 9.6 mg L^{-1} of O_3 catalyzed by 12.5 mg L^{-1} of GQDs@MnOOH. The kinetic rate constants were in the order: GQDs@MnOOH/O_3 (0.161 min^{-1}) > MnOOH/O_3 (0.079 min^{-1}) > O_3 (0.055 min^{-1}). The GQDs@MnOOH could enhance CIP degradation and inhibit BrO_3^- formation in different water sources. Results of scavenger and electron paramagnetic resonance (EPR) experiments demonstrated that oxygen radical (O_2•-), singlet oxygen ($^1O_2$), and hydroxyl radicals (•OH) were involved in CIP degradation by the GQDs@MnOOH/O_3 system. Accordingly, the degradation pathways of CIP and mechanism of catalytic ozonation over GQDs@MnOOH were investigated and proposed. This research is expected to shed light on the connection between carbonaceous material and metal hydroxide in catalytic ozonation.

KEYWORDS

MnOOH; GQDs; Catalytic ozonation; Ciprofloxacin, Bromate formation.

Microplastic Toxicity and Translocation, Its Traces in Drinking Water, and Membrane Filtration System as Potential Post-Treatment Process

Ziah Kiyana J. Sison[1], Kimberly Joy Silva[2], Randell M. de Raya[2] Katrina Cheng[1], Venson Cai[1], and Carl Francis Z. Lacson[1,3,*]

[1]*Department of Environmental and Sanitary Engineering. College of Engineering, National University, Manila 1008, Philippines*
[2]*Department of Civil Engineering. College of Engineering, National University, Manila 1008, Philippines*
[3]*Center of Excellence in Environmental Catalysis and Adsorption, Faculty of Engineering, Thammasat University, Pathum Thani 12120, Thailand*

**Corresponding author: cfzlacson@national-u.edu.ph*

ABSTRACT

This literature review discussed microplastics in drinking water, including translocation to human body, and potential toxicity. The effectiveness of membrane filtration systems in removing microplastics from water were further evaluated. Previous reports have revealed that microplastics were prevalent in drinking water sources, with contamination rates >50% of sampled tap water and about 90% of sampled bottled water. Literature has also shown that drinking water treatment plants have high concentrations of microplastics. Hence, microplastic ingestion from drinking water is highly possible; however, consuming microplastics can pose threat to human health accumulating in the organs especially in the gastrointestinal tract. Therefore, the review suggested the utilization of membrane filtration systems evaluating ultrafiltration, microfiltration, nanofiltration, and reverse osmosis which can potentially remove microplastics in drinking water. Overall, membrane filtration systems can be a useful as post-treatment process in removing microplastics.

KEYWORDS

pressure-driven process; microfiltration; ultrafiltration; nanofiltration; reverse osmosis

A review on fluidized-bed homogeneous crystallization process: recent advances, uses, and future direction

Victor E. Valderama Jr.[1], Florencio C. Ballesteros Jr.[1], Sergi Garcia-Segura[2] and Ming-Chun Lu[3,*]

[1]*National Graduate School of Engineering, College of Engineering, University of the Philippines Diliman, Quezon City 1101, Philippines*
[2]*Nanosystems Engineering Research Center for Nanotechnology-Enabled Water Treatment. Arizona State University, Tempe, AZ 85287-3005, United States of America*
[3]*Department of Environmental Engineering, National Chung Hsing University, Taichung, Taiwan 71710, R.O.C.*

**Corresponding author: mmclu@nchu.edu.tw; Tel: +886-4-22840441 ext 537*

ABSTRACT

Many wastewater treatment technologies are being used for the removal of contaminants at present (Khan & Boddu, 2021), but these technologies still have disadvantages such as insufficient removal capacity (Quimada et. al, 2022) and low quality of the crystals produced (Chen et. al, 2015; Vilando et. al, 2019). These disadvantages could be addressed by the new emerging wastewater treatment technology called the fluidized-bed homogeneous crystallization process (FBHCP). This paper investigates the recent developments in FBHCP, its uses, and potential future directions. It compares the advantages and disadvantages of FBHCP and the fluidized-bed heterogeneous crystallization process, as well as discusses the major operational parameters of FBHCP that influence the removal and recovery of contaminants in wastewater. It also examines the principle of contaminant removal and the current applications of FBHCP. The analysis indicates that the granulation efficiency of FBHCP ranges from 54.5% to >99.0%, while the removal efficiency ranges from 69.1% to 99.9%. For the modified FBHCP and/or combined with other methods, CP+FBHCP has the highest efficiency for both granulation and removal at 98.0%, while SDC-FBHCP has the lowest efficiency for both granulation (52.8%) and removal (62.7%). The majority of the wastewater types treated by FBHCP were from industrial sources, with none being commercial sources. Currently, FBHCP treats fourteen contaminants from sixteen wastewater types under four wastewater sources.

KEYWORDS

Homogeneous crystallization; Granulation process; Wastewater contaminant removal; Fluidized-bed Homogeneous Crystallization Process; Fluidized-bed Homogeneous Granulation Process; FBHCP; FBHGP

Experimental study on improving physical and chemical properties of mudstone soil and planting crops by using volcanic pumice

You-Ren Chen, Jian-Chuan Shern*

Department of Marine Environmental Engineering, National Kaohsiung University of Science and Technology, Taiwan 71710, R.O.C.

**Corresponding author: jcshern@nkust.edu.tw ; Tel: +886-9-22804217*

ABSTRACT

Mudstone is a type of sedimentary rock formed from extremely fine particles with a high alkaline soil pH range of 8 to 10. When mudstone is exposed at the surface, its weak rock structure makes it vulnerable to erosion by rainfall, resulting in the formation of fragmented or serrated terrain and small ridges. Due to the low organic matter content in mudstone soil, plant attachment, and growth are difficult, leaving the entire mountain bare and barren, earning it the reputation of "badland" or "moon world". This region is one of the most challenging areas in southern Taiwan for land rehabilitation and vegetation restoration.

This study aims to use the porous nature of volcanic pumice to improve the physicochemical properties of mudstone soil and add a certain percentage of compost. Two types of plants, eggplant (Group A, Dicotyledons) and corn (Group B, Poaceae Monocotyledons), were selected for planting, and different proportions of pumice were added to the soil mixture ranging from 0% to 16%. The plants were planted in triplicate for observation. The results show that the porous nature of pumice can indeed help mudstone soil retain water, with a more significant effect as the amount of irrigation water increases. Adding pumice can also improve the physical properties of mudstone soil such as porosity and air permeability, and increase the water content of mudstone soil while reducing the electrical conductivity of mudstone soil. Preliminary results showed that the higher the amount of pumice added, the higher the growth of dicotyledonous eggplant and the resultant yield improved significantly. However, the growth and harvest of monocotyledonous corn were not significant.

In the future, in addition to continuously monitoring the growth and appearance of the plants, various growth indicators such as crop growth rate (CGR) and leaf area index (LAI) will be calculated. pH and electrical conductivity (EC) will also be monitored to evaluate the effectiveness of using volcanic pumice to improve the physicochemical properties of mudstone soil and crop yield.

KEYWORDS

Mudstone; Volcanic pumice; Soil amelioration; Badland plowing

Developing a practical tool to evaluate the cost and benefit of $PM_{2.5}$ pollution control measures on air quality improvement in Ho Chi Minh City, Vietnam

Long Ta Bui[1,2,*], Phong Hoang Nguyen[1,2], Duyen Chau My Nguyen[1,2], Nhi Tuyet Hoang Nguyen[1,2]

[1]*Laboratory for Environmental Modeling, Faculty of Environment and Natural Resources, Ho Chi Minh City University of Technology (HCMUT), 268 Ly Thuong Kiet Street, District 10, Ho Chi Minh City, Vietnam*
[2]*Vietnam National University Ho Chi Minh City (VNU-HCM), Linh Trung Ward, Thu Duc City, Ho Chi Minh City, Vietnam*

**Corresponding author: mmclu@mail.cnu.edu.tw; Tel: +886-6-266-7323*

ABSTRACT

Local $PM_{2.5}$ pollution has become one of Ho Chi Minh City's (HCMC) most crucial environmental issues because of the rapid industrialization and urbanization. The city authority is recently in an important stage for developing measures of $PM_{2.5}$ pollution control and implementing an intensive Clean Air Plan (CAP) towards 2030. Nevertheless, it has been not entirely clear what the extended benefits on the basis of conducted current control measures continue for the future. Simultaneously, decision-makers often lack practical tools to be able to quantify $PM_{2.5}$ exposure effects and demonstrate the effectiveness of $PM_{2.5}$ pollution mitigation. This study aims to present a modelling framework platform implemented in the Environment, Public Health and Economic Benefit Management Support Integrated System (EnHEBIS) through a comparative analysis based on the health benefit-to-control cost ratio of CAP. To determine the priority of CAP, 14 measures of $PM_{2.5}$ pollution control covering point, mobile, and area sources of air pollution were analysed. The outstanding study results reported that the annual mean $PM_{2.5}$ level in 2019 (baseline scenario) was higher than the National Air Quality Standard (NAAQS) (i.e., 25 $\mu g.m^{-3}$) between 1.01 and 8.73 times, as well as there were roughly 3.12 (95% CI: 1.03; 5.32) thousand cases of premature mortality. Meanwhile, in the control scenario, air quality improvements will ensure that over 75% of the population lives in areas of HCMC with $PM_{2.5}$ concentrations below the current annual NAAQS thresholds and will reduce the number of early deaths by more than 15% in 2030. Moreover, the implementation of CAP measures also created net benefits as improvements in public health was generally much higher than technical costs. These results are the evidence to prioritize implementing different air pollution solutions from CAP. Furthermore, the EnHEBIS tool has provided a practical framework by which managers could further build appropriate policies to achieve multiple environmental, economic, and human health benefits.

.

KEYWORDS

Benefit-to-cost ratio, CAP, EnHEBIS, health impacts, PM2.5 distributions.

Natural factors affecting coastal erosion in the Mekong Delta and the effectiveness of West Sea embankment in case of sea level rise due to climate change

Long Ta Bui[1,3,*], Hanh Thi Hong Pham[2,3]

[1]*Laboratory for Environmental Modeling, Faculty of Environment and Natural Resources, Ho Chi Minh City University of Technology (HCMUT), 268 Ly Thuong Kiet Street, District 10, Ho Chi Minh City, Vietnam*
[2]*VNU-HCM Key Laboratory of Advanced Waste Treatment Technology, Ho Chi Minh City University of Technology (HCMUT), 268 Ly Thuong Kiet Street, District 10, Ho Chi Minh City, Vietnam*
[3]*Vietnam National University Ho Chi Minh City (VNU-HCM), Linh Trung Ward, Thu Duc City, Ho Chi Minh City, Vietnam*

[*] *Correspondence: longbt62@hcmut.edu.vn (**Long Ta Bui**).*

ABSTRACT

In recent decades, around the world, as well as in Vietnam, the phenomenon of coastal erosion has become a severe problem and has attracted the attention of many scientific organizations and scientists. Coastal erosion has become one of the natural hazards threatening communities and coastal ecosystems, especially under the influence of climate change. Climate change increases wave energy and causes sea level rise. Sea level rise, in addition to increasing the intensity of erosion, also passively inundates many lowland areas as the coastal plain of the South. This study uses the MIKE 21/3 Coupled Model FM model, which has been calibrated and verified to simulate the factors of water level, current speed, wave, and sediment transport in sea level rise due to climate change scenario 2030. The simulation results show that the time of low tide causes erosion in the East Sea area is stronger than at the peak tide. The sea level rise of 12 cm makes the current speed in the whole area increase by an average of 0.02 m/s. For wave factor, sea level rise causes wave height to increase by 0.02 m on average across the study area. Sediment concentrations in the sea level rise scenario decrease compared to the current scenario at both low and high tide times. SSC in this scenario along the shoreline tends to increase sharply, especially in the estuary of the Mekong River, Hau River, Dong Hai district (Bac Lieu province), Dam Doi district (Ca Mau province), the entire coastline of Ca Mau province in the west, and Cai Lon - Cai Be estuaries (Kien Giang province). The sea level rise of 12 cm causes the total bed thickness to fluctuate in the negative direction (erosion) with an average value of 0.1 m across the area. Accretion occurs in the area about 7km from the shoreline of Tien Giang - Ben Tre province and Cai Lon - Cai Be estuary with the level of 0 - 0.1m; In particular, accretion doesn't occur much in the accretion zone of Ca Mau Cape, only a small accretion zone at the level of 0 - 0.1 m at Bay Hap estuary and Ngoc Hien district in the west.

.

KEYWORDS

Coastline erosion, Sea level rise, Climate change, Mekong Delta.

Assessing of self – cleaning factor role on River Water Environmental Capacity–a case study of Cay Bang catchment, Binh Duong, Vietnam

Long Ta Bui[1,2,*], Diem Luong Thi Tran[1,2], Nhi Hoang Tuyet Nguyen[1,2]

[1]*Laboratory for Environmental Modeling, Faculty of Environment and Natural Resources, Ho Chi Minh City University of Technology (HCMUT), 268 Ly Thuong Kiet Street, District 10, Ho Chi Minh City, Vietnam*
[2]*Vietnam National University Ho Chi Minh City (VNU-HCM), Linh Trung Ward, Thu Duc City, Ho Chi Minh City, Vietnam*

[*] *Correspondence: longbt62@hcmut.edu.vn (**Long Ta Bui**).*

ABSTRACT

With the rapid development of the economy, many catchment basins in the world are facing pollution, leading to the urgent need to make a quantitative assessment of the carrying capacity of the river water environment carrying capacity (RWEC), as a necessary parameter for sustainable development. Studies on RWEC have been carried out, in which the dependence between RWEC and hydrological, hydraulic, and discharge factors were considered and analyzed. However, there is no study focusing the RWEC dependence on self-cleaning capacity of the river network. This study is focused on the role of self-cleaning capacity of river, channels catchment, which directly affected by the determination of ecological parameters dataset in the catchment. The aims of this study is to propose a framework for assessing the impact of self-cleaning factors on the RWEC and to apply the proposed framework for a case study - Cay Bang catchment in Binh Duong province, Vietnam. Hydrodynamic models are used to simulate hydrodynamic, water quality with attention to the ecological parameters set that are used to modelling water quality. Four substances: NH_4^+, BOD_5, NO_3^-, PO_4^{3-} were selected. The calculation results show that the self-cleaning factor helps to increase the load carrying capacity depending on the season. In the dry season, the load capacity of NH_4^+ increased by 33%, BOD increased by 56%, NO_3^- decreased by 45%, PO_4^{3-} increased by 114%, in the rainy season, the load capacity of NH_4^+ increased by 53%, BOD increased by 55 %, NO_3^- down 54%, PO_4^{3-} increase 98%. This result shows that in order to improve the load capacity and it is necessary to find medium and long-term solutions to maintain and conserve the aquatic ecosystem to improve the self-cleaning capacity of the river channel network.

.

KEYWORDS

Water quality, Self - cleaning capacity, Hydrodynamic models, Ecological models, Catchment

Comparative evaluation of inorganic and chitosan coagulants for flocculation of algae Chlorella Vulgaris

Tran Phung Nha Thuyen*, Tran Bui Phuc**

Faculty of Environmental and Food Engineering, HCM city, Vietnam

***Corresponding author: tbphuc@ntt.edu.vn*

ABSTRACT

This study aimed to compare the settling time, settling efficiency, and flocculation efficiency of chitosan and inorganic salts for the flocculation of *Chlorella Vulgaris* algae using the flocculation method. The inorganic salts used in the experiment were $FeSO_4$, $FeCl_3$, $AlCl_3$, and $Al(SO_4)_3$. The results showed that chitosan also demonstrated floc ability similar to high-concentration inorganic chemicals ($FeSO_4$ 150 mg/L, $FeCl_3$ 200 mg/L, $AlCl_3$ 100 mg/L, and $Al(SO_4)_3$ 150 mg/L). The settling efficiency of the coagulants derived from aluminum salts ($AlCl_3$ and $Al(SO_4)_3$) was around 5.2 - 5.5%, which was higher than that of iron salts ($FeSO_4$ and $FeCl_3$) at 2.3 - 2.5%. On the other hand, *Chlorella Vulgaris* algae flocculated with chitosan at a concentration of 15 mg/L and achieved a flocculation efficiency of up to 99%, with a settling efficiency of 1.67%. The settling time of chitosan for algae was the shortest (10 mins), followed by aluminum salts (20 - 30 mins) and then iron salts (30 - 40 mins). Observation under a microscope showed that chitosan flocculated algae formed distinct clusters and attached to the beaker's bottom with clear water above. In conclusion, chitosan may be considered an effective and environmentally friendly coagulant for the flocculation of *Chlorella Vulgaris*, potentially used in aquaculture.

KEYWORDS

Chlorella vulgaris, coagulant, chitosan, inorganic, aquaculture.

Utilizing Fluidized-Bed Homogeneous Crystallization to Recover Bismuth as Bi_2O_3 from Synthetic Wastewater

Qian Lin, Yao-Hui Huang*

Department of Chemical Engineering, National Cheng Kung University, Tainan, Taiwan 701, R.O.C.

**Corresponding author: yhhuang@mail.ncku.edu.tw*

ABSTRACT

Bismuth is a valuable metal that has abundant applications in different industries, such as semiconductors, photocatalysts, etc. However, it is classified as a rare element on earth. Only 20% of all of the bismuth used around the world could be recycled. This study aims to reclaim bismuth from synthetic wastewater as low–moisture bismuth oxide particles through Fluidized-Bed Homogeneous Crystallization Technology (FBHC). Bismuth nitrate pentahydrate was used as the bismuth source in the wastewater model with an initial bismuth concentration of 500 mg/L. Sodium hydroxide was chosen as the precipitant. Various operating parameters, including cross-sectional surface loading and upflow velocity were optimized to obtain the maximum value of total bismuth removal (TR) and crystallization ratio (CR). The TR and CR achieved up to 99% and 95% at cross-sectional surface loading and upflow velocity of 1 kg/m^2h and 33 m/h, respectively, corresponding to the low residual bismuth concentration of 1.1 - 1.5 mg/L. The analysis results of XRD and FTIR indicated that the component of pellet by-products from the FBHC system is Bi_2O_3, with particles size around 0.2 - 0.25 mm.

KEYWORDS

Bismuth oxide, Wastewater treatment, Fluidized-Bed Homogeneous Crystallization Technology, FBHC, Reclamation

Application of $Fe_{0.66}Cu_{0.33}/Al(OH)_3$ as Catalyst in Oxalic Acid Containing System to Degrade and Mineralize Azo Dye by Visible Light Fenton Method

Cai-Sheng Lin[1], Wei-Zheng Li, Yao-Hui Huang[*]

Department of Chemical Engineering, National Cheng Kung University, Tainan, Taiwan 701, R.O.C.

**Corresponding author: yhhuang@mail.ncku.edu.tw; Tel: +886-6-275-7575*

ABSTRACT

Azo dye has been classified as a toxic and mutagenic compound. However, due to its low cost and desired properties, the utilization of azo dye in textile industries continues and generates a huge amount of wastewater. Photo-Fenton technology is recognized as an outstanding method for treating organic wastewater due to its high degradation and mineralization efficiency. Commonly, UV light was used as light source for the purpose of its high energy emission. However, the usage of UV light would be inconvenient due to the high cost and hard operation. In this research, the simulated RB5-containg wastewater ($[RB5]_0$ = 100 mg/L) was treated using yellow light–assisted photo-Fenton process. $Fe_{0.66}Cu_{0.33}/Al(OH)_3$ particles were recovered from metal wastewater via FBC (Fluidized-bed crystallization) was chosen as the catalyst to enhance the radical production. Oxalic acid was added to increase the active radical production. The experimental parameters including reaction pH (pH_r) and oxalic acid concentration were introduced to obtain the optimum degradation and mineralization efficiency. Under the optimum condition of pH_r of 5.0 and initial oxalic concentration of 80 mg/L, the complete degradation of RB5 and 64% of mineralization efficiency were achieved after 270 minutes of reaction time. The usage of waste particles as a catalyst and visible light irradiation source in this study offers a potential alternative method in an organic-containing wastewater treatment.

KEYWORDS

Azo dye; Photo-Fenton; yellow light; oxalic acid; visible light irradiation; degradation; mineralization

Influence of organic acids on the treatment of synthetic swine wastewater by fluidized granulation process

Ralf Ruffel M. Abarca[1], Jodrel Shem P. Balcita[1], Carlo S. Alfaro[1], Josephine G. Cuabo[1], Mark Daniel G. de Luna[2], Ming-Chun Lu[3,*]

[1]*Department of Chemical Engineering and Technology, Mindanao State University-Iligan Institute of Technology, Iligan City 9200, Philippines*
[2]*Department of Chemical Engineering, University of Philippines-Diliman, Quezon City 1800, Philippines*
[3]*Department of Environmental Engineering, National Chung Hsing University, Taichung 40227, Taiwan*

**Corresponding author: mmclu@nchu.edu.tw; Tel: 886-4-22840441 ext 537*

ABSTRACT

In this study, nutrients from synthetic swine wastewater were recovered via a fluidized granulation process. The effects of influent pH and organic acids on nutrient recovery were analyzed using a 2-level factorial design. Increasing influent pH from 8.5 to 9.3 increased PO_4^{-3} granulation and removal, struvite recovery and effluent pH. Among the three organic acids evaluated, citric acid had the largest effect in inhibiting the granulation and removal of PO_4^{-3} and NH_4^+ ions. Maximum PO_4^{-3} granulation and removal were 85.5% and 93.2%, respectively, while maximum NH_4^+ granulation and removal were 83.7% and 88.3%, respectively. Harvested crystals were analyzed and confirmed to be struvite by X-ray diffraction, Fourier transform infrared spectroscopy, scanning electron microscopy and thermogravimetry. Thermal analysis of struvite granules showed three major mass loss processes namely: dehydration of water of granulation, deamination and pyrophosphate-forming dehydration. Dehydration of water of granulation is the sole stable and spontaneous step while pyrophosphate-forming dehydration is the only exothermic process of struvite thermal degradation.

KEYWORDS

Fluidized Bed Reactor; Magnesium Ammonium Phosphate; Thermal Analysis; Kinetics; Thermodynamics

"Pagkayab" Tropical Brutalism: A Vertical Public Cemetery for Tanza, Iloilo

Keisha Faith Dechaca[1,*], Angelie Lago[1], and Ella Marie Degillo[1], Ma. Theresa M. Austria[1], and Glenda S. Guanzon[2]

[1]*Department of Architecture, University of San Agustin-Iloilo, Iloilo City, Philippines 5000*
[2]*Department of Computer Engineering, University of San Agustin-Iloilo, Iloilo City, Philippines 5000*

**Corresponding author: kfdechaca@usa.edu.ph ; Tel: +639054057288*

ABSTRACT

An upward trend of death statistics for the past four years influenced by the Covid-19 pandemic affected the burial space demands in the country. Hence, strategic and well-organized environment space planning of burial spaces is essential. This study investigated the existing condition of one local public cemetery in the Philippines. Tanza Public Cemetery has been operating as burial place for Iloilo City residents since the 1800's. Due to old age and unregulated construction of tombs, spatial and environmental consequences emerged in the cemetery. A case study of the location, review of laws and building standards, and a public survey of the residents of Iloilo City were used to gather data. Survey and post-occupancy evaluation results showed that the cemetery is overcrowded, has limited facilities, unregulated tomb construction, dilapidating conditions, and has scarcity of burial spaces. The dilapidating conditions and improper management of the cemetery poses environmental hazards specifically when collapse of unreliable niches happened. These conditions led to the integration of a vertical public cemetery in Tanza, Iloilo City, Philippines. The soil test from previous civil engineering study on the same cemetery confirmed that the site is suitable for a multi-level building. Combined results showed that establishing this new building typology can address the existing spatial and environmental problems in Tanza public cemetery by introducing a multi-level cemetery that can accommodate decades of future deaths. Hence, the researchers of this study proposed a design model of a vertical public cemetery exploring the Tropical Brutalism architecture.

KEYWORDS:

Architecture; Vertical Public Cemetery; Tropical Brutalism; Urban Void

"Pabigong": Deconstructivism for Intergenerational Care Complex in Active Aging

Mikaela A. Nulla*, Jewelyn P. Remandaban, Arsen Jun L. Mucho and Ma. Theresa M. Austria

Department of Architecture,University of San Agustin, Iloilo City, Iloilo, 5000

**Corresponding author: mnulla@usa.edu.ph; maustria@usa.edu.ph*

ABSTRACT

The economic insecurity of older Filipinos increased their vulnerabilities during the COVID-19 pandemic due to their inability to access and pay for healthcare expenses. The current concerns on government support and a formal welfare system for the senior segment of the Filipino population provided a challenge for Filipino families to keep their duty as primary caregiver of the older family member. A Senior Citizens' Center can play a critical role on the aging continuum of care by providing diverse array of recreational, health, and social programs. This study explores the possibility of cohabitation or co-participation concepts among senior and non-senior citizens in rethinking the traditional Senior Citizens' Center. Hence, the hiligaynon term "Pabigong" was used to refer to the act of rethinking as there is distortion of traditional perception, socially and in architectural manner. The mixed-method study was conducted using quantitative survey, and post occupancy evaluation (POE) tool. An ocular site survey conducted in a Senior Citizens' Center, Iloilo City, Philippines verified that the facility requires more functional spaces for recreational and social programs due to limited development works. The survey results indicated that co-participation was the most acceptable living arrangement for 97 senior and 113 non-senior citizens, while the POE revealed significant gaps needed to be resolved for intergenerational interventions. The data gathered within the study variables eventually supported the analysis in setting design parameters for human and spatial factors for rethinking of the design model of a Senior Citizens' Center into an intergenerational care facility within the framework of optimal healing environment. The resulting design model puts emphasis on promoting overall wellness and positive sensory experience that highlights communal spatial elements for health and recreation, and sustainable design features based on phenomenological design approach by Steven Holl, hence a deconstructivist form.

KEYWORDS

Architecture; Senior Citizen's Center; Deconstructivism; Optimal Healing Environment; Cohabitation/Co-participation

Application of Marine Fuel Sludge Recycling Technology

Chin-Ko Yeh, Zhang-Wen Ke, Ching-Ti Yeh and Hsueh-Chen Shen*

Department of Marine Engineering, National Kaohsiung University of Science and Technology, Kaohsiung, Taiwan 805301, R.O.C.

**Corresponding author: hsuehchen@nkust.edu.tw; Tel: +886-7-361-7141*

ABSTRACT

Maritime transport accounts for approximately 80% of global trade, and the marine fuel of ships will produce a large amount of waste oil sludge every day. When the ship was docked, the oil sludge was delivered to the oil sludge treatment factory, which wasted a lot of time and money. Therefore, the best way to dispose of the ship's oil sludge is to recycle it as a resource on the ship, recover the heat energy of the waste oil sludge, and provide the energy demand for the operation of the ship. In this study, waste oil sludge from ships was subjected to pyrolysis and gasification treatment, and it took an average of ten minutes to convert 8 kg of oil sludge into three types of substances: solid, liquid, and gas. Among them, liquid oil and gaseous mixed gas are used as fuel for the boiler, and are used to generate hot water at 60 – 80 °C. Then use the thermal energy of this hot water to heating the water generator, which can produce 0.6 liters of ship boiler water per minute on average. This integrated system especially utilizes the intelligent automatic control module, which can regulate the quality of seawater desalination according to different conditions to meet the water standard of ship boilers, so as to improve energy efficiency.

KEYWORDS

Ship oil sludge treatment; Pyrolysis; Gasification; Water generator; Desalination

Assessment on the Learning Environment of Zoological Park: METAMORPHOSIS, Rethinking Malabon Zoo through Immersive Design to Enhance Visitor's Experience and Animal Welfare

Rheniel Vincent B. Sevilla*, and Arianne Joy Q. Dullas

School of Architecture, Industrial Design, and the Built Environment, Mapúa University- Intramuros, Manila 1002, Philippines

**Corresponding author: rvbsevilla@mymail.mapua.edu.ph; Tel: +63927-7388-973*

ABSTRACT

One of the primary roles of zoological parks is to educate their visitors about the importance of wildlife in sustaining balance within the environment. However, the case of Malabon Zoo in Barangay Potrero has poor space utilization, resulting in problems concerning user experience and animal welfare. The study aims to assess the learning environment using the criteria formulated based on Kolb's Experiential Theory. Moreover, the assessment criteria were divided into three sections: comfort and image, animal welfare, and uses and activities. Through methodological triangulation of surveys, interviews, and direct observations, the design intent is to represent the zoo's transformation into an animal oasis that connects humankind to nature; this is through the idea of an immersive design and reverse zoo concept. This involves creating spaces for animals that dominate the area for the people, and immersing visitors in the same natural environment as the animals by providing elevated social space, visible animal enclosures, and specific space for sustainable practices. These efforts can help the animals feel more at ease while also injecting designs that can educate and enhance the human experience of visiting the zoo.

KEYWORDS

Zoological park; Kolb’s Experiential Theory; Animal oasis; Reverse zoo; Immersive design;

BAKARA IBAUNA - Redevelopment of an Urban Wetland Park Utilizing Regenerative Design: A Case of Las Piñas- Parañaque Critical Habitat and Ecotourism Area (LPPCHEA)

Mikaella Dianne E. Bernardo*, Arianne Joy Dullas

School of Architecture, Industrial Design and the Built Environment, Mapúa University, Intramuros, Manila 1002, Philippines.

**Corresponding author: mdebernardo@mymail.mapua.edu.ph ; Tel: +09062458387*

ABSTRACT

LPPCHEA or Las Piñas–Parañaque Critical Habitat and Ecotourism Area is a declared critical habitat for its wide range of migratory birds and broad scope of mangroves in the area. As an urban wetland in Metro Manila, the location has been exposed to uncontrollable garbage, which restricts its ability to be a tourist attraction and a safe place for educational field trips. The site's wide variety of flora and fauna also presents the opportunity to accommodate students and research scientists. Due to the site's significant characteristics, this paper introduced the Ecotourism Complex Centre with Waste Recycling Facility, Research Centre, and Recreational Facility. It will regulate the garbage while enhancing the area's potential to advance tourism, education, and environmental conservation. However, according to recent studies, since all the structures must be well-lighted, the biggest concern would be "light pollution," which concerns the wide variety of birds considered nocturnal species or sensitive to lights.

The project proposes the incorporation of Regenerative Design with a focus on DSLP or Dark Sky Light Protection Program, to be utilized in association with the overall design to develop an Ecotourism Complex Centre that will enhance, protect, and connect people to nature without jeopardizing of one's welfare. A design process framework provided by HDR, recognized by Design Awards, is a design metrics based on the ecological features of the site, which helps the study to determine the regenerative design goals and metrics to be set. It examines how the Regenerative Design Framework with Dark Sky Light Protection Program is translated into an Architectural Design as a solution to the problems presented on the site. DSLP also includes design standards to control light leaks and light glows inside the building, and the program has been incorporated as a main component of the Regenerative Design goal. In accordance with the findings, the orientation, shape of the building, and materials used on the site are suitable for the lighting's impact. The structures are oriented away from the sky, and the facilities' shape is intended to facilitate the dynamic flow of air and maximize the use of natural light. The ceilings are designed to reduce the intensity of light glow generated at night. The study utilizes the Regenerative Design with Dark Sky Light Protection program to create a layout that will merge with the site's natural elements while regenerating and connecting people and nature under a clear sky.

KEYWORDS

Regenerative Design; Light Pollution; Eco-tourism; Dark Sky Light Program; Wetland Conservation; Migratory Birds

Application of Efficient Daylighting Strategies: Reducing Energy Use and Maximizing Natural Lighting through Window Design, A Public Library and Study Hub in Malate, Manila

Jeremieah Millen N. Ines*, and Arianne Joy Q. Dullas*

School of Architecture, Industrial Design, and the Built Environment, Mapúa University-Intramuros, Manila 1002, Philippines

Corresponding author: jmnines@mymail.mapua.edu.ph; Tel: 09274636118, ajdullas@.mapua.edu.ph

ABSTRACT

The effects of climate change in the Philippines has made the building related emissions increase by 51% over the last 5 years (Philippines Climate Transparency Report 2020). While there is a demand for the use of cooling systems due to the heat, there is also an increase in the global temperature and energy cost. Using appropriate window design benefits the environment by the reduced carbon emissions from green public buildings and eventually mitigate the effects of climate change. The research focused on the relationship between window design and learning spaces by gathering data from existing case studies and survey questionnaires. The study aimed to determine (1) the ways which window design affect the user's performance and the space's function, (2) does using the appropriate passive window design method in a tropical climate benefit both the environment and the building, and (3) the positive and negative effects of taking advantage of natural lighting in learning spaces. Factors relating to user perception are also studied as to how they influence the window design and learning space. A recommended window design criteria is made based on the combination of different window design standards and strategies that were tested by different case studies. This will be used to determine the strategy in reducing the building's energy consumption, maximize natural lighting and ventilation, and provide a comfortable and conducive learning environment in public libraries.

KEYWORDS

Global Temperature, Window Design, Green Buildings, Learning Spaces, Passive Design

Adaptive Reuse of Tabacalera Ruins to Cultural Museum: The Efficiency of Using Carbon-Negative Materials on Heritage Conservation in Improving Air Quality

Josa Angela L. Saep* and Arianne Joy Q. Dullas

School of Architecture, Industrial Design, and the Built Environment. Mapua University, Philippines

**Corresponding author:jalsaep@mymail.mapua.edu.ph; Tel: 09165640624*

ABSTRACT

Heritage conservation is the process of maintaining the significance of cultural property which includes restoration, preservation, protection, reconstruction, or adaptation. However, historic buildings require frequent repairs and conservation works that result to having environmental risks like air pollution. The construction and operational phases of built environment are the major contributors of carbon dioxide emissions in the world. Carbon dioxide emission affects the air quality that contributes to air pollution. This paper examined the efficiency of using carbon-negative materials like lime-based products to the newly conserved heritage buildings in Ilocos Norte and developed a comprehensive approach on how the existing heritage ruins in Ilocos Norte should be conserved. The research design of the study is a mixed methodology of quantitative and qualitative research. For the quantitative research, the newly conserved structures were examined to test the efficiency of carbon-negative materials in improving air quality. The indoor air quality of the three structures with lime-based mortar and a structure with cement-based mortar were gathered to determine the difference of the effects of using carbon-negative materials and non-carbon-negative materials on heritage conservation to the air quality. The result of the indoor air quality sampling shows that all structures with carbon-negative materials like lime-based mortar have excellent level of carbon dioxide (CO_2) and Total Volatile Organic Compounds (TVOC) based on the standard Air Quality Index (AQI) from EPA. For the qualitative research, the researcher conducted a survey to determine how the existing heritage ruins in Ilocos Norte should be conserved. The result of the survey shows that the people in Ilocos Norte prefers the conservation of these heritage ruins through the adaptive reuse to cultural museum than restoring the structure only. The research study concludes that using carbon-negative materials on the conservation of heritage ruins in Ilocos Norte is efficient in improving air quality.

KEYWORDS

Heritage Conservation, Adaptive Reuse, Carbon-negative Materials

Analyzing the relationship of water pricing and water conservation for sustainable water management in Multifamily Residential Building in Manila, Philippines

Adrian Jim Reyes*, Michelle Pernia

School of Architecture, Industrial Design, and the Built Environment, Mapua University, Manila, Philippines.

**Corresponding author: reyesadrianjim@gmail.com; Mobile: +63916-996-8032*

ABSTRACT

Rapid urbanization and its consequent effect on water demand is among the most pressing problems that needs to be addressed to achieve sustainable development. Efficient pricing to control water use does not only charge consumers the full cost of water use– supply cost, opportunity cost, and externalities – but also conveys the "right" consumption signals. However, it is a policy that regulators are not fond of, and water service providers are continued to be given support by the government. In Manila, many mid- to high-rise multifamily residential buildings use a master meter, the reading of which is divided and charged to individual units by the building administration. This presents an opportunity for community-based water management system. However, there is much to learn about the household water consumption behaviour in this building types.

This study provides a characterization of water consumption behaviour and preferences in a typical walk-up tenement housing in Metro Manila. Monthly data of water consumption and its associated price from the building management, and a household stated preference survey data were used to measure behavioural impact of pricing. The result of the analysis showed that water pricing is significantly correlated with the household water consumption. Based on the demand model, a one peso increase in the monthly water bill resulted to an expected 0.404 cubic meter or 2% decrease in water consumption of the household. It also showed that the mediator variable, awareness of sustainability, shows marginal relationship with water consumption. It was also proven that "wrong" pricing resulted to poor water management such as contamination, poor system maintenance, and water interruption. The result of the survey supports water pricing is a good lever in managing water consumption, however there can be issues on its acceptability as households tend to prefer sustainable water conservation measures rather than pay for the full cost of water.

KEYWORDS

Water resource management, Water pricing, Water conservation, Sustainability

An integrated flood risk assessment of rural and peri-urban communities: A case study in Angat, Bulacan

Van Barry Par[1,*], Ma. Aileen Leah Guzman[1], May Celine Thelma Vicente[2], Jude Anthony Estiva[3], and Jairus Josol[4]

[1]*Department of Environmental Science, School of Science and Engineering, Ateneo de Manila University, Quezon City 1108, Philippines*
[2]*Manila Observatory, Quezon City 1108, Philippines*
[3]*Aparri Engineering LLC, Hackensack NJ 07601 USA*
[4]*Department of Environmental Science, School of Science and Engineering, Ateneo de Manila University, Quezon City 1108, Philippines*

**Corresponding author: van.par@obf.ateneo.edu; Tel: +63939-779-2861*

ABSTRACT

Weather variabilities have contributed to the frequency and intensity of extreme weather events leading to floods and droughts. The Philippines, being an agricultural country, is thus susceptible to these changes in the climate. Of particular interest to this research is Angat, Bulacan which is situated near the Angat river which traverses through two major dams, Angat and Ipo dam. This study assessed the risks entailed by flood using geographic information system to provide the rural and peri-urban communities in Angat, Bulacan information on two disaster scenarios. The study followed the risk framework wherein the combination of hazards and vulnerabilities would equate to the flood and drought risks of the area. Flood hazard, vulnerability and risk maps were produced to give information on which communities would endure greater risk and damage. Additionally, key informant interviews were conducted on each of the barangays which served as a risk validation tool and a manner of identifying vulnerable areas. The key-informant interview also helped in providing insight on what specifically does each of the communities need so that the local government could act according to their necessities. The result of the study shows that 14 out of the 16 barangays in Angat, Bulacan would be subjected to flooding if typhoons similar to that of Ondoy (2009), and Kading (1978) are to hit the Angat. As an agricultural municipality, such event would bring great damage to local agricultural production.
The study provides recommendations on policies to effectively address the flood issues that the municipality of Angat faces.

KEYWORDS

flood risk, risk assessment, geographic information system

Hydrogenation of D-glucose into sorbitol over oxide-based material supported Ru catalyst

Pakpoom Athikaphan[1], Umaporn Chantarapratak[1], Jureewan Khamma[1], Jirawat Kongprasopsap[1], Arthit Neramittagapong[1,2], Sutasinee Neramittagapong[1,2,*]

[1]*Department of Chemical Engineering, Faculty of Engineering, Khon Kaen University, Khon Kaen 40002, Thailand*
[2]*Research Center for Environmental and Hazardous Substance Management (EHSM), Khon Kaen University, Khon Kaen 40002, Thailand*

**Corresponding author: sutasineene@kku.ac.th; Tel:*+668-18320382

ABSTRACT

In this research, the hydrogenation of D-glucose into sorbitol over Ru supported on oxide-based materials was investigated the effect of support on the hydrogenation of the D-glucose reaction. Ru/ZSM-5, Ru/H-Beta zeolite, Ru/ AI_2O_3 and Ru/HZSM-5 catalysts were prepared by wet-impregnation. The catalytic performances of catalysts were performed in a batch reactor at the temperature of 130 ° C and an initial hydrogen pressure of 50 bar for 4 h. The catalyst properties were analyzed using N_2-adsorption and SEM techniques. The results showed that the presence of ruthenium yielded sorbitol with a high conversion of D-glucose and the effect of type support. 0.5%Ru/ZSM-5 catalyst exhibited the highest conversion, and sorbitol yield was almost 100% and 98.12 %, respectively. This result indicated that the support effect of the catalyst promotes Ru dispersion, and the shape of the support may lead to immobilization of the Ru particle. Therefore, the support effect exhibited in catalytic performance provides a reference for the design of subsequent catalysts for the liquid phase hydrogenation of D-glucose, which can be derived from agricultural waste.

KEYWORDS

Ru-catalyst, Sorbitol, Glucose, Hydrogenation, Support

Assessment of green tea reductive degradation of halogenated solvents

Siang Chen Wu[1], Chi-Wei Wang[2], Li-Hsin Hsu[1], Chenju Liang[1,*]

[1]*Department of Environmental Engineering, National Chung Hsing University, 250 Kuo-kuang Road, Taichung, 402, Taiwan, R.O.C.*
[2]*Department of Environmental Engineering, Da-Yeh University, 168 University Road, Dacun, Changhua, 515006, Taiwan, R.O.C.*

**Corresponding author: cliang@nchu.edu.tw; Tel: +886-4-2284-0441*

ABSTRACT

Green tea (GT) leaves can be brewed into a solution rich in polyphenols that serve as effective reducing agents, and the complexes formed by combining green tea with ferrous ion (GT/Fe(II)) can provide an elevated reduction potential. The dissociated GT polyphenols at alkaline pH can dramatically increase the formation of GT/Fe(II) complexes. This experimental work evaluated the reductive reactivity of alkaline GT solution and GT/Fe(II) complexes (at pH 10) on 14 halogenated volatile organic compounds (VOCs). Carbon tetrachloride (CT), with a highest carbon oxidation state (COS) of IV, was observed to be degradable by the alkaline GT solution, while all others proved ineffective. The GT/Fe(II) complexes are very reactive and capable of degrading halogenated methanes, ethanes, and ethenes, in which chemical structures exhibit zero or positive COS values, and the chlorine or bromine atom is bonded at the saturated carbon atom, such as CT, chloroform, bromoform, dibromomethane, 1,1,1-trichloroethane, and 1,1,1,2-tetrachloroethane. The linear free energy relationship (LFER) approach was used to determine the overall reduction potentials (E^0_H) of the alkaline GT solution and GT/Fe(II) complexes, which were found to be -0.131 V and -0.368 V, respectively. These findings demonstrated that GT/Fe(II) complexes exhibit the potential to remediate halogenated contaminants and the E^0_H information obtained in this study may serve as a reference in determining probable reactivity that contributes to degradation of environmental contaminants.

KEYWORDS

Chlorinated solvents; In situ chemical reduction (ISCR); Soil and groundwater remediation; Polyphenol; Green tea

Cu supported on Na-Alginate for Methyl orange dye degradation via Fenton-like reaction

Pongpanit Kongkoed[1,2], Natthaphong Lertna[1,2], Pakpoom Athikaphan[1,2], Arthit. Neramittagapong[1,2], and Sutasinee Neramittagapongand[1,2,*]

[1]Department of Chemical Engineering, Faculty of Engineering, Khon Kaen University, Khon Kaen 40002, Thailand
[2]Research Center for Environmental and Hazardous Substance Management (EHSM), Khon Kaen University, Khon Kaen 40002, Thailand

**Corresponding author: sutasineene@kku.ac.th Tel: +66818320382*

ABSTRACT

Methyl orange (MO) degradation was performed using a Fenton-like oxidation reaction with Cu supported on Na-alginate, a biopolymer catalyst. The catalyst was synthesized by precipitation, and then a bead catalyst was formed by using hydrogel method. Response Surface Methodology (RSM) was combined with Box-Behnken design to identify three parameters, including pH, catalyst dosage, and H_2O_2 concentration, in order to optimize conditions in the degradation of methyl orange. Moreover, X-ray diffraction (XRD), Scanning electron microscopy (SEM), Energy dispersive X-ray spectroscopy (EDX), and Transmission electron microscopy (TEM) were used for the catalyst characterization. In addition, UV-vis analyzes the concentration of methyl orange, and atomic absorption spectroscopy assays the metal leaching into the solution. The result showed that the degradation of methyl orange in 99% over Cu supported on Na-Alginate and the catalyst is active and stable in removing methyl orange.

KEYWORDS

Fenton; Methyl orange; Precipitation; Textile wastewater

Demineralization bypass of hydrochar synthesis from waste prawn exoskeleton for the production of olivary carbon particles

Symphony S. Dajay[1], Leaniel C. Silva[1], Seigfreid D. Kempis[1], Alexander O. Mosqueda[2,3] Raymond V.Rivera Virtudazo[1], Maria Cristina P. Vegafria[2,3,*]

[1]*Department of Materials and Resources Engineering and Technology, Mindanao State University – Iligan Institute of Technology, Iligan City, 9200 Lanao del Norte, Philippines*
[2]*Department of Chemical Engineering and Technology, Mindanao State University – Iligan Institute of Technology, Iligan City, 9200 Lanao del Norte, Philippines*
[3]*Bioprocess and Bioresources Engineering Research Center, Mindanao State University – Iligan Institute of Technology, Iligan City, 9200 Lanao del Norte, Philippines*

**Corresponding author: mariacristina.vegafria@g.msuiit.edu.ph*

ABSTRACT

An olivary (olive-shaped) microstructure was produced by utilizing the chitin and calcite content of locally sourced prawn (Penaeus monodon) shells, which are generally thrown as waste. This was achieved by a simple demineralization step bypass of the hydrochar synthesis process; and proceeding through the other stages of deproteinization, deacetylation, and hydrothermal carbonization (wet pyrolysis). The demineralization bypass retains the calcite content of the shells and cross-links it with chitosan during the carbonization process. Fourier transform infrared and x-ray diffraction spectroscopy of the resulting product showed that some of the chitosan's functional groups started to diminish, while calcite has retained its form and structure even at 200 °C carbonization. Furthermore, thermogravimetric analysis and scanning electron microscopy determined that the olivary structures (length ~3 μm) only started forming on the surface of the material when the carbonization temperature was at 200 °C for 12 h. Investigation of the cross-linking behavior can be continued by exploring higher carbonization temperatures (> 200 °C) and reaction times (> 14 h). This unique carbon microstructure was produced through a facile stage skip and can be potentially used for wastewater treatment applications.

KEYWORDS

Demineralization; Prawn shells; Chitosan; Calcite; Hydrothermal carbonization

Effects of Magnesium oxide acid modified biochar on Cadmium adsorption

Siraprapa Suwanree[1], Kaewta Jetsrisuparb[1], Pornnapa Kasemsiri[1], Prinya Chindaprasirt[3] and Jesper T. N. Knijnenburg[2]

[1]*Department of Chemical Engineering, Khon Kaen University, Khon Kaen, Thailand 40002*
[2]*International College, Khon Kaen University, Thailand 40002*
[3]*Department of Civil Engineering, Khon Kaen University, Khon Kaen, 40002, Thailand*

**Corresponding author: jespth@kku.ac.th; Tel: +66 43885641851*

ABSTRACT

Cadmium is one of the most toxic heavy metal and extremely significant pollutant due to its toxicity and high solubility in water. Biochar is a carbon material produced by pyrolysis of biomass. Its unique properties such as high porosity and surface functional groups can enhance heavy metal adsorption. Phosphoric acid (H_3PO_4) has been widely used as reagent as it can alter functional groups, increase porosity, and sorption ability of the biochar. Magnesium oxide (MgO) is also used as an active component to improve heavy metal adsorption capacity due to the presence of oxygen-containing groups. In this study, H_3PO_4/MgO modified biochar is synthesized via pyrolysis at 600 °C and the effects of the molar ratio of P:Mg (1:0, 1:0.25, 1:0.5, 1:0.75, 1.1, 1:1.5, and 1:2) on cadmium (Cd II) adsorption capacity from aqueous solution were investigated. Scanning electron microscopy (SEM), Fourier transform infrared spectroscopy (FTIR), Nitrogen adsorption-desorption isotherms morphological, and X-Ray diffraction analysis (XRD) were used to determine the physicochemical properties of the produced biochar and their ability to adsorb Cd. The decreased surface area of H_3PO_4/MgO modified biochar compared with the unmodified biochar and H_3PO_4/MgO modified biochar is due to precipitation of magnesium phosphate ($Mg_2P_2O_7$) on the biochar surface, blocking the pores as confirmed by the XRD results. The presence of MgO improves the Cd adsorption capacity of biochar up to 99.98% (18.5 mg/g). This suggests that H_3PO_4/MgO modified biochar could be a potential adsorbent in wastewater management.

KEYWORDS

Modified biochar; cadmium adsorption; Phosphoric acid; Magnesium oxide; Sugarcane leaves

The Ultra-Low-Energy Vertical Farm: An Interdisciplinary Architecture Featuring Ultraviolet Glass Panels And Modern Farming In San Andres, Malate, Manila, Philippines

Ramirez, Joana Marie L. and Arch. Dullas, Arianne Joy Q.

School of Architecture, Industrial Design, and the Built Environment, Mapua University.

ABSTRACT

This study focuses on solving the high-energy consumption of vertical through interdisciplinary architecture in the Philippine setting. A vertical farm is a type of urban farming, which was part of the United Nations Development Program's sustainable goals by 2030. It gain recognition worldwide due to its capability to grow plants in a controlled environment and assures a stable temperature, airflow, and enough nutrients, with no anticipated problems from the outside. Contrastingly, it has gained criticism in terms of high energy consumption (Kalantari, Tahir, Joni, & Ezaz, 2017). To prove this claim, this study conducted an empirical and quantitative analysis of existing vertical farms internationally and locally. Using the related projects and studies in Vertical farming, the chosen models are Vertical Farm 2.0 of the German Aerospace Center (Zeidler, Schubert, & Vrakking, 2017) and Impact of Growing Power Inc. (Andrade, et al., 2015) which has a different Vertical farm architecture such as industrial design and greenhouse design, and Urban Greens situated in Makati, Philippines. The data used are the specifications from the vertical farm of Urban Greens particularly the lighting system which was the highest consumer of power. The result found the *216 kWh mean* in its lighting system of *VF 2.0 with 703 kWh/day and Impact VF with 271 kWh/day* gained from applying the operational hours of both vertical farms. To scrutinize the total with the general system, the systems from Urban greens are added giving *736 kWh/day and Impact VF with 639 kWh/day, with a mean of 49 kWh/day.* Solving the problem with interdisciplinary Architecture, the primary material was AuReus PV glass panels the invention of Engr. Maigue (2020), is a photovoltaic glass that produces energy from ultraviolet light within 360 spectra. The concept of the vertical farm was an origami architecture, with formulated principles such as (1) form modification of the building that aims to extend the parameter of the building giving an additional area of PV glass (2) Internal redesign, an approach that modifies the AuReus technology. From the flat surface, it was redesigned into an origami concept adding *0.96 kWp*. (3) Form façade and roof integration that will help in maximizing the PV glass and supplementary lighting. (4) Passive cooling, through the use of simple material without compromising the plants' vulnerability to insects. With the given principles, the *Ori-Mado VF model* attained *90-92% balance emission*.

KEYWORDS

Vertical farm, Controlled Environment, AuReus, Photovoltaic Glass, Ultra-low-energy Building

Morphosis: Re+Creating The Empress Palace Pension

Angelo T. Estorpe, Hansen Cyrus L. Cembrano, Jim Marcel D. Bansagan* and Ar. Ma. Theresa Austria

Department of Architecture, University of San Agustin, Iloilo City, Philippines 5000

**Corresponding author: jmbansagan@usa.edu.ph; Tel: +639982497013*

ABSTRACT

This study aimed to redesign the Empress Palace Pension anchored on the Morphosis Framework, specifically the application of SMART Skin Design. Following the quantitative approach, the gathering of data utilised the researcher-made survey questionnaire ascertaining the preference of the 50 participants regarding the current state and the future sustainability of the building. In terms of urban scale, building scale, and room scale. Data were analysed and interpreted based on the mean and standard deviation. To evaluate further the current status of the building, the researchers conducted the Post-Occupancy Evaluation. The results of the survey reveal that the current status of the building is moderately functional. Whereas, the future preference of the building is functional as it shows under the Post-Occupancy Evaluation that the sections of the building are in need of a redesign process particularly the facade to meet modern trends and to update the marketability of the structure. The Post-Occupancy Evaluation results corroborated with the survey conducted based on the correlated findings as the Empress Palace Pension requires to meet the current building standards and should be inspired by the sustainability concept. This study will serve as a basis for existing old buildings and provide solutions for the users of the building. Moreover, this is also to encourage future researchers and the architecture community to innovate and collaborate with other experts to come up with architectural masterpieces built over 10 years that should still meet future needs in terms of flexibility, standards for functionality, and sustainability.

KEYWORDS

Architecture; Empress Palace Pension; Morphosis; Post-Occupancy Evaluation; Smart Façade; Building Form

Chitosan Production from Waste Crustacean Shells in Iligan City, Philippines: Supply Analysis and Characterization for Mine Wastewater Treatment Application

Maria Cristina P. Vegafria[1,3,*], Kenneth Roy M. Rojo[1], Seigfreid D. Kempis[2], and Leaniel C. Silva[2]

[1]*Department of Chemical Engineering and Technology, Mindanao State University-Iligan Institute of Technology, Iligan City 9200, Philippines*
[2]*Department of Materials & Resources Engineering and Technology, Mindanao State University-Iligan Institute of Technology, Iligan City 9200, Philippines*
[3]*Bioprocess and Bioresources Engineering Research Center, Mindanao State University – Iligan Institute of Technology, Iligan City 9200, Philippines*

**Corresponding author: mariacristina.vegafria@g.msuiit.edu.ph*

ABSTRACT

Large volumes of seafood waste discarded from various sources can be a potential raw material for the production of high-value products such as chitosan. Chitosan is a promising biodegradable and non-toxic material with multiple applications, including wastewater treatment. This study identified local sources of crustacean (crab, prawn, shrimp) shells and added value to these waste materials by creating a chitosan-based adsorbent intended for mine water treatment. First, the study identified local crustacean species to establish sustainable sources. A survey was commissioned in wet markets of Iligan City to determine the end consumers. Results showed that 82% of tiger prawns, 93% of crabs and 95.5% of shrimps are sold to households with the remaining going to restaurants. Another survey conducted among restaurants in Iligan City revealed a total weekly consumption of ~22 kg of tiger prawns, 112-125 kg of shrimp and 43-48 kg of crabs. For the adsorbent synthesis, the study utilized *Penaeus monodon* (tiger prawn) waste shells from local restaurants as it has a high chitin content ranging from 35 up to 42%. A combination of boiling, rinsing, and sorting processes were employed to isolate and clean the shells. The shells were then ground and underwent demineralization, deproteination, and deacetylation to extract chitosan through an optimized microwave irradiation technique. Finally, the chitosan went through hydrothermal carbonization. The microwave irradiation-assisted route was able to produce chitosan with at least 75% degree of deacetylation. The hydrothermal carbonization process has created an even distribution of adsorption sites, thereby increasing the stability of chitosan in a mine wastewater environment.

KEYWORDS

Chitosan; Chitin; Hydrothermal carbonization; Microwave irradiation; Tiger prawn shells; Mine water treatment

Water Quality Status of Bucayo Creek, Hermosa, Bataan, Philippines, Based on Palmer Pollution Index, Family Biotic Index, Shannon Diversity Index, and Water Quality Index

Victor E. Valderama Jr.[1,*] and Marco Roberto VC. Scharer[2]

[1]*National Graduate School of Engineering, College of Engineering, University of the Philippines Diliman, Quezon City 1101, Philippines*
[2]*Schvaldwen Environmental Consultancy Co., Parañaque City 1700, Philippines*

**Corresponding author: vevalderama@up.edu.ph; Tel: +9178236695*

ABSTRACT

This study examines the water quality of Bucayo Creek in Hermosa, Bataan, Philippines, using the Palmer Pollution Index, Family Biotic Index, Shannon Diversity Index, and Water Quality Index. The creek was divided into three sections, with three sampling plots at 100- meter intervals in each. Samples were collected and analyzed to determine the levels of pollutants and parameters influencing water quality. Results revealed that the upstream portion of the Bucayo Creek presented "lack/absence of organic pollution" while its downstream and midstream exhibited a "moderate degree of organic pollution", as indicated by the Palmer Pollution Index scores of 5.0–11.0. The Shannon Diversity Index ranged from 1.44 to 1.48, indicating that the creek is "moderately polluted". The Family Biotic Index ranged from 4.50 to 5.40, suggesting "some organic pollution probable" in the upstream and midstream and "fairly substantial pollution likely" in the downstream. The Water Quality Index revealed that the upstream has "good" water quality (WQI of 76), while the midstream and downstream were rated as "medium" (WQI of 62 and 68, respectively). The findings of this study suggest that further monitoring and management of the creek should be implemented to guarantee its sustainability and prevent further deterioration of its water quality.

KEYWORDS

Palmer pollution index, family biotic index, water quality index, Shannon diversity index, Bucayo Creek

Effects of light intensity and electrical stimulation on cultivating the reef coral, *Pocillopora acuta* and crustose coralline algae

Hsing-Chuan Chiang[1,*], Jian-Chuan Shern[1], Tung-Yung Fan[2]

[1]*Department of Marine Environmental Engineering , National Kaohsiung University of Science and Technology, Kaohsiung, Taiwan 811213, R.O.C.*
[2]*Department of Planning and Research, National Museum of Marine Biology and Aquarium, Pingtung, Taiwan 94450, R.O.C.*

**Corresponding author: F109184113@nkust.edu.tw; Tel: +886-8-852-0791*

ABSTRACT

Stony corals and crustose coralline algae are important reef-building organisms, and their growth is affected by both calcification and photosynthesis. There are more researches on light effects but few studies and inconsistent results on electrical effects. Our preliminary results showed that the intermittent weak current treatment (0.01A, 6 hours/time, 3 times/week) has higher survival and growth rates than the continuous high current treatment (0.02A and 0.04A, 24 hours) for the cultivation of reef coral, *Pocillopora acuta*, and crustose coralline algae. Furthermore, these two experimental organisms were cultivated under high or low light intensity (200 and 50 μmol photons m-2s-1, respectively) as well as with or without intermittent weak current treatments for 56 days. The results showed that the survival rate and weight change rate of *P. acuta* were only significantly affected by light intensity and were higher in the high light treatment. The survival rate, area change rate and color of crustose coralline algae were also significantly affected by light intensity only, but were higher and the color was darker in the low light treatment. These findings will help to improve the techniques for culturing and restoring stony corals and crustose coralline algae.

KEYWORDS

reef coral; *Pocillopora acuta*; crustose coralline algae; light intensity; electrical stimulation; growth rate; survival rate

Photocatalytic oxidation treatment of Reactive Red 195 onto iron-cobalt catalyst: statistical modeling and optimization via Box-Behnken design

Khyle Glainmer N. Quiton[1], Yao-Hui Huang[2] and Ming-ChunLu[3,*]

[1]*School of Chemical, Biological, and Materials Engineering and Sciences, Mapúa University, Intramuros, Manila 1002, Philippines*
[2]*Department of Chemical Engineering, National Cheng Kung University, Tainan 701, Taiwan*
[3]*Department of Environmental Engineering, National Chung Hsing University, Taichung 40227, Taiwan*

**Corresponding author: mmclu@nchu.edu.tw; +886-4-22840441*

ABSTRACT

Response surface methodology (RSM) is an effective tool for process optimization with multi-complex operational factors. The present work aims to model and optimize the photocatalytic oxidation (PCO) parameters of Reactive Red 195 (RR195) dye decoloration with the SiO_2-supported Fe-Co catalyst (FCS) derived from a novel catalyst synthesis method, fluidized-bed crystallization (FBC) process, using Box-Behnken design (BBD) as the RSM statistical model. The Fe-Co@SiO_2 catalyst was successfully synthesized using the FBC technology, and it showed good catalytic activity and performance toward the decoloration of RR195. The extent of the effects of initial pH, H_2O_2 dosage (HD), catalyst loading (CL), and operating time (t) on RR195 decoloration was studied. Accordingly, the order of variable significance follows the sequence: pH > t > CL > HD. pH has the most significant effect among the variables for the decoloration of RR195. The decoloration efficiency predicted by the BBD model was 88.3% under the optimized operating conditions of initial pH of 3.15, 0.76 mM H_2O_2, 1.18 g L^{-1} of FCS catalyst, and 59.42 min of operating time. The actual decoloration efficiency was very close to the predicted value suggesting that BBD can efficiently be employed to optimize the degradation of RR195 with FCS under the PCO system.

KEYWORDS

Bimetallic catalyst; Box-Behnken design; Fluidized-bed crystallization; Photocatalytic oxidation; Reactive Red 195; Response Surface Methodology

Project LV: A Case Study on Innovative and Green Design of a Single Storey Residence in the Philippines

Leiron Mark S. De Guzman

School of Architecture, Industrial Design and the Built Environment, Mapua University, 658 Muralla St, Intramuros, Manila, 1002, Philippines.

**Corresponding author: lmsdeguzman@mapua.edu.ph ; Tel: +63977612540*

ABSTRACT

Applying modern technology and making residence green is a big challenge for architects, compromising what clients want than those the project needs. Documenting it and making it into a research paper is another doubting task architects don't usually do. This paper tries to bridge the gap in project documentation while application of green technology in the designer's every project. Designing a residence is common to architects and designers, applying innovation, green technology, and sustainability is another level of expertise. The client's intent to have rainwater collection for backup water supply, solar panels to reduce electric consumption, and softwater technology to lessen the effect of hard water in plumbing fixtures are the prime green solution they want to explore in the project. However, doing everything and documenting it in a research study or paper for documentation is an unchartered task uncommon to the practice. This paper aims to jumpstart design research and project documentation as a norm among practicing architects teaching in the academe.

KEYWORDS

Solar Panels, Rain Water Harvesting, Soft Water Technology, Architecture and Design

Macronutrients Uptake of *Lahi-Lahi* (*Syzygium acuminatissimum, Blume*) Nursery Seedlings as Mediated by Biofertilizers in Heavy Metal Contaminated Mined-Out Soils in Surigao Del Norte, Philippines

Mitz C. Tapi-on[1,*], Nelly S. Aggangan[2], Dennis S. Gilbero[3], Hernando P. Bacosa[1], Jaime Q. Guihawan[1], Ruben F. Amparado, Jr.[1]

[1]*Environmental Science Graduate Programs, Department of Biological Sciences, College of Science and Mathematics, and Premier Research Institute in Science and Mathematics (PRISM), Mindanao State University-Iligan Institute of Technology, Iligan 9200, Philippines,*
[2]*National Institute of Molecular Biology and Biotechnology, University of the Philippines, Los Banos, Laguna,*
[3]*Forest and Wetlands Ecosystem Research, Development, and Extension Center (FWERDEC), Ecosystem Research and Development Bureau (ERDB), Butuan City*

**Corresponding author: mitz.tapi-on@g.msuiit.edu.ph; Tel: +639219019688*

ABSTRACT

Mined-out areas and soils following the termination of mining activities are considered marginalized and unproductive. The prospects of rehabilitating them are not only difficult but costly as well. Cost-efficient strategies to rehabilitate mined-out areas include using microbial biofertilizers as an enhancer to promote better growth and performance of plants. This study was conducted to determine the potential use of biofertilizers to that will enhance the growth of Lahi-lahi (*Syzygium acuminatissimum, Blume*) seedlings in heavy metal contaminated mined-out soils from Claver and Placer, Surigao del Norte, Philippines under nursery conditions. Soil collection in Claver was done in randomly chosen 10 grids (1m x 1m each) in a one-hectare plot while in Placer, the soil was collected from a stockpile beside the run-off pathway of the mined-out area. The substrate for the nursery experiments was prepared by mixing mined-out soil and vermicompost (1:1 v/v). A total of 300 seedlings were prepared in each soil, with 6 treatments each in ten blocks following the Randomized Complete Block Design (RCBD). Biofertilizers were inoculated into Lahi-lahi seedlings grown for 30 days for the microbes to infect the roots and then repotted into the mined-out soil mixed with vermicompost and complete fertilizer (14-14-14). Nursery monitoring showed that MYKORICH® treatment promoted ($p < 0.01$) shoot height and diameter growth of Lahi-lahi seedlings in both mined-out soils while MYKOVAM® and control treatments are comparably the highest in both growth parameters above. In the control or uninoculated treatment, there could be the presence of potential and beneficial indigenous species of microbes in the mined-out soil, which necessarily need to be isolated and further studies to test its effectiveness. MYKORICH® inoculation was the first to reach a sturdiness peak and is considered more robust, with enhanced seedling dry biomass, plant volume, water content, and root shoot ratio. This also increased the uptake of essential nutrients such as phosphorus (P), nitrogen (N), and potassium (K). Computed indices: Quality index (DQi) and Biovolume (Bv) in Taganito Mining Corporation (TMC) mined-out soil revealed that MYKORICH® has the highest ($p < 0.05$) (1.58) and Bv of 68.65 while the lowest was obtained in the control and dual inoculation of NEWMYC and NEWNFB, respectively. DQi in Manila Mining Corporation (MMC) mined-

out soil was observed highest in the MYKORICH® (1.13) while the Bv was likewise recorded the highest in the MYKORICH® treated seedlings. The results indicated that microbial biofertilizers, specifically the arbuscular mycorrhizal fungi (AMF) present in the commercially available MYKORICH®, promoted the overall growth performance of Lahi-lahi seedlings in the heavy metal contaminated mined-out soil.

KEYWORDS

Syzygium acuminatissimum, Blume, Mined-out soils, Microbial biofertilizers, MYKORICH®, Biomass index.

Bimetallic Nickel–Cobalt Oxide/Porous Carbon Nanocomposite as an Efficient Cathode for High-Performance Electrochemical Desalination

Po-Chang Wu, Chia-Hung Hou*

Graduate Institute of Environmental Engineering, National Taiwan University, Taipei, Taiwan 106, R.O.C.

**Corresponding author: chiahunghou@ntu.edu.tw; Tel: +886-2-3366-4400*

ABSTRACT

Efficient desalination technologies are increasingly important due to growing demand for fresh water. Inspired by electrochemical energy storage technology (i.e., supercapacitor and battery), capacitive deionization (CDI) has emerged as a promising electrochemical separation technology over the past decade. CDI utilizes highly porous electrodes at a low potential electric field and has drawn significant attention for its low energy consumption for low-salinity water and low environmental impact. The use of pseudocapacitive materials and active Faradaic reaction cathodes is critical for achieving high desalination performance via CDI. This study focuses on the bimetallic nickel-cobalt oxide/activated carbon (NiCoOx/AC) nanocomposite electrodes in asymmetric CDI for enhancing desalination performance. The nanocomposite electrodes were synthesized through the anodic electrodeposition method, resulting in a network structure composed of ultrathin nanosheets. The electrochemical properties of the electrodes showed that the NiCoOx/AC had the highest specific capacitance (84.0 F g^{-1}), followed by CoOx/AC (60.3 F g^{-1}) and AC (39.5 F g^{-1}) electrodes. It is probably attributed to the intercalation of Na^+ ions by the conversion reaction of Co^{3+}/Co^{0+} and Ni^{2+}/Ni^{0+}, respectively. The NiCoOx/AC nanocomposite electrode demonstrates excellent pseudocapacitive-like behavior and simplifies electrode processing, making it a high-performance electrode in asymmetric CDI applications. This study provides a new strategy for developing pseudocapacitive composite electrodes to advance the field of CDI.

KEYWORDS

Electrochemical desalination; Bimetallic nickel-cobalt oxides; Pseudocapacitive behavior; Porous carbon nanocomposite electrode; Asymmetric capacitive deionization

Inundation Analysis for A Proposed Detention Basin Using Environmental Protection Agency Stormwater Management (Epa-Swmm) Model at Barangay Saog, Marilao, Bulacan

Duane Ikhail A. Badua[1], Romeo B. Donato Jr. [1], Russell Mae A. Hernandez[1], Shayrence Twayle T. Saplaco[1], Carlos Jerome SJ. Tuazon[1], Ian Gail D. Cabrera[1], Donamel M. Saiyari[1,2,*], Kenneth Bryan M. Tana[1]

[1]*Department of Civil Engineering, College of Engineering, Polytechnic University of the Philippines, Sta. Mesa, Manila, 1016 Philippines*
[2]*Environment and Biotechnology Division, Industrial Technology and Development Institute, Department of Science and Technology, Bicutan, Taguig City, 1631 Philippines*

[*]*Corresponding author: dmsaiyari@itdi.dost.gov.ph; Tel: +63-2-83837-750 to 69*

ABSTRACT

Detention basins are stormwater management systems used to protect an area against flooding. In practice, decrease peak flow rates to diminish the adverse consequences of flooding, resulting in the delay of runoff and reduced volume in storm sewers. Environmental Protection Agency Storm Water Management Model (EPA-SWMM) was utilized for simulating rainfall events with varying return periods, namely 2-year, 10-year, and 100-year return periods, with input data of hyetograph, sub-catchment parameters and drainage system networks to redirect quantified stormwater runoffs in Barangay Saog, Marilao, Bulacan. ArcGIS Pro 1.2.0 was employed to generate the study area map. The simulation results in SWMM showed a decline in peak discharge and flooding hours in the basin with varying return periods. It further highlighted that implementing a detention basin in the study area helped reduce the flooding hours and volume. The study recommends the establishment of low-impact development (LID) control in the sub-catchment area for the detention basin construction.

KEYWORDS

Detention Basin, Inundation Analysis, EPA-SWMM Model

Development of ICP-MS hyphenated with gas exchange device- toward real-time online monitoring of $PM_{2.5}$ metal contents

Yi-Chin Hsieh[1], Ta-Chih Hsiao[2], Yi-Pin Lin[2], Wen-Che Hou[1,*]

[1] *Department of Environmental Engineering, National Cheng Kung University, Tainan City 701, Taiwan*
[2] *Graduate Institute of Environmental Engineering, National Taiwan University, Taipei 106, Taiwan*

**Corresponding author: whou@mail.ncku.edu.tw; Tel: +886 62757575, ext. 65842*

ABSTRACT

Particulate matters with sizes below 2.5 μm ($PM_{2.5}$) in the ambient atmosphere can cause a great harm to human health. The metal composition of $PM_{2.5}$ provides a fingerprint that can be used to identify the origins of $PM_{2.5}$. However, the traditional offline method, which involve collecting $PM_{2.5}$ on membrane filters, followed by digestion and ICP-MS analysis is time-consuming with a serious lag time. The Offline method compresses the $PM_{2.5}$ collected from different sources for long time into an average concentration, which cannot consider change of time. Online direct analysis by ICP-MS offers a tremendous opportunity for highly time-resolved near real-time monitoring of atmosphere $PM_{2.5}$ metal concentrations. However, the atmospheric composition is incompatible with ICP-MS that requires argon for effective plasma ignitions. In this work, a gas exchange device (GED) in which gases in atmospheric samples flowing within a ceramic tubular porous membrane (pore size 100 nm) were replaced with argon that flows over the outer membrane surface was made and connected to ICP-MS. The feasibility of GED-ICP-MS for the online $PM_{2.5}$ metal analysis was tested by monitoring $PM_{2.5}$ metals including Al, Pb, Cu, Fe, Cr, and Zn in the laboratory air. An initial test showed detectable signals of PM metals in the indoor air samples in large contrast to those of HEPA-filtered pure argon as blank. We established a metal mass calibration method by using aqueous metal standards. The mass-to-signal ratio calibration curve was established by nebulizing varying amounts of metal standards into the sample flow before entering plasma and the resulting signal areas were integrated. The instrument sensitivity was assessed using the slope of the calibration curve, and the detection limit of the method was evaluated to be 3.3 times of the standard deviation of y-intercept divided by the slope. Zero air, filtered air, and unfiltered air were used to establish the mass-signal calibration curves with results showing a significant matrix effect. The greater sensitivity was observed with the filtered air, that was 1.4 times and 2.5 times higher than those of zero air and unfiltered air. This phenomenon likely suggests that the calibration curve is better established by adding metal standards into unfiltered air sample. Finally, the results of the 6-hour continuous monitoring of indoor air $PM_{2.5}$ showed that the average concentrations of Al, Pb, Cu, Fe, Cr, and Zn in $PM_{2.5}$ were 54.4, 10.7, 5.5, 80.8, 0.4, and 76.2 ng/m^3, respectively. The online monitoring result were compared with those by the traditional filter collection method. The $PM_{2.5}$ metal concentrations measured with the filter method were all below the detection limit except for Fe and Zn, demonstrating the high sensitivity of GED-ICP-MS method.

KEYWORDS

Online ICP-MS, atmospheric particulate metal, highly time-resolved monitoring; trace level metal concentration.

Potable Water Quality Assessment on Purified Water and Tap Water in Barangay Poblacion, Muntinlupa City, Philppines

Liam-Jezner T. Cabrera[1], Jenny A. Dinauanao[1], Roy Jhon M. Gorpido[1], Lea Regina R. Sapuco[1], Donamel M. Saiyari[1,2,*], Melvin G. Singayan

[1]*Department of Civil Engineering, College of Engineering, Polytechnic University of the Philippines, Sta. Mesa, Manila, 1016 Philippines*
[2]*Environment and Biotechnology Division, Industrial Technology and Development Institute, Department of Science and Technology, Bicutan, Taguig City, 1631 Philippines*

[*]*Corresponding author: dmsaiyari@itdi.dost.gov.ph; Tel: +63-2-83837-750 to 69*

ABSTRACT

Complaints of water quality contamination from several households in Muntinlupa City in the Philippines inflict a primary concern in 2022. Customers have claimed that the water from their faucets is discolored and unfit for immediate use. This study aims to assess the water quality of purified and tap water in Barangay Poblacion, Muntinlupa, to address complaints of tap water contamination influencing Filipino households' preference for the source of potable water. Water samples from water refilling stations and consumers' faucets in Muntinlupa were collected. Physicochemical water quality analyses assessed its pH levels, Total Dissolve Solids (TDS), and Turbidity. Outputs from the study suggest that different factors affect tap water quality in Muntinlupa, which poses a considerable risk to the citizen's health. These results advocate the local water providers of the city to conduct initiatives to improve tap water quality, thus, redirecting the water source preference of the community from purified water to the water piped into their dwelling.

KEYWORDS

Muntinlupa City, Potable water, Purified Water, Tap Water

Development of Reinforced Polyvinyl Acetate Wood Adhesive using Bacterial Nanocellulose

Maria Sheila K. Ramos[1,2,*], Ralf Ruffel M. Abarca[1], Viatto Leonard D. Palangan[1], Judy Ann D. Hambre[1], Roger B. Dologuin Jr.[2]

[1]*Department of Chemical Engineering and Technology, Mindanao State University-Iligan Institute of Technology, Iligan City 9200, Philippines*
[2]*Sustainable Resource Engineering Research for Construction Technologies Center, Mindanao State University-Iligan Institute of Technology, Iligan City 9200, Philippines*

**Corresponding author: mariasheila.ramos@g.msuiit.edu.ph; Tel: +63 (063) 221-4056 local 4188*

ABSTRACT

The study aimed to assess the effects of integrating bacterial nanocellulose (BNC) into commercially available polyvinyl acetate (PVAc) wood adhesive. BNC was produced by *Acetobacter xylinum* using molasses, and Hestrin Schramm medium. Molasses is a by-product from sugar, and paper-making industries, making it widely-available in the Philippines. It improved the yield of BNC, and valorizing it adhered to a circular economy. The BNC was characterized through scanning electron microscopy and Fourier transform infrared spectroscopy. D-optimal mixture design, with different formulations of PVAc (97-100 wt%) and BNC (0-3 wt%), was utilized. Numerical optimization of factors and responses determined the optimal formulation.The 0.76 wt% BNC has the highest shear strength of 20.86 MPa, stages a 20.59% increase. Increasing the concentration of BNC in PVAc significantly improves its water resistance, as determined by adhesive dissolution and water absorption. The highest shear strength is observed at a pH of 7.4. Thermogravimetric analysis revealed that BNC and PVAc each have two distinct processes, and the addition of BNC to PVAc improves its thermal stability. The increase in mechanical, thermal stability, and water resistance was determined to be brought about by the incorporation of BNC into the PVAc matrix.

Keywords:

Polyvinyl Acetate (PVAc); Wood Adhesive; Bacterial Nanocellulose (BNC)

Recycling of waste ammonium sulfate as S, N-doped carbon quantum dots for the determination of tetracycline

Cheng-Yuan Ho, Ting-Wei Lee, Xin-Yu Li, Chiaying Chen*

Department of Environmental Engineering, National Chung Hsing University, Taichung City 402, Taiwan

**Corresponding author: chiayingchen@nchu.edu.tw; Tel: +886-4-22840441#541*

ABSTRACT

The widespread usage and lack of awareness in the management of pharmaceuticals (e.g., tetracycline (TC)) utilization have led to its inevitable release into the environment, which results in negative effects, such as the proliferation of resistant strains of bacteria or genes (antibiotic resistance genes, AGRs). The development of an on-site method for TC determination with high sensitivity, selectivity, cost-effectiveness, nontoxicity, and rapid response is therefore imperative and highly desirable. In this study, S,N-doped CQDs derived from waste ammonium sulfate have a particle size distribution of 1-5 nm with an average particle diameter of 3.15 nm and exhibit a strong blue fluorescence generated near the UVA–visible light region. The developed S,N-doped CQDs demonstrate features including facile fabrication, rapid response, high optical stability, wide linear range, and low detection limit for the determination of tetracycline through a static quenching mechanism. Furthermore, as a recovered product from semiconductor industry wastewater, the novel use of ammonium sulfate as a doping agent for CQDs realizes both waste valorization and fluorescence performance enhancement. Collectively, the compiled results suggest that the proposed S,N-doped CQDs show application potential in the on-site monitoring of tetracycline in aquatic systems.

KEYWORDS

Carbon quantum dots, Fluorescence sensor, Static quenching, Tetracycline, Sulfate and nitrogen doping

Development of a Rapid Method for Quantification of Hydroxyl Radical in the Natural Aquatic Environment

Melvin Pacquiao[1], Mark Daniel de Luna[1,2], Analiza Rollon[1,2], Yi-Ting Chen[3], Tsair-Fuh Lin[3,*]

[1]*Environmental Engineering Program, National Graduate School of Engineering, University of Philippines, Diliman, Quezon City 1101, Philippines*
[2]*Department of Chemical Engineering, University of Philippines, Diliman, Quezon City 1101, Philippines*
[3]*Department of Environmental Engineering, National Cheng Kung University, Tainan 70101, Taiwan*

**Corresponding author: tflin@mail.ncku.edu.tw; Tel: +886-6-236-4455*

ABSTRACT

Fluorescent-based probes are widely used for sensitivity and selectivity to detect various contaminants and reactive oxygen species (ROS) due to their high photoluminescence and wide range of applicability. Hydroxyl radicals (·OH) are reactive oxygen species that are potent and formed in a natural or artificial environment. Due to their high reactivity and short lifetime, the selective and sensitive detection of ·OH presents the most significant challenge for quantification. Herein, we developed a rhodamine-based derivatives, as a fluorescent probe, to rapidly detect and sense ·OH concentration, in the natural aquatic environment. UV-visible spectroscopy and Fluorescence spectrophotometry were used as facile and benchtop instrumentation eliminating the need for sophisticated equipment having a correlation coefficient of 0.99928 and 0.99587, respectively, under 553nm. The ·OH was produced using UV/H_2O_2 photolysis at 300nm and then quantified using a RhB-based fluorescent probe. Furthermore, the Relative fluorescence quantum yield, limit of quantification, and limit of detection of ·OH concentration were measured. Also, the RhB-based fluorescent probe was used to accurately measure the equivalent exposure ·OH generated in the real water sample and was found that it can effectively detect and quantify ·OH. Thus, the RhB-based fluorescent provides a promising methodology through other detection and imaging applications such as colorimetric, paper strips, and staining microplastics in natural water.

KEYWORDS

Fluorescent probes; Rhodamine-based derivatives (RhB); Hydroxyl radical; Hydrogen peroxide; Photolysis; Quantification

NiFeMn coated carbonnanotube electrocatalysts for oxygen evolution reaction of alkaline water electrolysis

Kaewta Jetsrisuparb*, Kriangkrai Khwayotha and Sapphawat Kawinwisit

Department of Chemical Engineering, Khon Kaen University, Khon Kaen, Thailand 40002

**Corresponding author: Kaewta@kku.ac.th; Tel: +66 43009700*

ABSTRACT

Alkaline water electrolysis (AWE) is a potential technology to produce hydrogen from water. This technology can be coupled with renewable energies to produce green hydrogen, regarding as an energy carrier for the future. Unlike many applications, the alkaline environment of AWE allows a wide range of materials to be chosen from as electrocatalysts, not limited to the high-cost noble metals. The presence of high performance cost-effective electrocatalysts helps to boost the reactions and is a prerequisite for many electrochemical processes including AWE. In this work, electrodes were produced from the carbonnanotube (CNT) film coated onto Ni foam substrate (CNT-NF). The formation of the CNT film increases the surface and the defects of carbonnanotubes enhances oxygen evolution reaction (OER) and hydrogen evolution reaction (OER), lowering the OER and HER overpotentials. However, CNT-NF suffers greatly from electrode degradation. Formation of hydrogen and oxygen gases causes the delamination of carbonnanotube film from the Ni foam substrate. Coating of Ni, Fe and Mn on to the CNT film not only helps improving the durability, the synergistic effects between CNT, Ni, Fe and Mn also increase the electrode performance, lowering the HER and OER overpotentials. At 10 mA/cm^2 in 1 M KOH, the OER overpotential of NiFeMn-CNT/NF is lowered by 270 mV, comparable to that of IrO_2 and Ru_2O electrocatalysts. The prepared electrodes showed high stability in the 20 h durability test. Therefore NiFeMn-CNT/NF electrode could be an alternative electrode in alkaline water electrolysis.

KEYWORDS

Modified carbonnanotube; Alkaline water electrolysis; Electrocatalysts; Nickel; Iron; Manganese

Overview of the Current Operating Practices of Leather Tanneries in Meycauayan, Bulacan, Philippines

Reynaldo L. Esguerra*, Engel Ryan G. Ibarra, Rochelle L. Retamar, Prima Joy F. Margarito

Environment and Biotechnology Division, Industrial Technology and Development Institute, Department of Science and Technology
Bicutan, Taguig City, 1631 Philippines

**Corresponding author: rlesguerra@itdi.dost.gov.ph; Tel: +63-2-8683-7750*

ABSTRACT

The Philippines' leather tanning industry creates jobs and boosts the country's foreign exchange earnings. However, the leather tanning industry has been categorized as one of the highly polluting industries. During the leather processing operation, only 20% of the raw material is converted into finished leather; the remaining 80% is discarded as waste. Additionally, tanneries utilize various chemicals to transform hides into leather. Untreated residual chemicals, solid and hazardous wastes, and pollutants in tannery effluents pose environmental risks and endanger human and animal health. Due to increasingly stringent environmental regulations, tannery waste management has become indispensable. This study aims to assess and compare the current operating practices of leather tanneries in Meycauyan, Bulacan, Philippines. There are three (3) significant stages in the tanning process: the beamhouse, tanyard, and finishing. In the beamhouse operations, animal hides are soaked, washed, dehaired, limed, and fleshed. The tanyard process, on the other hand, involves deliming, bating, pickling, and tanning. The finishing stage involves retanning, dyeing, fat-liquoring, drying, and finishing. The current operating practices of leather tanneries provided the baseline information for developing strategies, projects, and programs to address the issues and concerns of the leather tanning industry, including waste reduction.

KEYWORDS

Beamhouse, Current Operating Practices, Leather Industry, Tannery

"Tambi-tambi": Deconstruction Design for Bulabog Puti-an National Park, Dingle, Philippines

Rexaneegh Mallorca[1,*], Cherie Gil Luengo[1], Ella Macadangdang[1], Ma. Theresa M. Austria[1], Julinette Yap Coo[1], and Mary Michelle L. Batayola[2]

[1]*Department of Architecture, University of San Agustin-Iloilo, Iloilo City 5000, Philippines*
[2]*Department of Architecture, Iloilo Science and Technology University, Iloilo City 5000, Philippines*

**Corresponding author: rmallorca@usa.edu.ph; Tel: +639295651766*

ABSTRACT

Forest parks play an important role in providing a good place for recreation and conserving natural resources. Conscious considerations of the local aesthetic preferences for trees and green spaces are important factors in planning and designing forest parks and recreational facilities. The purpose of this study is to evaluate the existing conditions and gather perspectives as well as aesthetic preferences from the locals about the three selected forest parks. The data were gathered using mixed methods through post-occupancy evaluation (POE), and qualitative survey. The POE results reveal that transportation, accommodations, recreational facilities, and activities offered by the parks greatly affect attracting more visitors. Public survey results from 150 respondents reveal that recreational facilities and activities are significant factors in planning forest parks and are part of architectural design. The current development of forest parks has a significant gap and differs from experts' design considerations. Hence, the researchers chose the building form based on the theory of deconstruction and the elements of Avant-garde adhocism as a design solution. With the study's various design methods, locals, and visitors may be able to fully immerse themselves in forest parks, enhancing their physical and emotional well-being as well as the community's ecology and economy.

KEYWORDS:

Architecture; Deconstruction, Avant Garde Adhocism; Forest Parks and Recreations

Impact Analysis of Spatial Crowding to the Movement of Users within a Public Market: PAGHABI, A Redevelopment of UBVAS Public Market in Bocaue, Bulacan

Pamela Julianne O. Lofamia*, and Arianne Joy Q. Dullas

School of Architecture, Industrial Design, and the Built Environment, Mapúa University- Intramuros, Manila 1002, Philippines

**Corresponding author: pjolofamia@mymail.mapua.edu.ph ; Tel: +63968-8981-208*

ABSTRACT

Spatial crowding defines as the consumer's perception being restrictive towards a limited space, while human crowding is restrictive movement in the space by human density. In the case of public markets in the Philippines, they are the primary trading center that revolves around the relationship between consumers, vendors, and suppliers. Being unsanitary and uncomfortable to the users is one of the known issues; however, this study included that spatial crowding is the most prevalent issue in the Philippine markets today by differentiating factors such as physical, social, and personal conditions that affect the whole market environment and well-being and movement of users. The study used a qualitative and quantitative research method that consisted of site visits, analysis of floorplans, and surveys and interviews. It follows the concept of Stokol's Theory of Spatial Crowding and Tsuchimi's Spatial Sequence to identify the sensible experience within the public market. For a public market to be deemed walkable and for no spatial crowding to happen, the redesigning of the Bocaue Public Market consists of integrating two types of social spaces, commercial and recreational. The additional outdoor spaces, such as the esplanade and the market extension, connect all users of the public market and even helps create an identity for the municipality. The public market design is justified by identifying consumer walking and personal space, open spaces in public markets, use of various circulations, and adjusting street vendors to their proper and appropriate locations.

KEYWORDS

Public market; Stokol's Theory of Spatial Crowding; Human crowding; Spatial sequence; Circulation and movement;

Comparative Assessment of Current Wastewater Treatment Technologies in the Selected Hospitals in Metro Manila

Joshua S. Egnisaban[1], John Exequiel T. Talagag[1], Ezekiel Clive M. Tango[1], Edzel C. Vetus[1], Krizel F. Villaluz[1], Donamel M. Saiyari[1,2,*], Edna P. Arojado[1]

[1]*Department of Civil Engineering, College of Engineering, Polytechnic University of the Philippines, Sta. Mesa, Manila, 1016 Philippines*
[2]*Environment and Biotechnology Division, Industrial Technology and Development Institute, Department of Science and Technology, Bicutan, Taguig City, 1631 Philippines*

[*]*Corresponding author: dmsaiyari@itdi.dost.gov.ph; Tel: +63-2-83837-750 to 69*

ABSTRACT

One of the primary sources of contaminated wastewater is the hospitals in cities like Metro Manila, so countries are utilizing different wastewater treatment technology to mitigate this problem. However, more research and studies need to focus on the current condition of wastewater treatment technology in the Philippines. This paper assessed the existing wastewater treatment systems in the selected hospitals in Metro Manila. The study evaluated the efficiency and effectiveness of the chosen hospitals' wastewater treatment technologies, identified current system gaps, and provided improvement recommendations. Collected wastewater samples and treated wastewater samples were subjected to water quality analyses. The wastewater quality results were compared to the General Effluent Standards (GES) of the Department of Environment and Natural Resources Administrative Order (DAO) 2016-08. The study results showed that the hospitals had varying levels of wastewater treatment methods in place. The study identified gaps in the current wastewater treatment systems, such as inadequate maintenance, limited capacity, and poor effluent quality monitoring. Conversely, some hospitals had well-functioning wastewater treatment systems; others had outdated and ineffective schemes. Findings elucidated that an integrated and sustainable hospital wastewater management system is recommended. This includes regular maintenance of treatment facilities, the use of advanced treatment methods, the incorporation of sustainable practices, and the establishment of an efficient monitoring and evaluation system.

KEYWORDS

DAO 2016-08, Hospital wastewater, Wastewater treatment technology

Synthesis and Application of Nanosilica in Concrete Pavement Bricks

Nolan Tolosa[1,*], Achilles Espaldon[1], Nicole Aira Billones[2]
Jason Capilayan[2], Rosalie Capilayan[2], and Joshua Rhenee Palma[2]

[1]*Department of Chemical Engineering, College of Technology, University of San Agustin, Iloilo City Philippines 5000*
[2]*Department of Civil Engineering, College of Technology, University of San Agustin, Iloilo City Philippines 5000*

**Corresponding author: nctolosa@usa.edu.ph; Tel: +63-961-742-3926*

ABSTRACT

Because of the abrupt change in weather conditions, as well as the uneven settlement and brittle damage of concrete pavement bricks caused by heavy loads passing through bricks, nanosilica from rice husk was introduced as a cement additive in brick concrete mixture. The overall goal of this research is to strengthen the pavement bricks. Its specific objective is to replace the amount of cement by 1%, 3%, and 5% nanosilica to determine the desired mixture with high compressive strength. The compression and water absorption tests of samples containing nanosilica particles for concrete pavement were studied experimentally and compared to plain concrete. In the experiment, Block H sample with the mixture of coarse aggregate and 5% nanosilica gives the highest compressive strength of 27.42 MPa, followed by Block G with the same mixture and formulation gives 22.93 MPa. At the same time, Block H has the lowest water absorption capacity (1.75%). The test results show that replacing nanosilica improves compressive strength due to its pozzolanic activity, or the chemical reaction that occurs in Portland cement when siliceous materials with low cement value are added. According to the findings, the higher the percentage of nanosilica replacement gives greater the compressive strength and the lower the absorption capacity.

KEYWORDS

Paving blocks; Rice hulls; DPWH; pozzolanic activity; UTM; Curing

Quantifying dry rice biomass to determine the influence of straw burning on BC and NO_2 emissions in the Hanoi metropolitan region

Van The Pham[1,2], Tuyet Anh Thi Do[3], Hau Duc Tran[4,*], Anh Ngoc Thi Do[5,*]

[1]*Laboratory of Ecology and Environmental Management, Science and Technology Advanced Institute, Van Lang University, Ho Chi Minh City, Vietnam*
[2]*Faculty of Applied Technology, School of Technology, Van Lang University, Ho Chi Minh City, Vietnam*
[3]*Hanoi University of Natural Resources and Environment, Phu Dien, Bac Tu Liem, Ha Noi, Viet Nam*
[4]*Hanoi National University of Education, 136 Xuan Thuy, Cau Giay, Hanoi, Vietnam*
[5]*Vietnam National University, Ha Noi University of Science, 334 Nguyen Trai, Thanh Xuan, Hanoi, Vietnam*

**Corresponding authors: hautd@hnue.edu.vn; dothingocanh_t62@hus.edu.vn*

ABSTRACT

Despite being an urban area, rice is the key crop, which is now cultivated in Hanoi's suburbs, and rice straw burning in the field has been a severe issue therein. Thus, it is necessary to map the spatial rice distribution, estimate the dry biomass, and calculate emissions from rice straw burning in Hanoi city. It stated that the Deep convolutional neural networks (DCNN) model achieved a highly accurate performance in mapping the spatial distribution of rice in Hanoi city, and rice farming were extensive in its suburbs. Data gained from Synthetic Aperture Radar (SAR) data might be a valuable source for mapping rice fields in tropical regions like Vietnam. Furthermore, the hybrid model, Ant colony optimization-eXtreme gradient boosting (ACO-XGBoost), might be a powerful tool in measuring rice's above-ground biomass (AGB) in this city. The present study shows the spatial distribution of rice biomass in Hanoi city. Of the six layers of the rice biomass distribution map, most areas in Hanoi city were occupied by the fifth level, with 3.0-4.0 kg/m2. This is a crucial source of emissions for the city's air quality. It is important to note that the rice straw burning rate is still high, above 80% in surveyed districts of Hanoi, typically more significant in areas close to the city centre. R2 and the NSI indexes employed revealed the accuracy of the emission estimation, which is mainly in the rice field cultivation of its suburbs. On average, Hanoi city has high gas emissions from rice straw burning. Thus, the present results will serve a significant function for management and policy-making to generate data and calculate air pollution in Hanoi.

KEYWORDS

Air pollution, air quality, deep learning, emission, rice biomass, Sentinel-1A

Development of green emulsified industrial waste oil technology for circular economy and evaluation of cost-effective

Bo-Chih Chiang[1], Pei-Cheng Cheng[1], Yuan-Chung Lin[1,2,*], Heng-Yi Lin[3], Yao-Ting Tu[3], Ming-Xian Lin[4], and De-San Chen[4]

[1]*Institute of Environmental Engineering, National Sun Yat-sen University, Kaohsiung 804, Taiwan.*
[2]*Center for Emerging Contaminants Research, National Sun Yat-sen University, Kaohsiung 804, Taiwan*
[3]*Infinite Resource Technology Company, Pingtung 931, Taiwan*
[4]*Evermega Energy and Resources Technology Company, Kaohsiung 800, Taiwan*

**Corresponding author: yuanchung.lin@gmail.com; Tel: +886-7-525-2000#4412*

ABSTRACT

In view of the limited global energy resources and the scarcity of natural resources recently, more than 99% of our energy resources are imported. Henceforth, the use of resources or the conversion of resources into usable energy has become the most important issue and objective in the economic development of countries around the world. In this study, liquid wastes from factories were used to make derivative fuels, and different combinations of oil emulsions were tested to form water-in-oil molecular groups, and the difference in boiling points between oil and water resulted in micro-explosions (i.e. secondary atomisation), resulting in more complete combustion. Analysis of the basic characteristics of the five oils shows the non-hazardous organic waste oil (A) has the highest oxygen content (88%), while heavy metal analysis shows the waste oil (C) has the highest Zn content (5,700 ppm) and the highest heat content (10,700 kcal/kg) for waste oil (A). The oil emulsification experiments were carried out with different concentrations of interfacial activator dosing ratios. The results showed that the emulsified oil produced by using waste oil (A) and waste oil (C) with non-ionic surfactants (Span85, Tween65) at a HLB value of 3 and a high homogeneous speed did not show any delamination until 83 days. The basic characteristics analysis showed that C (53%) and O (30%) were the top two elements, while Zn(4,700-4,720 ppm) and Cu (1,270-1,320 ppm) were still the highest in heavy metals. Under the same emulsification conditions, it was observed that the lower concentration of the surfactant showed better and longer lasting non-delamination than the higher concentration. Which indicated that there was no direct correlation between the emulsion stability and the concentration of the surfactant. The results of the interfacial tension test were in the range of 29.8 dyne/cm to 32.6 dyne/cm with a chlorine content of 40.4 ppm, and the oil droplet size was in the range of 4.72 μm to 12.7 μm when observed in an electron microscope at 40x zoom. The waste oil (A) has a high heating value, but the concentration of sulphide is about 2.11%. In future, it is expected that if the amount of added surfactant can be reduced while maintaining the same emulsification days, it will not only be economical to reduce the amount of surfactant added to it gradually, but will also increase the applicability of environmentally friendly emulsified oils in the future.

KEYWORDS

Refuse Derived Fuels, Waste oil, Emulsion, Surfactant

Paraquat removal in Fenton-like reaction by Fe/GAC catalyst packed in up-flow continuous reactor

Natthaphong Lertna[1,2], Pakpoom Athikaphan[1,2], Pongpanit Kongkoed[1,2]
Shawn C. Rood[1], Arthit Neramittagapong[1,2], and Sutasinee Neramittagapong,[1,2,*]

[1]*Department of Chemical Engineering, Faculty of Engineering, Khon Kaen University, Khon Kaen, 40002, Thailand*
[2]*Research Center for Environmental and Hazardous Substance Management (EHSM), Faculty of Engineering, Khon Kaen University, Khon Kaen, 40002, Thailand*

**Corresponding author: sutasineene@kku.ac.th; Tel: +668-1832-0382*

ABSTRACT

Paraquat degradation by the Fenton process was performed in an up-flow fixed-bed reactor using a packed iron/granular activated carbon (Fe/GAC) catalyst and calcium peroxide (CaO_2) as the H_2O_2 source in the presence of citric acid (CA) as the chelating agent. The Fe/GAC catalyst was synthesized by reducing nFe0 on a GAC support using sodium borohydride. Catalysts with Fe loadings of 1%, 2.5%, 5%, and 10% were prepared. Various techniques were used to investigate the characterization of the catalyst. Increasing the Fe loading led to a decline in specific surface area and the good dispersion of Fe on GAC. The successful decoration of Fe0 on the support was also confirmed. The Fenton process was performed to decompose a 25 ppm paraquat solution with 2.5%Fe/GAC and a residence time of 2 min. Twice the stoichiometric amount of CaO_2 and a 0.2 mM concentration of CA were used to obtain about 90% paraquat removal within 10 min, and about 80% was retained until 60 min. Using the fixed-bed reactor, excellent paraquat degradation performance was achieved due to the slow release of CaO_2 to form H_2O_2. This provided hydroxyl radials for the Fenton reaction. Meanwhile, the chelating agent stabilized the catalyst, preventing catalyst deactivation.

KEYWORDS

Paraquat, Fenton, Zero valent iron, Up-flow continuous reactor, Fixed-bed reactor

Mixing Layer Height Estimation via Ceilometer Measurements and its Correlation with Major Ambient Pollutants

Duy-Hieu Nguyen[1], Tereza Šedivá[2,3], Dušan Štefánik[2], Chih-Hsiang Liao[4], Chitsan Lin[1,5,*]

[1]*Ph.D. Program in Maritime Science and Technology, College of Maritime, National Kaohsiung University of Science and Technology, Kaohsiung 81157, Taiwan (R.O.C.)*
[2]*Slovak Hydrometeorological Institute, Jeséniova 17, 833 15, Bratislava, Slovakia*
[3]*Faculty of Mathematics, Physics and Informatics, Comenius University in Bratislava, Mlynská Dolina, 842 48 Bratislava, Slovakia*
[4]*Department of Environmental Engineering and Science, Chia-Nan University of Pharmacy and Science, Taiwan 71710 (R.O.C.)*
[5]*Department of Marine Environmental Engineering, National Kaohsiung University of Science and Technology, Kaohsiung 81157, Taiwan (R.O.C.)*

*Corresponding Authors: ctlin@nkust.edu.tw

ABSTRACT

The mixing layer height (MLH) plays a crucial role in weather, climate, and air quality models, even though its exact nature remains equivocal. It significantly influences short-term variations of air pollutants, making it an important factor for consideration. In this study, we investigate the diurnal variation of the MLH in correlation to the air pollutants (O_3, NO_x, $PM_{2.5}$), based on 2020 data from two stations in Slovakia (Banska Bystrica and Prievidza). The findings indicate a strong correlation between O_3 and MLH, with a coefficient of 0.96. However, we found an anticorrelation between PM2.5 and MLH, with a coefficient of -0.39, and an unclear correlation between NO_x and MLH. When analyzed seasonally, the relationship between pollutants and MLH showed distinct behavior, especially for $PM_{2.5}$, which exhibited a strong negative correlation during winter (-0.76) in Banska Bystrica and a strong positive correlation during summer (0.83) in Prievidza. While NO_x showed a weak (-0.26) to moderate (-0.55 and 0.48) relationship, mainly in spring and summer. The results indicate that MLH greatly impacts air quality in Central Europe, where high concentrations of PM are common, especially during winter and summer. In contrast, the correlation between O_3 and MLH remained strong throughout the year. Finally, we evaluated our results against the MLH based on radiosonde measurements to ensure the accurate and reliable estimation of the MLH from ceilometers. In short, the study is essential for local researchers and practitioners working in the field of boundary-layer meteorology, as it sheds light on the relationship between MLH and air pollutants, which has significant implications for air quality management and climate change mitigation.

KEYWORDS

Vaisala CL31, Backscatter Profiles, Diurnal Variation, Merged Method, Richardson Number Method, Correlation Analysis

Crystal facet effect of palladium decorated PdSn(200) and PdSn(101) electrodes on electrochemical nitrate reduction and selective formation of N_2

Zhi-Lun Wu, Yu-Jen Shih*

Institute of Environmental Engineering, National Sun Yat-sen University, Kaohsiung. Taiwan 8024, R.O.C.

**Corresponding author: yjshih@mail.nsysu.edu.tw; Tel: +886-7-525-2000#4429*

ABSTRACT

The crystal habit of metallic tin (Sn) on a nickel foam electrode (Sn/Ni) was manipulated by cationic surfactants in the plating bath in order to assess the effect of Sn facet on the selective conversion of NO_3^-. The electroplating additives included benzethonium chloride (BZT), cetylpyridinium chloride (CPC), cetyltrimethylammonium chloride (CTAC), and hexyltrimethylammonium bromide (C_6TAB). Characterization showed that the preference of the Sn(200) facet was modified, which the diffraction plane factor $F_{Sn(200)}$ was in the following order: BZT > CPC > CTAC > C_6TAB-Sn/Ni. The results of the electroanalysis and batch electrolytic experiment showed that NO_3^- was reduced by surface hydrogenation, on which the formation of nitrogenous compounds was strongly affected by Sn facet orientations. A positive correlation between selectivity of N_2 (S_{N2}) and $F_{Sn(200)}$ existed, and the highest S_{N2} (65%) was obtained at $F_{Sn(200)}$ = 0.95. Effects of Pd nanoparticles (NPs) in Pd_xSn_{1-x}/Ni electrodes with preferred diffraction planes of Sn(101) and Sn(200) were further studied on the N_2 selectivity. Pd loading obviously enhanced the current density of proton diffusion controlled Sn0/Sn(II) transition. NO_3^- reduction was much more efficient on PdSn(200) than on PdSn(101); N_2 yield could increase up to 85% on $Pd_5Sn(200)_{95}$/Ni, while further increasing Pd loading would gradually increase NH_3 yield. The steady-state kinetics proposed a scheme of adsorption and deoxygenation of NO_3^- on Sn(200) and hydrogenation of NO_2^- to N_2 on Pd NPs beside the Sn crystals.

KEYWORDS

Metallic tin; Surfactant; Crystal facet; Nitrate; N_2 selectivity

Preparation of TiO_2 Superfine Powder to Catalyze Pentachlorophenol with $TiCl_4$ Hydrolysis

Shu-Lung Kuo[1], Edward Ming-Yang Wu[2], Chien-Nan Lee[1]

[1]*Kelee Environmental Consultant Corporation, Kaohsiung 806, Taiwan*
[2*] *College of Maritime, National Kaohsiung University of Science and Technology, Kaohsiung, 811, Taiwan*

ABSTRACT

This study determined the preparation of titanium dioxide (TiO_2) superfine powder with titanium tetrachloride ($TiCl_4$) hydrolysis and the efficiency of applying low energy sodium light to the powder to catalyze pentachlorophenol in polluted waterbodies. In this study, pure $TiCl_4$ served as the precursor and was intensely stirred in a cooling bath before undergoing vacuum drying and various stages of high temperature calcination to obtain TiO_2 superfine powder. The main strength of this powder is that it can change the reaction conditions of anatase phase and rutile phase after ammonium sulfate and ammonia solution are added to it, while enabling the TiO_2 crystals to form evenly and densely that the agglomeration effect is more remarkable.

The physicochemical experiment conducted on the TiO_2 superfine powder revealed that the hydrolysis reaction in this study accelerated the sintering process of the powder. Particularly, the thermogravimetric analysis revealed two ranges of degradation temperatures (200°C~240°C and 500°C~680°C), which should be related to the decomposition of the carbon-containing organic components left from the desorption of the -OH group adsorbed on the surface of TiO_2 crystals. Regarding the application of TiO_2 superfine powder to the catalyzation of pentachlorophenol in water, the additional sulfate ion increased the surface area of the superfine powder, which, along with the buffering action of the NH_4^+ in the ammonia solution (the neutralization of H^+ formed during the process), effectively accelerated the catalyzation of pentachlorophenol. When 0.08% of TiO_2 was added to pentachlorophenol-polluted (100 ppm) waterbodies, 60 minutes of low energy sodium light exposure resulted in 100% of degradation; when 0.10% of TiO_2 was added (with an additional ammonium sulfate equal to 5% of the weight of TiO_2), 100% of degradation was achieved with 50 minutes of low energy sodium light exposure. Because TiO_2 superfine powder is an amorphous solid, the additional ammonium sulfate enabled the superfine powder to carry different types of precious metals with higher efficiency, which resulted in an efficient catalyzation of pollutants.

KEYWORDS

$TiCl_4$; TiO_2 superfine powder; hydrolysis; pentachlorophenol; catalyze

Improving photocatalytic activity using metal ferrite nanocomposites to remove target pollutants

Chanat Chokejaroenrat[1,*], Athaphon Angkaew[1], Yao-Tung Lin[2], Chainarong Sakulthaew[3]

[1*] *Department of Environmental Technology and Management, Faculty of Environment, Kasetsart University, Bangkok 10900, Thailand*
[2] *Department of Soil & Environmental Sciences, National Chung Hsing University, Taichung 402, Taiwan*
[3] *Department of Veterinary Technology, Faculty of Veterinary Technology, Kasetsart University, Bangkok 10900, Thailand*

**Corresponding author：chanat.c@ku.ac.th ; Tel：+668-9893-1017*

ABSTRACT

The objective of this study is to provide a practical method of treating wastewater contaminated with organic pollutants using two types of synthesized magnetically recoverable $MnFe_2O_4$/g-C_3N_4 nanoparticles as photocatalysts to activate hydrogen peroxide (H_2O_2) in the presence of simulated sunlight. The material was synthesized via co-precipitation and melanine-assisted calcination and characterized via X-ray diffractometry (XRD) and vibrating sample magnetometry (VSM). XRD results confirmed no impurities in the highly crystalline spinel structure. The results also demonstrated that the magnetism of the composites was greatly enhanced by the addition of decorative g-C_3N_4. Tested on methylene blue, we found that photogenerated electrons played a significant part in the catalytic activity, and that singlet oxygen ($^1O_2$), produced from the interaction of oxygen vacancies and divalent metal during oxidative activation was the major reactive species for methylene blue degradation. Both types of catalysts were reusable for several cycles. Although both types of materials were capable of treating organic pollutants, the smaller particle size made it more difficult to undergo both practical synthesis on a larger scale and to achieve complete retractable for successive cycles. Based on these results, our nanoparticles have promise as photocatalysts for converting H_2O_2 to these reactive oxygen species, which may then be used to degrade an organic pollutant in water.

KEYWORDS

Advance oxidation process; $MnFe_2O_4$/g-C_3N_4 nanoparticles; Pollutant removal; Reusable catalyst; Wastewater treatment

Increasing permanganate treatment performance for removing Trichloroethylene from groundwater

Chainarong Sakulthaew[1,*], Yao-Tung Lin[2], Chanat Chokejaroenrat[3]

[1] Department of Veterinary Technology, Faculty of Veterinary Technology, Kasetsart University, Bangkok 10900, Thailand*
[2] Department of Soil & Environmental Sciences, National Chung Hsing University, Taichung 402, Taiwan
[3] Department of Environmental Technology and Management, Faculty of Environment, Kasetsart University, Bangkok 10900, Thailand

**Corresponding author：cvtcns@ku.ac.th; Tel：+668-9706-4869*

ABSTRACT

Injection-based remediation is challenging for treating aqueous and non-aqueous phase trichloroethene (TCE) in low permeable zones (LPZs) because injected oxidants naturally avoid LPZs and remain in permeable zones for long period of time. Once the contaminated permeable zones were treated, contaminants would typically diffuse out of the zones and contaminate surrounding flowing water, called rebound phenomenon. To reduce rebounds, permanganate (MnO_4^-) must enter the LPZs, minimize MnO_2 rind generation, and overcome the kinetic restrictions of treating a DNAPL with an aqueous-phase oxidant. MnO_4^- was mixed with xanthan and/or stabilizing aids to minimize MnO_2 generation. We tested multiple flooding techniques to improve TCE destruction under batch conditions using small LPZ cylinders injected with ^{14}C-labeled TCE. Transport studies showed that MnO_4^- alone penetrated the LPZ poorly and produced MnO_2 rind with non-aqueous phase TCE. MnO_4^- and xanthan increased sweeping efficiency and dissolved-phase TCE oxidation by 12%. Xanthan and MnO_4^- solution improved dissolved-phase TCE oxidation although non-aqueous phase TCE still formed MnO_2 rinds. Utilizing xanthan and sodium hexametaphosphate (SHMP), sweeping efficiency reached 100% and LPZ MnO_2 precipitation was minimal. MnO_4^-+xanthan+SHMP oxidized 8% more non-aqueous phase TCE than MnO_4^- alone. Batch experiments showed that stabilizing aids improved TCE destruction by 11–21%. Our findings justify treating polluted aquifers with xanthan and stabilizing aids for aqueous and non-aqueous phase TCE.

KEYWORDS

DNAPLs; In situ chemical oxidation; Low permeable zones; Permanganate oxidation; Rebound phenomenon; Shear-thinning fluids; Stabilizing aids

Using slow-released reductants for removing pesticide-contaminated groundwater

Kanidrawee Techauay[1], Chanat Chokejaroenrat[2], Yao-Tung Lin[3], Chainarong Sakulthaew[1,*]

[1] Department of Veterinary Technology, Faculty of Veterinary Technology, Kasetsart University, Bangkok 10900, Thailand*
[2] Department of Environmental Technology and Management, Faculty of Environment, Kasetsart University, Bangkok 10900, Thailand
[3] Department of Soil & Environmental Sciences, National Chung Hsing University, Taichung 402, Taiwan

**Corresponding author：cvtcns@ku.ac.th; Tel：+668-9706-4869*

ABSTRACT

Increasing agricultural productivity requires pesticide usage, which has polluted groundwater in several nations. In this research, we manufactured a slow-release reductant for treating herbicide-contaminated groundwater. Alachlor (ALC), metolachlor (MTC), 2,4-dichlorophenoxyacetic acid (2,4-D) and atrazine (ATZ) were representative most frequently used herbicides. Results showed that although ALC showed the fastest degradation, and the concentration was unchanged when 2.5%, w/v was used. The degradation mechanisms under aerobic conditions were ruled out for both reductive and oxidative reactions, suggesting that both electron transfer and reactive radicals occurred simultaneously. Among various reductants, Fe^0 provided the best compatibility to use for groundwater remediation. A ∅0.6 cm x 2.5 cm slow-release Fe^0 (SRZ), made by combining Fe^0 with heated paraffin in a 4.7：1 ratio (w/w), eliminated the plateau and the herbicide degradation was extended, which would be the most benefit for the use of SRZ in groundwater remediation. While under anaerobic conditions, Fe^0 and SRZ remove ALC more rapid by 15% and 28%, respectively. The ALC degradation was even faster under acidic condition because Fe^0 oxide layer was possibly removed from the SRZ, creating better electron transfer. In a two-dimensional transport tank, stacked SRZ was able to reduce ALC concentration collected from sampling arrays faster by 20-35% as compared to DI water flushing. These findings confirmed treating herbicide-contaminated groundwater using SRZ.

KEYWORDS

Groundwater remediation; Herbicide degradation; Oxidative reaction; Reductive reaction; Slow-released reductant

Steroid hormone removal using permanganate enhanced metal ferrite

Sapun Saengsoda[1], Chainarong Sakulthaew,[2] Yao-Tung Lin[3], Chanat Chokejaroenrat[1,*]

[1] Department of Environmental Technology and Management, Faculty of Environment, Kasetsart University, Bangkok 10900, Thailand*
[2] Department of Veterinary Technology, Faculty of Veterinary Technology, Kasetsart University, Bangkok 10900, Thailand
[3] Department of Soil & Environmental Sciences, National Chung Hsing University, Taichung 402, Taiwan

**Corresponding author：chanat.c@ku.ac.th; Tel：+668-9893-1017*

ABSTRACT

Steroid hormone contaminants are one of the pollutants usually found in aquatic environments, and they have been reported to have negative impact on exposed living animals around the world. This research aims to remove a mixture of four steroid hormones (estrone, E1; 17β-estradiol, E2; estriol, E3; and 17∝-methyltestosterone, MT) using permanganate (PM)-enhanced ultraviolet (UV), three metal ferrite catalysts (manganese ferrite, $MnFe_2O_4$; copper ferrite, $CuFe_2O_4$; and nickel ferrite, $NiFe_2O_4$). Results showed that the PM/UV treatment had a positive impact for E1 and MT while it had a negative impact for E2. Notably, the MnO_2 particles may cause consequence retarding degradation rates. Since UV alone had a higher removal rate than the PM/UV treatment, this research focused on enhancing the PM treatment using metal ferrites. Results showed that, among three tested metal ferrites, $NiFe_2O_4$ was the best catalyst to remove mixed steroid hormones in water. By varying the $NiFe_2O_4$ doses (0.15 to 0.35 g/L), the steroid hormones removal rates increased at the range of $NiFe_2O_4$ of 0.15 to 0.25 g/L while these rates decreased at the range of 0.25 to 0.35 g/L. At PM concentration of 2 mg/L and $NiFe_2O_4$ dose of 0.25 g/L, the removal efficiency for E1, E2, E3, and MT were 73%, 69%, 75%, and 69%, respectively, which was higher than using PM alone. This indicated that this condition was the optimum dose for treating steroid hormone-contaminated water. Overall results provide proof that only minimal amount of $NiFe_2O_4$ can effectively enhance PM oxidation on steroid hormones and our treatment can be applied to degrade other pollutants in the environment.

KEYWORDS

Enhanced permanganate; Metal ferrites; Nickel ferrite; Permanganate oxidation; Steroid hormones

Effects of treated water from $Cu_{0.5}Mn_{0.5}Fe_2O_4/H_2O_2$/light process on aquatic plant and zooplankton

Matura Angkaew[1], Athaphon Angkaew[1,*], Chainarong Sakulthaew[2], Yao-Tung Lin[3], Chanat Chokejaroenrat[1]

[1] Department of Environmental Technology and Management, Faculty of Environment, Kasetsart University, Bangkok 10900, Thailand*
[2] Department of Veterinary Technology, Faculty of Veterinary Technology, Kasetsart University, Bangkok 10900, Thailand
[3] Department of Soil & Environmental Sciences, National Chung Hsing University, Taichung 402, Taiwan

**Corresponding author：athaphon.ak@gmail.com ; Tel：+666-2861-2828*

ABSTRACT

This work aims to study the environmental friendliness of the $Cu_{0.5}Mn_{0.5}Fe_2O_4/H_2O_2$/light process, which is a powerful heterogeneous photo-Fenton system practicable to degrade several organic pollutants. To study the effects of treated water on the aquatic environment, we mixed different ratios of treated water (5%-15%) with submerged macrophytes (*Hydrilla verticillat*a) and zooplankton. Results showed that the treated water had a significant effect on the *Hydrilla verticillata* leaves at the beginning phase (5 days of exposure). Loss of chlorophyll and changes in leaf morphology were more evident at higher percentages of treated water, signifying the plant stress from the treated water that may contain residual H_2O_2 and some reactive oxygen species (ROS). However, leaf regeneration and growth were observed after only 10 days of exposure, indicating that the treated water had no long-term effects on the plants, allowing them to adapt and survive. The study of treated water effects on the zooplankton community found that the number of Arthropods and survival zooplankton significantly decreased at high percentages of treated water (10% and 15%), while the survival zooplankton and rotifer numbers increased when exposed to 5% of the treated water. At 5% of the treated water, the residual H_2O_2 may be useful to decompose the existing organic matter to a smaller size and slightly increase the dissolved oxygen that is suitable for rotifers for nutrient uptake and growth, but not enough to harm rotifers. These observations support that the $Cu_{0.5}Mn_{0.5}Fe_2O_4/H_2O_2$/light system is an environmentally-friendly system.

KEYWORDS

Copper-manganese ferrites; Heterogeneous photo-Fenton; Magnetic nanoparticles; Toxicological effects; Zooplankton

Using CuO/BiVO4 nanocomposites to enhance photocatalytic activity for Methylene blue

Chonnipa Chinwong[1], Athaphon Angkaew[1], Chainarong Sakulthaew[2], Yao-Tung Lin[3], Chanat Chokejaroenrat[1,*]

[1] Department of Environmental Technology and Management, Faculty of Environment, Kasetsart University, Bangkok 10900, Thailand*
[2] Department of Veterinary Technology, Faculty of Veterinary Technology, Kasetsart University, Bangkok 10900, Thailand
[3] Department of Soil & Environmental Sciences, National Chung Hsing University, Taichung 402, Taiwan

**Corresponding author：chanat.c@ku.ac.th; Tel：+668-9893-1017*

ABSTRACT

Many reactive dyes are found in high concentrations in the effluents that textile dyeing industries release into natural receiving waters without proper treatment, and these dye residuals can be harmful to both aquatic life and human health. In this study, we synthesized the high-efficiency photocatalyst copper oxide bismuth vanadate ($CuO/BiVO_4$) for treating methylene blue, which was the selected dye representative. $BiVO_4$ was synthesized using a one-step hydrothermal method while $CuO/BiVO_4$ was synthesized using in situ chemical deposition method followed by heating at 300 C for 60 min or 550C for 180 min to obtain a dark teal or brown color, respectively. The optimum composition with different weight ratios of CuO and $BiVO_4$ was 1 to 2, which yielded the highest degradation of methylene blue (MB) under the conditions of 50 mg catalyst, 0.2 M of hydrogen peroxide (H_2O_2), and simulated sunlight irradiation. Our catalyst proved its impeccability on oxidative reactions and provided outstanding stability for the MB degradation. Within the first 30 minutes of the reaction in the absence of light, no changes in concentration were observed, indicating that adsorption and desorption equilibrium had been successfully achieve within this period. By varying H_2O_2 concentrations (0.05 to 0.5 M), results showed that 0.3 M H_2O_2 yielded the most rapid MB degradation rates as H_2O_2 decomposition may have occurred at higher H_2O_2 concentrations. Our results lend credence to the concept that our nanocomposites can serve well as photocatalysts for the activation of H_2O_2 to efficiently degraded methylene blue residuals in water.

KEYWORDS

Copper oxide bismuth vanadate; Nanocomposites; Photocatalytic activity; Photo-Fenton catalyst; Reactive oxygen species

Thermal activation of persulfate to decompose microplastics

Nan Hammawiboon[1], Chainarong Sakulthaew[2], Yao-Tung Lin[3], Chanat Chokejaroenrat[1,*]

[1] Department of Environmental Technology and Management, Faculty of Environment, Kasetsart University,Bangkok 10900, Thailand
[2] Department of Veterinary Technology, Faculty of Veterinary Technology, Kasetsart University, Bangkok 10900, Thailand
[3] Department of Soil & Environmental Sciences, National Chung Hsing University, Taichung 402, Taiwan

**Corresponding author：chanat.c@ku.ac.th; Tel：*+668-9893-1017

ABSTRACT

The widespread use of plastics around the world that leads to improper discharge has resulted in pollution that threatens ecosystems on a variety of scales. Released microplastics have a high specific surface area and can act as vectors for organic and inorganic micropollutants. The objective of this research was to determine the efficacy of thermally activated persulfate to decompose microplastics. Preliminary experiments were tested against the methyl orange concentration (MO) prior to applying treatment conditions to selected microplastics (MPs) (i.e., polyamide 6,6 and polyethylene). Because aging MPs could have a direct effect on the surface durability, we selected polyamide 6,6 with different ages. Initially, 0.5 g of the tested MPs were placed in the 200 mg per liter solution at varying temperatures (25°C to 75°C). The persulfate concentration was maintained at the designed level by adding freshly prepared persulfate concentration every day until 14 d. Samples were collected periodically and characterized for physical and chemical changes. Results showed that sulfate radicals ($SO4^{\bullet-}$) were largely produced at the highest concentration (750 °C), quickly reducing MO concentration and obviously transforming tested MPs, especially the aged polyamide 6,6. This result suggested that the previously-used polyamide 6,6 may have been subjected to physical stresses that made them more vulnerable to attack by $SO4^{\bullet-}$ and caused a surface abrasion to occur more readily than in the case of the new polyamide 6,6. While only a tiny scratch surface was observed for the new polyamide 6,6 and polyethylene, the carbonyl index increased by 1.1% and percent mass loss was ranged between 3.92 and 6.94% for polyamide 6,6 and the carbonyl index increased by 18.6% and percent mass loss was 2.46%. These results provided proof that thermally activated persulfate was capable of decomposing MPs, and the degree of decomposition readily depended on the contact time and the exposure of MPs to physical stress.

KEYWORDS

Microplastic decomposition; Persulfate oxidation; Polyamide; Polyethylene; Sulfate radical; Thermal activation

High-quality of bio-coal production by hydrothermal carbonization of giant Salvinia

Piyanut Phuthongkhao[1,2], and Kitirote Wantala[1,2,3,*]

[1] *Department of Chemical Engineering, Khon Kaen University, Khon Kaen, 40002, Thailand*
[2] *Chemical Kinetics and Applied Catalyst Laboratory (CKCL), Faculty of Engineering, Khon Kaen University, Khon Kaen 40002, Thailand*
[3] *Research Center for Environmental and Hazardous Substance Management (EHSM), Khon Kaen University, Khon Kaen, 40002, Thailand*

**Corresponding author：kitirote@kku.ac.th; Tel：+668-1-499-5370*

ABSTRACT

Hydrothermal carbonization (HTC) is an induced coalification process that transforms raw biomass into hydrochar, a coal-like product with high carbon content and high heating value (HHV). Giant salvinia, also referred to as GS, is a common species of aquatic plant that grows in paddy fields, ponds, and other hydrostatic waterways. It is one of the phytoplankton that may be found in Thailand's eutrophic water bodies and has a quick growth rate. The aim of this study was to determine the effects of time, temperature, and liquid/solid mass ratio (L/S) on the production of hydrochar from GS using the HTC process. The experiments according to the run conditions designed by Box-Behnken Design (BBD) in the effects of temperature (200 to 220 °C), time (2 to 6 hours), and L/S (12 to 20) were examined. The physical and chemical characteristics of hydrochar were analyzed by many techniques as follows： HHV was measured with a bomb calorimeter. C, H, N, and O elemental contents were determined with a FlashSmartTM Elemental analyzer. Ash, volatile, and fixed carbon contents were analyzed by a Thermogravimetric analyzer. Combustion behavior analysis such as kinetic analysis and comprehensive combustibility index calculated by TGA/DTG analyzer. The maximal condition for hydrochar production was at 220°C, 6 hours at L/S of 16. In addition, Hydrochar products showed higher FC (%), HHV, and Yield (%) about 17.2, 23.5 MJ/kg and 51.4, respectively. It can be concluded that GS can produce renewable fuel that is comparable to a low-rank coal such as sub-bituminous coal.

KEYWORDS

Renewable energy; Giant salvinia; Hydrochar; Bio-coal; High-quality of bio-coal

Recycling Organic Waste into Environment-Friendly Eco-Enzyme

Agatha Hannabel Avnanta Puteri[1*], Erni Puspanantasari Putri[1], and Bonifacius Raditya Sri Pramana Putra[2]

[1]*Department of Industrial Engineering, Universitas 17 Agustus 1945 Surabaya, Surabaya City 60118, Indonesia*
[2]*Department of Informatics Engineering, Universitas 17 Agustus 1945 Surabaya, Surabaya City 60118, Indonesia*

**Corresponding author：dagatha44@gmail.com; Tel：+62-856-9707-9748*

ABSTRACT

Waste and ways to recycle it have been a global issue for a long time. A study shows that 60% of total waste in Indonesia is organic waste. Waste accumulation and decomposition in landfills that are not treated properly will produce methane gas, which contributes to global warming, ecosystem damage, and climate change. The amount of organic waste originating from the activities of residents in urban areas is very large and is thought to have the potential to be a source of methane gas. Methane gas is one of the greenhouse gases that can cause the greenhouse effect, a cause of global warming. Environmental and health problems that arise due to organic waste must be overcome by reducing the production of organic waste as well as processing the organic waste produced, one of which is by processing organic waste into eco-enzymes. Eco-enzymes are the result of the fermentation of organic kitchen waste such as fruit and vegetable waste, sugar (brown sugar or cane sugar), and water. It is dark brown in color and has a strong sweet-sour fermented aroma. Eco-enzymes accelerate bio-chemical reactions in nature to produce enzymes by using fruit or vegetable waste. This enzyme from waste is one way of managing waste that utilizes kitchen scraps for something very useful. The effort to preserve the environment is made by raising public awareness of the importance of eco-enzymes. These reasons include： (i) enzymes convert ammonia to nitrate (NO3), a natural hormone and nutrient for plants; (ii) while converting CO2 into carbonate (CO3), which is beneficial for marine plants and marine life; (iii) savings by turning kitchen waste into natural household cleaners; (iv) reducing pollution, since methane gas released from discarded waste can trap 21 times more heat than CO2, exacerbating global warming; (v) air purify, namely by cleaning the air of toxins, pollution, and odors; and (vi) multi-use benefits, such as household cleaners, insecticides, antiseptics, body care products, fertilizers, and others.

KEYWORDS

Recycle; Organic waste; Eco-enzymes; Environmentally friendly

Alternative to Oil Fuel： Recycling Plastic Waste into A Renewable New Energy Source

Erni Puspanantasari Putri

Department of Industrial Engineering, Universitas 17 Agustus 1945 Surabaya, Surabaya City 60118, Indonesia

Corresponding author：erniputri@untag-sby.ac.id; Tel：+62-856-0815-2712

ABSTRACT

The amount of waste produced in Indonesia is predicted to be 85 thousand tons per day, rising to 150 thousand tons per day in 2025. Household waste makes up between 60% and 75% of this total. The increasing use of fuel oil requires an idea to develop alternative energy sources. Plastic waste can be used as raw material to produce fuel oil through the pyrolysis process. This process can reduce environmental pollution. Pyrolysis is the decomposition of a material at high temperatures. The process takes place in the absence of air or with limited air. The decomposition process in pyrolysis is also often referred to as devolatilization. Pyrolysis, which can also be called thermolysis, is a chemical decomposition process using heating without the presence of oxygen. The process heats the plastic to temperatures above 400 oC without oxygen. The plastic will melt and then turn into gas. Next is the process of cooling the gas. The gas will condense and form a liquid. This liquid is the fuel (either in the form of gasoline or diesel fuel). In order to get better results and performance, a catalyst is added. The results of the pyrolysis process include solid fuel (carbon), liquid (in the form of a tar mixture), and a number of other materials. Other products it produces are gases in the form of carbon dioxide (CO2), methane (CH4), and several other gases that contain small amounts. The results of pyrolysis are in the form of three types of products： solids (charcoal), gases (fuel gas), and liquids (bio-oil). Plastic waste can also be converted into fuel oil. It is an alternative to being disposed of. It is also an effort to increase energy security, namely through the production of fresh, renewable energy.

KEYWORDS

Oil fuel; Recycling plastic waste; Renewable new energy

Prohibition of Provision of Single-Use Plastics in Shopping to Reduce Plastic Waste in Surabaya

Annisa Purnamasari

Department of Industial Engineering, Universitas 17 Agustus 1945 Surabaya
Surabaya City, Indonesia

**Corresponding author：annisapurnamasari2806@gmail.com; Tel：0857-3305-6266*

ABSTRACT

Plastic waste is waste that is increasingly posing a threat to the environmental ecosystem, the increasing amount causing environmental problems that are difficult to handle. The use of plastic cannot be separated from everyday human needs. Shopping is a human activity that is carried out every day and usually more than once. In the shopping process, a shop or place of sale will provide disposable plastic to wrap shopping items, after which the plastic is thrown away and not used. If this is done continuously and more than once per day, it will result in very high plastic waste. If left unchecked, this waste will have a negative impact on the environment, both on land, in the sea and even in the air. To reduce the waste caused by plastic, the Surabaya Government and the student team made an appeal to prohibit the supply of single-use plastic in shopping stores, this was done so that residents brought their own shopping bags that could be used many times and not thrown away at will. like single use plastic. Surabaya residents who want to shop at shops will bring their own bag and if they don't carry a bag, they are advised to buy a bag or goods that are not given a bag and brought directly. From this appeal, plastic waste is greatly reduced and is very beneficial for environmental cleanliness. Even though there is still some plastic waste hanging around and still being used, 30% of the waste has decreased and if it continues it is predicted that by 2025 it will be reduced by 70%.

KEYWORDS

Plastic Waste; Prohibition of Plastic Use; Waste Reduction; Plastic Waste Pollution; Care for the Environment; Environment

Design Fulfillment of The Right To A Healthy Environment

Budiarsih

Department of Law, Universitas 17 Agustus 1945, Surabaya, Indonesia

**Corresponding author：budiarsih@untag-sby.ac.id; Tel：+62 812-2572-024*

ABSTRACT

The right to a healthy environment is the responsibility of all countries which must be fulfilled including Indonesia, the realization of the right to health will determine the highest degree of public health. However, the right to health faces many obstacles from various factors. It is on this basis that the focus of this study is how to design a healthy environment in Indonesia.
The method used in this study uses a mixed method that combines normative research and uses qualitative methods using respondents who are then analyzed using the SEM model analysis.
The problem of environmental pollution is a classic problem in human life. The increase in population and the increase in the number of development activities has resulted in a shift in land use patterns in Indonesia, land use patterns are often found that are not in accordance with spatial planning rules and land capability and suitability, resulting in problems such as critical land, loss of fertile agricultural land, and environmental pollution. Environmental pollution is the entry of hazardous substances into the environment, so that the quality of the environment is reduced or its function is not in accordance with its designation.
The results of the study found that fulfilling the right to a healthy environment is an effort to improve the health status of the people in Indonesia, several challenges become obstacles in realizing the right to the environment, so a solution is needed as a settlement effort in the form of several recommendations, including Educational design to improve the quality of health human resources, design health services, and improve health facilities ; Healthy environmental design (work environment, lifestyle, water pollution, environmental pollution, air pollution, and smart green); Political Design of Regulation and Supervision and Law Enforcement in the environment sector.
On the basis of these findings, a Collaborative Draft Design for the right to a healthy environment can be found to realize the highest degree of health.

KEYWORDS

Rights to the environment, Health, Law enforcement

Waste Management Through Waste Banks in Indonesia

Bonifacius Raditya Sri Pramana Putra[1], Erni Puspanantasari Putri[2], and Agatha Hannabel Avnanta Puteri[2]

[1*]*Department of Informatics Engineering, Universitas 17 Agustus 1945 Surabaya, Surabaya City 60118, Indonesia*
[2]*Department of Industrial Engineering, Universitas 17 Agustus 1945 Surabaya, Surabaya City 60118, Indonesia*

**Corresponding author：radityabf@gmail.com; Tel：+62-822-3116-6245*

ABSTRACT

The waste problem in Indonesia is a complicated problem that has not been solved until now. A lot of garbage that mountains at a certain point. Garbage is a crucial problem. This is due to the fact that waste management has not been properly organized. In addition, there is a lack of public awareness about recycling waste. Establishing a waste bank is one way to control waste production. Waste banks really need to be built in every region. Thus, waste production becomes more controlled. This study aims to examine the good and correct management of waste banks. Thus, it can provide economic value to society. Furthermore, this research can be used as a reference to develop waste bank independence. The method used in this study is a qualitative research method. The results of the study indicate that waste management really needs community empowerment. Communities need education about the 3R program (reuse, reduce, and recycle). Garbage is not just trash. Garbage will have added value if the community can manage waste properly and well. Waste management needs to be carried out in a comprehensive and integrated manner from upstream to downstream using a circular economy approach by the central government, local government, and community so that it can provide economic benefits, is healthy for the community, and is also safe for the environment. Various achievements in managing the waste bank by empowering the community are as follows： (i) The Jambangan Village Waste Bank was selected as a pilot project for independent waste management. This achievement led the Jambangan Village to receive the Sustainable Proklim Village award from the Indonesian Ministry of Environment and Forestry in 2021; (ii) The 'Bersinar' Waste Bank (BWB) in Baleendah, Bandung, West Java Province, won an award as the Best Waste Bank in Indonesia in 2021. BWB has succeeded in educating more than 300 waste bank units, has more than 11,000 customer registers, and has created various waste management innovations by implementing a circular economy; and (iii) The 'Bunda' Waste Bank in Bangun Rejo Village, East Kalimantan, won the 2019 Indonesia Sustainable Development Award in the SDG's 12 goal category for participation in environmentally friendly and recycled products.

KEYWORDS

Waste management; Waste banks; 3R; Reuse; Reduce; Recycle; Circular economy

Improvement Of Natural Tourism At Coban Talun Waterfall

Tomy Michael

Universitas 17 Agustus 1945 Surabaya

**Corresponding author：tomy@untag-sby.ac.id; Tel：+315931800*

ABSTRACT

Waterfall tourism is a feature in Batu City, East Java. One of them is Coban Talun Waterfall. In the past, Coban Talun Waterfall was a place for disposing of the bodies of rebels involved in the G30S/PKI incident in Malang. Now, Coban Talun Waterfall is clean and has become a tourist destination that is never empty of visitors. Coban which means this waterfall has a height of 50 to 60 meters with clear water flow. Coban Talun Waterfall originates from the Brantas River which enters a protected forest and has a swift flow. The choice of Coban Talun Waterfall is related to how to apply the law in ecotourism. In research using legal hermeneutics and survey methods. Where the research was conducted on March 10 – 12, 2023. See directly the things that are the problem and analyze according to the Law of the Republic of Indonesia Number 10 of 2009 concerning Tourism. Referring to Article 6 of the Law of the Republic of Indonesia Number 10 of 2009 concerning Tourism that tourism development is carried out based on the principles referred to in Article 2 which is realized through the implementation of tourism development plans taking into account the diversity, uniqueness and uniqueness of culture and nature, as well as human needs for travel. Tourism at Coban Talun Waterfall must provide facilities for disabilities, there are restrictions on taking photos to the availability of first aid in accidents.

KEYWORDS

Human; Natural; Tourism

Framing Ecotourism On BBC News Indonesia Youtube : "Terancam' Pembangunan Ibu Kota Nusantara : Pesut Tersudut, Nelayan Tersingkir"

Novan Andrianto*, Merry Fridha Tripalupi, Insan Romadhon

Communication Science Study Program, Faculty of Social and Political Sciences (FISIP), Universitas 17 Agustus 1945 Surabaya, Semolowaru No.45, Surabaya City, 60118

**Corresponding author：novan@untag-sby.ac.id; Tel：+62896-6739-1830*

ABSTRACT

This research is titled *Framing Ecotourism Pada Youtube Bbc News Indonesia ： "Terancam' Pembangunan Ibu Kota Nusantara ： Pesut Tersudut, Nelayan Tersingkir."* This research aims to see the big picture on a BBC News report in creating a framing on the news on the mega project of Nusantara Capital as the impact of ecotourism. Social Reality Construction Theory and Framing Analysis are used in peeling the news framing on BBC News Indonesia. The important object of this research is the video "*Terancam' Pembangunan Ibu Kota Nusantara ： Pesut Tersudut, Nelayan Tersingkir"* on BBC News Indonesia Youtube channel. The analysis methods applied show syntactic structure, script, thematic, storyline, rhetorical analysis on Pan and Kosicki Theory. Firstly on the process of preserving tourism on the Balikpapan coast shows how cornered the Irrawaddy dolphins are, and fishermen feels an impact which is considered not feasible for the capital of Indonesia. Secondly, the relocation of the capital to Kalimantan impacts on marine, culture, coasts, and protected and non-protected forests in Kalimantan.

KEYWORDS

Nusantara Capital, Ecoturisme, Framing, Irrawaddy Dolphins, Fishermen

Improvement Natural Tourism to Disability-Friendly Tourism in Santerra De Laponte Tourism, Batu, Malang

Mega Dewi Ambarwati

Universitas 17 Agustus 1945 Surabaya

**Corresponding author：megadewi@untag-sby.ac.id; Tel：+628111124696*

ABSTRACT

Flora Wisata Santerra De Laponte which is located in the city of Malang stands on an area of 4 ha. In the past, this place was just an ordinary land that was transformed into a tourist attraction with various Instagramable photo spots, and has become a popular attraction for tourists until now.

This tourist destination is to increase the income of local residents and increase jobs. By carrying out the concept of the sensation of being in Korea and the Netherlands. In the study using legal hermeneutics and survey methods. Where the research was conducted on March 10-12, 2023. See first-hand the problems and analyse according to the Law of the Republic of Indonesia Number 10 of 2009 concerning Tourism.

As a result of this study, Flora Wisata Santerra De Laponte needs to add facilities for people with disabilities, so that it becomes a disability-friendly tourism. In addition to focusing on magnificent buildings, flower designs and building shapes that amaze and the unique environment. So with the addition of facilities for the disabled will make Flora Wisata Santerra De Laponte a pioneer of disability-friendly tourist attractions.

KEYWORDS

Disable; Human; Natural; Tourism

Analysis of Functional Tests in Fast Honey Pasteurization Process with Ohmic Heating Method

Sasongko Aji Wibowo[1,2,*] , Sumardi Hadi Sumarlan[3], Anang Lastriyanto[3], Bambang Susilo[3], La Choviya Hawa[3], Elok Zubaidah[4]

[1]*Department Industrial Engineering, Universitas 17 Agustus 1945 Surabaya, Indonesia*
[2]*Department Agro-Industrial Engineering, Brawijaya University, Malang, Indonesia*
[3]*Department Biosystems Engineering, Brawijaya University, Malang, Indonesia*
[4]*Department Food Science and Biotechnology, Brawijaya University, Malang, Indonesia*

**Corresponding author：sasongkoaji@untag-sby.ac.id ; Tel：+6282278384943*

ABSTRACT

Pasteurization of honey is one of the important processes that must be carried out in the honey production industry. Ohmic heating can be used as a substitute for the pasteurization process using conventional methods, the test method is as follows. Raw honey is heated to a temperature of 63ºC then held for 30 minutes with a frequency selection of 3 treatments, namely 250Hz, 150Hz, and 50Hz. The voltage used in each treatment is 300 Volts. As a control treatment, the process of heating honey with a conventional heater was carried out. The aim of the research was to determine the value of the heating rate, electrode damage, and energy efficiency during the pasteurization process using an ohmic heater. The results showed that the value of the heating rate was determined based on the constant value per second, the constant value per second on ohmic heating using a frequency of 250 Hz obtained a value of 0.00874, the constant value per second on ohmic heating using a frequency of 150 Hz obtained a value of 0, 00620, the constant value per second on ohmic heating using a frequency of 50 Hz obtained a value of 0.00594, and the constant value per second on conventional pasteurization obtained a value of 0.00015. long heating process temperature 35ºC - 63ºC it was found that the heating time on ohmic heating using a frequency of 250 Hz obtained a heating time of 70 seconds. on ohmic heating using a frequency of 150 Hz, a heating time of 80 seconds is obtained. on ohmic heating using a frequency of 50 Hz, a heating time of 70 seconds is obtained. And in conventional pasteurization, a heating time of 450 seconds is obtained. The results of observing the electrodes for each frequency treatment using a digital microscope before and after the heating process did not find any damage to the electrodes. The electrodes used in the ohmic heating process are made of titanium. The conclusion of the research is as follows. The ohmic heating process in each frequency treatment has a faster heating rate value compared to the conventional pasteurization process. The pasteurization process using ohmic heating is faster than the conventional pasteurization process. The results of observing the electrodes for each frequency treatment using a digital microscope before and after the heating process did not find any damage to the electrodes.

KEYWORDS

Ohmic heating; Honey; Pasteurizer

Characteristic analysis of waste mushroom cultivable woods for energy uses

Pai-Haung Shih [1], Tung-Hsuan Lu [2], You-Xin Chen [3], Yi-Cheng Li [3] and Yi-Kuo Chang [3,*]

[1] *Department of Environmental Engineering and Science, Fooyin University, Kaohsiung 831, Taiwan.*
[2] *Li Shun Hing Technology CO., LTD.*
[3] *Department of Safety Health and Environmental Engineering, Central Taiwan University of Science and Technology, Taichung 406, Taiwan.*

** corresponding author：ykchang@ctust.edu.tw; Tel：+886-4-22391647 ext 6858*

ABSTRACT

The circular economy combines the renewable economic and industrial systems, to establish the material circulation and utilization, form the circular model of "resources, products and recovered energy resources". In this work, we turn the waste mushroom cultivable woods, which used to be regarded as "agricultural waste", into a useful "bioenergy". With the processes of separation, selection, mixing, drying and granulated into products, the formed solid recovered fuel (SRF) can be used as energy resources.
In this research, the waste mushroom cultivable woods will be collected from the farms in Xinshe District, Taichung city. Proximate analysis (moisture content, ash content and combustible matter), energy content, elemental analysis are used for evaluating the feasibility of solid recovered fuel from waste mushroom cultivable woods. Results from the proximate analysis showed the moisture content, ash content and combustible matter of waste mushroom cultivable woods was 8.76%, 1.83% and 89.41%, respectively. The elemental analysis revealed the C, H, O, N, S, Cl element was 40.75%, 5.01%, 41.98%, 1.40%, 0.07% and 0.2%. The results of calorific analysis showed that the lower heating value (LHV) of waste mushroom cultivable woods was 2,980 kcal/kg, which could be a bioenergy fuel alternative.

KEYWORDS

waste mushroom cultivable woods; characteristic analysis; solid recovered fuel

Advancing Natural Tourism at Palippis Beach Polewali Mandar

Muh Nasir

Universitas 17 Agustus 1945 Surabaya

**Corresponding author：nasibasri7@gmail.com; Tel：+6282335719034*

ABSTRACT

Palippis Beach is a beach located in West Sulawesi, precisely in Bala village, Balanipa sub-district, Polewali Mandar. Known as a beach with a beautiful panorama. Offers offshore directly facing the sea that separates the islands of Java, Kalimantan, and Sulawesi. Palippis Beach is famous for its beautiful white sand and clear seawater. There are other attractions such as bat caves and stretches of rock cliffs. The location of bat cave is on a hill not too far from the beach. On this beach, tourists can also see Sandeq boats lined up on the beach. The Sandeq boat is a typical boat of the Mandar tribe. In research using legal hermeneutics and survey methods. Where the research was conducted on 18–19 March 2023. Look directly at the things that are a problem and analyze it according to the Law of the Republic of Indonesia Number 10 of 2009 concerning Tourism. Referring to Article 6, 20, and 21 of the Law of the Republic of Indonesia Number 10 of 2009 concerning Tourism, Tourism at Palippis beach must be managed properly because it has great potential. Educating the public or tourists about the importance of keeping the environment clean. Palippis Beach must provide decent and standard facilities for everyone.

KEYWORDS

Natural; Tourisme; Palippis Beach

Titanium dioxide/Lignin nanocomposite for UV-Blocking and Antimicrobial Activity

Nuttaporn Chokesawatanakit**,** Sirirat Thammasang**,** Kewalin Ruangjantee, Pawarisa Chaisorn and Khanita Kamwilaisak*

Department of Chemical Engineering, Faculty of Engineering, Khon Kaen University, Khon Kaen, 40002, Thailand.

**Corresponding author：Khanita@kku.ac.th ; Tel：+66-95-664-2532*

ABSTRACT

This study involved a synthesis of TiO_2 and lignin nanocomposite doped with polyvinyl alcohol (PVA) for UV-blocking and antimicrobial activity. The TiO_2 / lignin nanocomposite was prepared through simple hydrolysis with an optimal ratio of TiO_2/lignin of 1.6/0.02, with an 8-hour reaction time. The efficacy of the nanocomposite was tested through photocatalytic and antibacterial experiments, using Rhodamine B (RhB) dye as an organic pollutant and *Staphylococcus aureus* (*S. aureus*) as a Gram-positive bacterium and *Escherichia coli* (*E. coli*) as a Gram-negative bacterium, respectively. The TiO_2/lignin nanocomposite, in the presence of UV-A light, degraded 47.90% of RhB in 180 minutes and exhibited high antimicrobial activity against both S. aureus and E. coli. The PVA film containing 3% of TiO_2/lignin (PVA-TiO_2-Lignin3%) was the most effective in slowing down the ripening of tomatoes, which was evaluated by measuring the Red, Green and Blue colors using the Image J program. The PVA-TiO_2-Lignin3% film could prolong the storage duration of tomatoes by 7 days, with a decrease of 9.78% in green color and an increase of 10.42% in red color. In contrast, the PVA film used as a control resulted in a significant change to red color on day 7, with a decrease of 34.46% in green color and an increase of 20.48% in red color. This study highlights the potential of lignin, a waste product from the paper production process, as raw material for producing nanocomposite films for food packaging.

KEYWORDS

Lignin; Titanium dioxide; UV-Blocking; Antimicrobial activity

Improvement Of City Park Tourism At Suroboyo Park

Diplomat King Agape Sembiring*

Universitas 17 Agustus 1945

**Corresponding author：kingsembiring14@gmail.com Tel：+6281228153039*

ABSTRACT

Taman Suroboyo is one of the many parks in the city of Surabaya. Inside the park has a variety of facilities and rides. The most interesting thing here is the statue of Suro and Boyo with a giant size which is 25 meters high. In addition to its large size, the seaweed statue which is a complementary decoration of this statue is made differently. The seaweed statues here are painted green, unlike the other Suro and Boyo statues. Not only statues, the attraction of this park is located next to Kenjeran Beach. The choice of Suroboyo Park is related to how to apply the law in ecotourism. In research using legal hermeneutics and survey methods. Where the research was conducted on 17–18 March 2023. Look directly at the things that are a problem and analyze it according to the Law of the Republic of Indonesia Number 10 of 2009 concerning Tourism. Referring to Article 6 of the Law of the Republic of Indonesia Number 10 of 2009 concerning Tourism that tourism development is carried out based on the principles referred to in Article 2 namely realized through the implementation of tourism development plans taking into account the diversity, uniqueness and uniqueness of culture and nature, as well as human needs for travel. Tourism in Suroboyo Park must provide facilities in the form of public restroom near the park in order to increase the comfort of visitors.

KEYWORDS

Human; Park; Tourism

Eco-friendly Nanocomposite Films Based on Poly(vinyl) Alcohol, Cassava Starch, and Titanium Dioxide

Nutsupa Pimsawat, and Khanita Kamwilaisak*

Department of Chemical Engineering, Khon Kaen University, Khon Kaen, Thailand

**Corresponding author：Khanita@kku.ac.th; Tel：+6643362240*

ABSTRACT

This research focused on producing and evaluating green composite films based on eco-friendly PVA and cassava starch as a matrix and filled with TiO_2 nanoparticles. PVA, Cassava starch, and TiO_2 nanoparticle films (PVA/CSS/TiO_2) were prepared by heating and mixing, and the composite films were obtained by solution casting method. TiO_2 nanoparticles were synthesized by $TiOSO_4$ hydrolysis at a low temperature (90°C) without calcination. The effect of TiO_2 concentration (0, 1.2, 2.4, 4.8, and 7.2 wt% of PVA and cassava starch) on the properties of nanocomposite films were investigated. Mechanical properties, water solubility, degree of swelling, TGA, XRD, FTIR, and SEM were used to characterize the physical and chemical properties of the films. Moreover, the efficiencies of the composite films were investigated by photocatalytic degradation of Rhodamine B under UV and visible light. The results showed that TiO_2 was filled in the space between PVA and cassava starch which was confirmed by SEM. The increasing TiO_2 nanoparticle increased tensile strength and Young's modulus while elongation at break was decreased. Moreover, decreased swelling was detected from 170% to 38% when increased TiO_2 caused wet tensile strength to increase. X-ray diffraction confirmed the anatase phase of TiO_2 nanoparticles on the composite films. The photodegradation of RhB by the composite films exhibited good efficiency even though the concentration of TiO_2 catalyst was low. In conclusion, TiO_2 improved the properties of PVA/cassava starch film and expanded their potential applications in packaging.

KEYWORDS

Composite film; Photocatalytic; TiO_2 nanoparticles; Cassava starch; Wet strength

Bio-Adhesive Based on Carboxymethyl/Polyvinyl Alcohol/Nanosilver For Wood Applications

Chaloton Jarensungnen and Pornnapa Kasemsiri*

Department of Chemical Engineering,Faculty of Engineering, Khon Kaen University, Thailand

**Corresponding author：pornkas@kku.ac.th; Tel：+668-6-862-35639405*

ABSTRACT

Aldehydes synthetic resins have been widely used as adhesives in various applications, especially in the field of wood-based materials owing to their strong adhesion to many surfaces. However, these resins still have the main drawback viz, formaldehyde emission. According to the World Health Organization (WHO), formaldehyde is categorized as a carcinogen that causes environmental and health safety. Consequently, there is a need to develop an eco-environmentally friendly bio-adhesive. In this study, the bio-nanocomposite adhesive samples were prepared using cassava starch waste modified by carboxymethylation (CMS) and mixed with polyvinyl alcohol (PVA) and green synthesized nano silver by tannic acid (Ag-TA). The incorporation of Ag-TA in bio-adhesives increased the dry shear strength about 3 folds in comparison with the CMS/PVA/TA host polymer. The wet shear strength was found to meet the requirements of the Chinese national standard (GB/T 9846-2015) for indoor plywood. In addition, the bio-nanocomposite also had antifungal activity. Based on the obtained results, the obtained bio-nanocomposite adhesive had a potential to be used as a substitute for formaldehyde resin adhesives.

KEYWORDS

Bio-adhesive; Starch waste; Sodium carboxymethyl starch; Polyvinyl alcohol; Tannic acid.

Bioactive Injectable hydrogels based on Gelatin/Dialdehyde starch/Ag-ZnO Bimetallic for Biomedical Applications

Rawit Jittham* and Pornnapa Kasemsiri

Department of Chemical Engineering,Faculty of Engineering , Khon Kaen University Khon Kaen, 40002, Thailand

**Corresponding author：Rawit@kkumail.com ; Tel ：+66 9-7954-4252*

ABSTRACT

Bacteria infection, one of a common health problem that affects to patients or human. Researchers have concentrated to create various types of adhesive dressing that can properly fulfil the requirement of anti-infection and wound healing due to harsh wound environment , severe inflammation and chronic wound healing. Hydrogels are one of the options with good biocompatibility properties but the characteristics that can be injected still have some restrictions. Nowadays , there is more research and development of injectable hydrogels that have been of interesting in developing wound dressing because the injectable hydrogels can prevent the soread of germs or bacteria, can be used as a drug delivery and cost- effective as it can replace surgical treatments. The aim of this work is synthesize an bioactive injectable hydrogels from gelatin , Dialdehyde starch (DAS) as a crosslinker and Ag-ZnO bimetallic that has antibacterial and wound healing characteristics. Injectable hydrogels are going to analyse by UV-Vis spectrophotometer , Fourier transform infared spectroscopy, Scanning electron microscopy , X-ray Diffractometer , Syringeability , Swelling and Cytotoxic evaluation. For further biomedical applications.

KEYWORDS

Injectable hydrogels, Gelatin , Dialdehyde starch (DAS) , Ag-ZnO , Bimetallic

Microplastic contamination in the aquatic ecosystem and their potential risks： a case study in Vietnam

Minh-Ky Nguyen[1,2,*], Chitsan Lin[2,3,*], Wazir Aitizaz Ahsan[4], Hoang-Lam Nguyen[5]

[1*]*Faculty of Environment and Natural Resources, Nong Lam University, Hamlet 6, Linh Trung Ward, Thu Duc City, Ho Chi Minh City 700000, Vietnam*
[2]*Ph.D. Program in Maritime Science and Technology, National Kaohsiung University of Science and Technology, Kaohsiung 81157, Taiwan*
[3*]*Department of Marine Environmental Engineering, National Kaohsiung University of Science and Technology, Kaohsiung 81157, Taiwan*
[4]*Institute of Aquatic Science and Technology, National Kaohsiung University of Science and Technology, Kaohsiung City, 81157, Taiwan*
[5]*University of Science and Technology, The University of Da Nang, Lien Chieu Dist., Da Nang 550000, Vietnam*

**Corresponding authors： nmky@hcmuaf.edu.vn, ctlin@nkust.edu.tw ; Tel： +886-975-087-364*

ABSTRACT

Microplastic (MP) contamination is increasing dramatically in Vietnam due to human activities from the domestic, agricultural, and industrial sectors. The average level of MPs in the aquatic ecosystem varied between 0.35 items m^{-3} and 519,000 items m^{-3}, indicating critical contamination. Findings show a crucial hotspot of MP pollution in environmental matrics, and their occurrence is an emerging threat to aquatic ecosystems. MP abundances were higher in the lakes and canals than in rivers, and their high concentration was confirmed in megacities such as Ha Noi and Ho Chi Minh City. The insights into Vietnam indicated their potential effects on health issues, which might cause severe risks through drinking-water supply and food chains. Therefore, enforcing plastic waste management and establishing national regulations towards MP reduction and improving water quality is critical. Further, strategies such as increasing recycling (4Rs), decreasing the use of single-use plastics (SUPs), and enhancing public awareness about the environmental impact of plastic usage must be implemented to overcome this issue. These efforts are crucial in reducing MP pollution at a discharged source toward the Sustainable Development Goals (SDGs) and minimizing potential health effects.

KEYWORDS

Aquatic ecosystems; Human health; Microplastic contamination; Sustainable Development Goals (SDGs); Plastic waste.

Self-Healable Epoxy Vitrimer Crosslinked With Dual-Networks

Jaturong Prompan, and Pornnapa Kasemsiri*

Department of Chemical Engineering, Faculty of Engineering, Khon Kaen University, Thailand

**Corresponding author：Pornkas@kku.ac.th; Tel：+66868629405*

ABSTRACT

Epoxy is a widely used coating for protecting materials such as metal textile etc. but epoxy coatings are generally not self-healing when there are cracks or scratches on the coating layer. To solve these problems, new kind of epoxy has been developed. Epoxy vitrimer has various smart functions such as self-healing, reprocessing, self-welding has been used for various applications. In this research, the epoxy vitrimer containing dual networks is studied. Two curing agents viz, cashew nut shell liquid (CNSL) and 4-aminophenyl disulfide (AFD) were used for preparation of epoxy vitrimer. The effect of AFD content on self-healing ability and other properties were investigated. The epoxy vitrimer cured with CNSL and AFD showed two-stages curing process at temperature of 161 - 170 °C and 195 - 200 °C. The stress relaxation time of epoxy vitrimer decreased with increasing AFD content. The highest self-healing efficiency was found to be 96% for epoxy vitrimer containing AFD 30 wt%. The self-healable epoxy vitrimer could be applied for smart applications such as coating.

KEYWORDS

Epoxy vitrimer, Self-healing, Stress relaxation

Multi response optimization of smart bio-based hydrogel using Taguchi's method and grey relational analysis for strain sensor application

Nattakan Jaroenthai, and Pornnapa Kasemsiri*

Department of Chemical Engineering, Faculty of Engineering, Khon Kaen University, Thailand

**Corresponding author：Pornkas@kku.ac.th; Tel：+66868629405*

ABSTRACT

Conductive hydrogels are widely used as strain sensor in medical application for detecting of human motion and personal health care monitoring. The objective of this work is to study the best proportion of smart conductive hydrogels. Tannic acid (TA), Glycerol and Sodium Chloride (NaCl) were used to prepare smart conductive hydrogels which were optimized mix proportions using Taguchi's method and Grey relational analysis. Three factors i.e. TA, Glycerol and NaCl at four levels were design by L16 orthogonal arrays. Glycerol was the main factor influencing the self-healing ability and stretchability of the hydrogels. TA and NaCl enhanced the conductivity of the hydrogel. Furthermore, the self-adhesive ability increased when TA content increased. The obtained result from grey relational analysis indicated that the optimal mix proportion was 2.5 %wt TA, 45 %vol Glycerol, and 5 %wt NaCl. The hydrogel containing TA, Glycerol and NaCl integrated smart functions such as self-healing and self-adhere which performed reproducibility and the stability of the signals during monitoring of human limbs movement. According to results, the hydrogel could be applied as strain sensor for monitoring human health.

KEYWORDS

Conductive hydrogel; Strain sensor; Biopolymer; Self-healing

Can we Collect Coral Rubble to Monitor Sponge Bioerosion and Eutrophication?

Jia-Yi Lim[1,*], Fleur van Duyl[2], Christine Hanna Lydia Schönberg[1,3]

[1]*Department of Oceanography, National Sun Yat-sen University, Kaohsiung, Taiwan 80424, R.O.C.*
[2]*Royal Netherlands Institute for Sea Research, 1790 AB Den Burg, Texel, Netherlands*
[3] *School of Engineering, University of Western Australia, Crawley, Perth, WA 6009, Australia*

**Corresponding author：limjy22@gmail.com; Tel：+886-988-265-476*

ABSTRACT

A range of environmental changes have been found to increase bioeroder abundances and erosion rates, and we study the relationship of bioeroding sponges with nutrients. As filter feeders, most sponges readily respond to changes in the water quality. Higher sponge bioerosion rates will affect sediment production and quality, as well as render calcium carbonate structures brittle, and will over time reduce the structural complexity of coral reefs. It is especially important to produce baseline data from Taiwan, because there is a lack of bioeroding research. Katherine Holmes (1997) introduced a simple method to assess sponge bioerosion along nutrient gradients or over time by collecting coral rubble and comparing the bioeroding sponge communities in it. According to her results, number of species and extent of sponge borings in the rubble were proportional to nutrient levels. Therefore, this would be a fast and efficient indicator of eutrophication and could be used to monitor bioerosion levels. In a pilot survey, we tested this approach at Liuqiu Island in the southwest of Taiwan. Runoff from the Gaoping River in the Pingtung County south of Kaohsiung seasonally ejects enriched water into the South China Sea close to Liuqiu Island and creates a nutrient gradient in NE to SW direction. Work was ongoing at the time of abstract submission, but preliminary data already showed that the two sites had different bioeroding sponge communities. At the northern site a Thoosa species was very dominant, a genus otherwise rarely sampled in the western Pacific. At the southern site, only clionaid species were found. Species counts still had to be established, but the differences in the species compositions already suggested that environmental conditions differed between the chosen sample sites.

KEYWORDS

Clionaidae; Thoosidae; biodiversity; nutrients; environmental assessment

Temperature Experiments on Internal Bioeroders

Wan Tze Ning Orczy[1,*], Christine Hanna Lydia Schönberg[2]

[1]*Department of Oceanography, National Sun Yat-sen Universit, Kaohsiung, Taiwan 80424, R.O.C.*
[2]*School of Engineering, University of Western Australia, Crawley, Perth, WA 6009, Australia*

**Corresponding author：want7e0@gmail.com; Tel：+886-0970190461*

ABSTRACT

Climate change and extreme weather pose significant environmental challenges to our planet. Coral reef ecosystems are particularly vulnerable to climate change, which affects their biological functions and the human societies that depend on them. Some research suggests that bioeroders, may be more resistant to environmental changes than corals, potentially exacerbating the decline of coral reefs. While previous studies have examined the impact of ocean acidification on internal bioeroders, the effects of temperature on this process are not well understood. To address this issue, we are conducting experiments to investigate the impact of temperature on internal bioeroders. Our study primarily involves heat treatments, with cold treatment as a secondary aspect, and a control group using live rocks collected from Little Liuqiu Island. We are measuring changes in buoyant weight to determine the bioerosion rate of internal bioeroders. The experiments will last for two weeks, and we assume that bioerosion rates will increase in proportion to the temperature until a critical limit is reached. This work is currently underway, and our findings could provide insight into the relationship between temperature and internal bioeroders under different environmental conditions. This knowledge could inform conservation plans and ongoing environmental monitoring efforts.

KEYWORDS

Bioeroders; Climate change; Temperature treatment

Developing the Natural Tourism Potential of Kelud Mountain

DIOVAN ADY PRASTYANA DEVA*

Universitas 17 Agustus 1945 Surabaya

**Corresponding author：diovanadyp.dap@gmail.com; Tel：+6282234121669*

ABSTRACT

Kelud Mountain is one of the volcanoes in Indonesia, located on the border of the district of Kediri with the district of Blitar, East Java. Kelud Mountain last time eruption in 2014 phenomenal with its volcanic ash carried home winds up to Yogyakarta, but the management of tourist sites of Kelud mountain is quite fast because there is no year of post-eruption of Kelud Mountain tourism opened to public. One of the famous sights is a Kelud mountain crater tour which is located in Kediri district, East Java. Kelud mountain tourism from Kediri presents very beautiful natural scenery, starting from pineapple plantations owned by local residents, gardens with various beautiful flowers, instagramable photo spot, and of course the amazing view of the crater of Kelud mountain. The choice of Kelud Mountain is related to how to apply the law in ecotourism. In research using legal hermeneutics and survey methods. Where the research was conducted on March 13-15, 2023. See directly the things that are the problem and analyze according to the Law of the Republic of Indonesia Number 10 of 2009 concerning Tourism. Referring to Article 6 of the Law of the Republic of Indonesia Number 10 of 2009 concerning Tourism that tourism development is carried out based on the principles referred to in Article 2 which is realized through the implementation of tourism development plans taking into account the diversity, uniqueness and uniqueness of culture and nature, as well as human needs for travel. Tourism at Kelud Mountain must improve the quality and the quantity of facilities.

KEYWORDS

Tourism; Kelud Mountain

Designing Bicycle Lane for a Sustainable Touristic Mobility

Tomas U. Ganiron, Jr*

Department of Civil Engineering, Adamson University, 900 San Marcelino Street, Manila, 1000 Metro Manila, Philippines

**Corresponding author： tomas.ganiron.jr@adamson.edu.ph; Tel：+639690133830*

ABSTRACT

This study addresses the use of non-motorized transportation. The global benefits of the bike paths, bike lanes, and other types of bicycle-specific infrastructure consist of a reduction in traffic congestion and a decrease in emissions of greenhouse gasses and other pollutants that commuters face today. Additional indirect benefits, of no less value, demonstrate the benefits and viability of bicycles and non-motorized transport. The aims of this study is to design a bicycle lane north–south road from Commerce Avenue in Metro Manila and determine the characteristics of the bikers in the area and to analyze the treats affecting bicycle riders using descriptive survey. The results of the data analysis show that familiarization of paths & facilities in north-south road was the main treats leading for a protected bike lane. A bicycle safety programs for ecotourism was recommended from the results of data analysis and through purposive sampling, a group of transportation engineers validated the bicycle program as well as the bikeway program.

KEYWORDS

Bikelane, Cycling, Ecotourism, Non-motorized transportation, Transportation engineering

Improvement Of Natural Tourism At Tegenungan Waterfall

Grace Mathilda*

Universitas 17 Agustus 1945 Surabaya

**Corresponding author：gracsmathilda@gmail.com; Tel：+83 831 997 260*

ABSTRACT

New destinations are always popping up on the island of Bali. Many tourists are quite enthusiastic to visit the natural tourism of the waterfall in Bali. One of the contemporary tourist destinations that is now crowded with tourists is Tegenungan Waterfall. Many tourists are quite enthusiastic to visit the natural tourism of the waterfall in Bali. Located within a tropical jungle, Tegenungan Waterfall or the neighboring village called Blangsinga waterfall offers a picturesque view in a hidden space. Blangsinga Waterfall is the same waterfall as Tegenungan Waterfall. The difference in the two names is only obtained because of the login access used. The name of the Tegenungan is pinned at this waterfall because it passes through Banjar Tegenungan. Similar conditions are also used because of the use of access through the Blangsinga Traditional Village.The blooming trees around the waterfall burst a tropical jungle vibe. Tegenungan Waterfall has various types of interesting tourist objects including nature tourism, arts and culture, and culinary. This area is one of the attractive destinations for tourists, both domestic and foreign tourists. So far, tourists visiting the area are more familiar with natural and cultural attractions. The uniqueness of nature and culture that is still well preserved such as views of rice fields, artistic activities, especially dance and percussion are very attractive to tourists. The location is about 10 kilometers from Ubud town. The waterfall height is just around 15 meters high. The beauty of the waterfall could clearly be seen after stepping down more than 150 wide stairs. Tegenungan waterfall is a great choice to take a break from an overwhelming temple trip.

KEYWORDS

Waterfall; Natural; Tourism

Developing Creative Tourism Potential of Bawean Island using Public Private People Partnership Method

Amalia Eka Astutik; Arifah Nur Ainia*; Riska Carollina

Universitas 17 Agustus 1945 Surabaya

**Corresponding author：arifah.nur.ainia@gmail.com; Tel：+62 85258892915*

ABSTRACT

Bawean Island is a secluded paradise in East Java, which is included in the Gresik district. It is because the island of Bawean has the charm of marine tourism and the wealth of ecosystems in the sea. In addition to sea tourism, there is also a captivity for the Bawean deer which is the only endemic in the world. From the uniqueness and beauty of Bawean Island, it is very suitable to be a creative tourist spot nowday. Some foreign tourists are also interested in visiting this beautiful island. Unfortunately the development and management of this island has not been maximal either from the central government or from the local area. So that it is necessary to develop a strategy using the public private people partnership method which involves the government, the private sector, and people who want to partner.

KEYWORDS

Bawean Island; Creative Tourism; Government Private Community Partnership Method

Impressive Mount Bromo

Raihan Rifky Imani* and Tomy Michael

Universitas 17 Agustus 1945 Surabaya,

**Corresponding author：raihanrifkyyy@gmail.com; Tel：082257116022*

ABSTRACT

The Tengger Mountains have a long volcanic history, starting from 1.4 million years ago (Mulyadi, 1992). Volcanologists named this mountain range the Bromo - Tengger Complex, consisting of several volcanic bodies with the main eruptive center forming an arc. In its infancy explosive and effusive activities have formed the Nongkojajar cone (1.4 0.2 million years ago), the Ngadisari Cone (822 90 thousand years ago), the Old Tengger Cone (265 40 thousand years ago), the Keciri Cone (unknown age) and the Cemoro Lawang Cone (144 - 135 30 thousand years ago). Bromo Volcano Cone is the only post-caldera activity center of the Sand Sea that still shows volcanic activity today. Some of the cones are in the Sand Sea caldera but are no longer active. In the National Park area, there is a tribe called the Tengger tribe. The name Tengger comes from the legend of Roro Anteng as well as Joko Seger which they believe is the origin of the name Tengger. "Teng" is the name suffix of Roro An-"teng" and "GER" is the name suffix of Joko Se-"ger". So Bromo itself they still believe in as a sacred mountain. They refer to it as Mount Brahma. the Javanese then called it Mount Bromo.

KEYWORDS

Mount Bromo; Tengger, Tourism; Impressive

Morokrembangan Fishing Village, Mangrove Forest and Local Wisdom

Tomy Michael*, Frega Anggaraya Purba

Universitas 17 Agustus 1945 Surabaya

**Corresponding author： tomy@untag-sby.ac.id; Tel：+315931800*

ABSTRACT

Morokrembangan is a place that has a side of Indonesian history. In 1960, the Republic of Indonesia Navy (ALRI) inaugurated the Morokrembangan Naval Air Base. Over time, Morokrembangan has also changed sociologically, one of which is the Morokrembangan Fishermen's Village. Here there is a mangrove forest that passes through the Morokrembangan Fishing Village and is close to the International Container Terminal. Then this research complements the previous research conducted at the Dutch Peneleh Cemetery in Surabaya in 2019. In this study, an interview was conducted directly with Erno Saputro (Mangrove Tourism Activist in Surabaya). This research was conducted on March 23, 2023 and used the legal hermeneutic method. See directly the things that are the problem and analyze according to the Law of the Republic of Indonesia Number 10 of 2009 concerning Tourism. There is a concrete suggestion that is the participation of the Surabaya City Government in reviving local wisdom in the Morokrembangan Fisherman's Village; digitalization efforts to attract tourists outside the city of Surabaya as well as training in human resources based on humanist tourism and the mangrove forest at the end of the Morokrembangan Fishermen's Village must be protected because there are flocks of birds moving there.

KEYWORDS

fishing village; morokrembangan; research

Potential Sourcing of Chitin from Prawn Shells in Iligan City, Philippines

Seigfreid D. Kempis*[,1], Reiner Baldomero[1], Alteiza R. Halibas[1], Giovanni Kim E. Reloba[1], Caryl Joie R. Sandigan[1], Leaniel C. Silva[1], Algen Secula[1], and Maria Cristina P. Vegafria[2,3]

[1] *Department of Materials and Resources Engineering and Technology, Mindanao State University – Iligan Institute of Technology, Iligan City, 9200 Lanao del Norte, Philippines*
[2] *Department of Chemical Engineering and Technology, Mindanao State University – Iligan Institute of Technology, Iligan City, 9200 Lanao del Norte, Philippines*
[3] *Bioprocess and Bioresources Engineering Research Center, Mindanao State University – Iligan Institute of Technology, Iligan City, 9200 Lanao del Norte, Philippines*

**Corresponding author：seigfreid.kempis@g.msuiit.edu.ph*

ABSTRACT

The Philippines' fisheries production amounts to 4.4 million metric tons from 2018 to 2020. Iligan City wet markets, one of the more important markets for local fish consumption in Mindanao, sources its fish and crustacean produce, particularly prawn, from various regions of the southern island. Wet markets of Iligan City receives about 150 kg of prawns daily during the period 2021-2022 according to survey. Prawn shell is a natural source of chitin and can become a sustainable source of raw materials in chitosan production for various purposes such as wastewater treatment. Of the prawns sold from the wet markets, more than 80% goes to local households in the city and nearby areas while the remaining volume are sold to local restaurants. Despite the lower volume of shell wastes produced from restaurants, it is preferred due the absence of logistic difficulties and health issues inherent to household collection. Iligan City restaurants collectively produce about 8 kg of prawn wastes on the daily basis. The collection of prawn shell from restaurants has more potential in sustaining chitosan production for wastewater treatment and concurrently helps in the management of solid waste.

KEYWORDS

Prawn; Prawn shells; Chitin; Philippines; Solid waste management

Social Media Marketing and Word of Mouth on Purchasing Intention by mediating Brand Awareness at Tourist Attractions in Surabaya

Estik Hari Prastiwi* and M Sihab Ridwan

Department of Management, Faculty of Economics and Business, Universitas 17 Augustus 1945 Surabaya, Indonesia

**Corresponding author：estik@untag-sby.ac.id; Tl +081-3-342-4471*

ABSTRACT

The purpose of this study is to prove the effect of social media marketing on purchase intention directly and through mediation of brand awareness. This research also wants to prove the effect of word of mouth on purchase intention directly or by mediating brand awareness. Collecting data with the method of distributing questionnaires. The sampling technique used purposive sampling method, namely visitors to tourist attractions in Surabaya who have visited because of information obtained from social media. The research method used is the quantitative method, processing and analyzing data with WarpPLS software. Data analysis using the outer model and inner model. The results of the study show that social media marketing has a significant effect on purchase intention. Social media marketing has a significant effect on purchase intention by mediating brand awareness. E-mouth of word has a significant effect on buying interest. E-mouth of word has a significant effect on purchase intention by mediating brand awareness.

KEYWORDS

Social media marketing;Word of mouth;Brand awareness; Purchasing Intention.

Improvement of Ecotourism at Pancar Wonotirto

Aisya Dewi F.Z*

Universitas 17 Agustus 1945 Surabaya

**Corresponding author：aisyadewifz@gmail.com; Tel：+6281330373690*

ABSTRACT

Pancar Wonotirto Tourism is a natural tour combined with culinary tourism and playground rides; Pancar Wonotirto is located in Kediri Regency, Wonokasian Village, Gurah District. Pancar Wonotirto is a shallow river transformed into a recreation area. Where tourists who come can immediately play in the water around the room; no need to worry about children because this tour is quite child-friendly, and the geography of the river flows calmly. Based on @pancarwonotirto, the origin of Pancar Wonotirto was an ordinary river. Thanks to the creative ideas of all elements of village institutions assisted by the Head of Gayam Village, Mr. Susilo, Pancar Wonotirto, nature tourism is present in rural areas. The hope is that Pancar Wonotirto nature tourism can improve the economy of residents.after reviewing the location, in general Pancar Wonotirto is quite safe for children and the elderly, but it is limited to a number of facilities and is not a tour that provides access for persons with disabilities.

KEYWORDS

Ecotourism; Natural; Tourist

The Pasuruan Date Garden Tour

Moh Nurul Jadid*

Department Of Industial Engineerimg, University 17 August 1945 Surabaya City, Indonesia

**corresponding author：nurul.jadid12@gmail.com ; Tel ：+6287849886858*

ABSTRACT

The pasuruan date garden tour which is located on the slopes of Mount Arjuna, Sukorejo Village, Sukorejo sub-district, Pasuruan Regency. The pasuruan date garden tour Opened on January 1 2017, operating hours are Tuesday-Sunday (08：00-16：00 WIB). In the 6.3 hectare area of the pasuruan date garden tourism lay hundreds of date palms, visitors can feel the sensation of picking dates directly from the tree. The pasuruan date garden tour has a replica of the Kaaba and replicas of places to perform the Hajj and Umrah worship. In addition, there are also several playgrounds that can be played by children or adults. In this study using legal hermeneutics and survey methods. Where the research was carried out on March 12-13 2023. Look directly at the things that are the problem and analyze it in accordance with the Law of the Republic of Indonesia Number 10 of 2009 concerning Tourism. Referring to articles 6, 20 and 21 of the Law of the Republic of Indonesia Number 10 of 2009 concerning Tourism, tourism in Pasuruan date gardens is an educative tourist spot. Managers of tourist attractions need to carry out regular checks on rides to play, considering that visitor safety is the main thing, and the availability of proper public facilities for all conditions of visitors needs to be provided.

KEYWORDS

Tourisme; The pasuruan date garden tour, Education.

Improvement Of Historical Tourism At Sisingamangaraja XII National Heroes Cemetry

Grace Mathilda*

Universitas 17 Agustus 1945 Surabaya

**Corresponding author：grace.18002@mhs.unesa.ac.id; Tel：+83 831 997 260*

ABSTRACT

Cultural heritage found in the Lake Toba area includes traditional Batak settlements, traditional woven fabrics (ulos), museums, traditional dances, and music. The Batak Museum, the T.B. Silalahi Center, and Sisingamangaraja XII National Heroes Cemetery are in this sub-district. Tourism conditions in Balige consist of nature tourism, cultural tourism, agro-tourism, and recreational tourism. Sisingamangaraja XII National Heroes Cemetery is one of the Indonesia National heroes during the War. Located in Balige, Tobasa, North Sumatra, this is the historical-tourism spot about Batak and Indonesia hero and one of several decent tourism spot in Balige besides lake Toba, natural waterfall, Museum Batak. The monument statue was erected in 1992, built with the aim of honoring the services of the national hero King Sisingamangaraja XII who died on the battlefield. Apart from his heroic values, his example is still alive and upheld and can motivate the value of the younger generation. This monument consists of a full-body statue of King Sisingamangaraja XII riding a horse on a pedestal and is equipped with other elements. The Monument of Sisingamangaraja XII was a complex that consists of two main objects, a statue and a traditional Toba house. The statue of Sisingamangaraja XII is positioned right at the center of the complex, directly in front of the monument's main entrance. It was an equestrian statue. In 1961 Sisingamangaraja XII was declared a "National Hero of Indonesia" – specifically a "Hero of the Struggle for Freedom" (Pahlawan Perjuangan Kemerdekaan) – by the Indonesian government under Presidential Decree number 590.

KEYWORDS

Monument; National; Tourism

Resin-Membrane Capacitive Deionization as a Purification System to Enhance Electrosorption Performance for Water Reclamation

Yi-Shan Jiang, Chia-Hung Hou *

Graduate Institute of Environmental Engineering, National Taiwan University, Taipei, Taiwan 106, R.O.C.

Presenter, Master student: r10541216@ntu.edu.tw

**Corresponding author, Professor: chiahunghou@ntu.edu.tw*

ABSTRACT

Energy recovered from purification techniques is crucial due to the rising problems of water scarcity and energy crises. However, achieving water purification with low energy consumption posed a significant challenge for many relevant technologies. The MCDI-based integration technology has been widely used in water purification. Nevertheless, it has received less attention in experimental studies on low-salinity desalination. Membrane capacitive deionization (MCDI) uses ion-exchange membrane coatings on electrodes to minimize the effects of co-ions, which confers the advantages of energy efficiency and high salt adsorption capacitive. In this study, we introduced a new concept filled with ion exchange resins in the chamber of MCDI (R-MCDI) to enhance electrosorption performance. Ion exchange resins were utilized as ionic transport channels to enhance both charge efficiency and desalination performance. Finally, the R-MCDI system was tested using permeate water from a single-stage reverse osmosis (RO) process. The R-MCDI experiments operated in a single-pass mode with 1 mM NaCl solution, which involved a charging stage for ion adsorption and a discharging stage for energy recovery. During the charging stage (1.2 V), it was observed that the conductivity sharply decreased with increasing time. The conductivity dropped from 130 ± 4.7 μS cm^{-1} to 1.91 ± 0.4 μS cm^{-1}. Furthermore, the R-MCDI cell demonstrated excellent performance, with the charge efficiency of 86% and the salt removal efficiency of 99%, respectively. To optimize the efficiency of the R-MCDI cell, several operational parameters have been employed, including the flow rate and the applied voltage. The results indicated that higher levels of water purification could be achieved by decreasing the flow rate and increasing the applied voltage. Ultimately, the single-stage RO permeate from the industry and was used as the feed water for the R-MCDI system, demonstrating excellent desalination performance and stability. This finding exhibits the potential of R-MCDI technology in the purification of low-salinity water, offering a novel perspective on water reclamation.

KEYWORDS

Membrane capacitive deionization; Ion-exchange resin; Energy recovery; Pure water; Reclaimed water; Electrosorption

Synthesis of carbon nanomaterial from wetland waste as water hyacinth using chemical vapor deposition method

Nayaya Saokhwan[1], Chonthica Supad[1], Athitaya Phonrat[1], Nisarut Phansiri[2], Suparat Sasrimuang[1]

[1]Department of Chemical Engineering, Faculty of Engineering, Ubon Ratchathani University, Ubon Ratchathani, 34190, Thailand
[2]Department of Electrical and Electronics Engineering, Faculty of Engineering, Ubon Ratchathani University, Ubon Ratchathani, 34190, Thailand

**Corresponding author：suparat.s@ubu.ac.th; Tel：+668-0415-4235*

ABSTRACT

This study aimed to synthesize carbon nanomaterials (CNMs) from water hyacinth (WH) without adding any catalyst using the chemical vapor deposition (CVD) method. The water hyacinth wetland plants were harvested from the pond of the constructed wetland at Ubon Ratchathani University. The CNMs were synthesized without catalyst addition at 700 °C using acetylene as the carbon source. The morphology, chemical elements, and graphite pattern were characterized by a Field Emission Scanning Electron Microscope (FESEM), Energy Dispersive X-Ray Spectroscopy (EDS), and X-Ray diffraction analysis (XRD). The results showed the presence of Fe in the roots of the samples, which acted as a catalyst for the formation of carbon nanotubes. The SEM results showed that the synthesized CNMs were bamboo-like carbon nanotubes type (B-CNTs), and the strongest peak of XRD at $2\theta = 26.44°$ represented the graphitic carbon. This work successfully converts waste into valuable material.

KEYWORDS

Water hyacinth; Carbon nanomaterials; bamboo-like carbon nanotubes; Chemical vapor deposition; Wetland plants

Synthesis of carbon nanotubes from Durian husks using a microwave oven

Sirikanya Pimsaran[1], Kanlayanee Nonsiri[1], Chonthicha Anantepa[1], Wara Sa-ngajai[1], Nisarut Phansiri[2] and Suparat Sasrimuang[1]

[1]Department of Chemical Engineering, Faculty of Engineering, Ubon Ratchathani University, Ubon Ratchathani, 34190, Thailand
[2]Department of Electrical and Electronics Engineering, Faculty of Engineering, Ubon Ratchathani University, Ubon Ratchathani, 34190, Thailand

**Corresponding author：suparat.s@ubu.ac.th; Tel：+668-0415-4235*

ABSTRACT

Durian is an important fruit in Thailand, not only consumed locally but also generating a significant amount of export revenue each year. However, the high consumption of both the fruit and processed forms of it results in a large amount of durian husks being discarded as solid waste, leading to environmental problems. To address this issue, this study aimed to synthesize carbon nanotubes (CNTs) from durian husks using an 800-watt microwave oven for 3 minutes. The durian husks were first dried, finely ground, and then divided into three groups of 180 μm, 300 μm, and 1 mm for the synthesis process. Ferrocene was used as a catalyst. The morphology, chemical elements, and chemical bonds were characterized by Field Emission Scanning Electron Microscope (FESEM), Energy Dispersive X-Ray Spectroscopy (EDS), and Fourier Transform Infrared Spectroscopy (FT-IR). The results showed that the growth of CNTs was directly proportional to the size of the dried durian husks, and microwave ovens can efficiently synthesize carbon nanotubes (CNTs). The CNT synthesis process is short and cost-effective.

KEYWORDS

Durian husk; Carbon nanotubes; Microwave oven

A Study for Improvement and Centralization of Safe Water Management and Sanitation for the Public – Adapting Ecotecture to Natural and Built Environment, In the Case of Las Piñas City, Philippines

Rejmen Sam Cabigao*, Arianne Joy Dullas

School of Architecture, Industrial Design, and the Built Environment, Mapúa University-Intramuros, Manila 1002, Philippines

**Corresponding author：rscabigao@mymail.mapua.edu.ph ; Tel：09260185251, ajdullas@mapua.edu.ph*

ABSTRACT

One of the biggest problems that Filipinos face is having difficulties with water supply in their homes. In the Philippines, a lack of water is nothing new. At least 10 percent of the population still does not have access to clean water. As a result, the researcher set out to investigate the dangers and hazards that the environment poses to people and their living arrangements and habits, which might impact the community's health. This study aims to create an innovative tourism hotel structure that will adapt ecotecture and enhance Las Pinas City's safe water management and sanitation facility.

Additionally, the study will focus on developing ecotecture, passive designs that can be used for the proposed facility and benefit the water biodiversity and its intended users. The research aims to identify solutions to the community's shared spaces and the lack of clean and safe water in Las Pinas. This involves assessing the current state of distribution of safe-water in the area, along with their experiences and practices. As a result, the majority of people despise the location they now live because they do not know if they will have access to clean, safe water. The pandemic impacts both the security and quality of clean water. Waste and sanitation are the problems in the Las Pinas ecosystem, as the study has shown. As a result, along with the provision of suitable sanitary facilities, the provision of the improvement of the existing wastewater treatment infrastructure may help to improve the living conditions of the residents who do not have access to enough safe water.

KEYWORDS

Shortage of water supply, ecotecture, wastewater treatment, Built Environment, Pandemic

Sustainable Ecotourism Development

Titiek Rachmawati*, Nekky Rahmiyati, Ontot Murwato, Ahmad Maqsudi

Faculty of Economics and Business, Universitas 17 Agustus 1945 Surabaya, Surabaya, Indonesia

**Corresponding author：titiekrachmawati@untag-sby.ac.id*

ABSTRACT

Ecotourism is a type of tourism that supports conservation efforts. The definition of conservation is regular management of the preservation or protection of natural resources to prevent damage and destruction. The research was conducted at "Wana Wisata Grape", which is located in Kresek Village, Wungu District, Madiun Regency, East Java Province, Indonesia or about 13 kilometers southeast of Madiun city. The location of "Wana Wisata Grape" is on the edge of a teak forest which is the Madiun "Forest Management Unit" (KPH) area with an area of about 1.5 hectares. This research was conducted with a qualitative descriptive method. The results of this study are the development of sustainable ecotourism in the "Grape Tourism Ecotourism" area depending on the involvement of stakeholders. This ecotourism manager must be able to accommodate stakeholders so that the sustainability of this ecotourism is carried out.It is hoped that tourism in conservation areas will have many advantages and as a source of area financing. "Wana Wisata Grape" includes areas managed primarily to support the sustainability of an ecosystem. The main targets of the management are environmental protection, sustainable use of ecosystems and the preservation of species and biological diversity. The main targets of the management are environmental protection, sustainable use of ecosystems and the preservation of species and biological diversity. The next target is the protection of the jungle and the management of traditional culture. Finally the potential and achievable targets are tourism and recreation, sustainable use of ecosystems, scientific research and Education. The conclusion from this research is that infrastructure is improved, promotion is improved, local economy is enhanced and local government policy support for ecotourism development is increased, especially for "Wana Wisata Grape".

KEYWORDS

Ecotourism; Sustainable; Conservation; Protection; Management of traditional culture.

Natural Tourist Attraction Of Kelimutu Lake

Veronika Yuliani Moo*

Department of Law, Universitas 17 Agustus 1945 Surabaya

**Corresponding author：veronikayuliani89@gmail.com; tel：081239999602*

ABSTRACT

The kelimutu lake in the village of pemo, kab. Ende, flores of east east is a lake that has three different colors and can change over time. Keli means 'mountain' and the word "mutu" means boiling. Since its unique feature is the only 3 - color lake in the east southeast nusa, making Kelimutu lake enshrined in the Indonesian currency of the five thousand rupiah denomination issued in 1992. The three lakes have an area of about 1,21,000 square feet [1,051,000 sq m] with a volume of 1,292 million cubic feet [1,292 million cu m] of water. The boundary of the lake is a narrow stone wall that squatters steeply and steeply, with a 70-degree pitch. Besides, the kelimutu lake is also supported by other potential such as： traditional souvenirs like bags, key chains, campground, agro-tourism, and beautiful view. It has proven to increase the opportunity for local communities on the tourism sector and also helps local to get jobs. This research uses data analysis methods and the author's personal experience of visiting Lake Kelimutu in 2020. Then it will be analyze according to the Law of the Republic of Indonesia Number 10 of 2009 concerning Tourism. Based on article 1 paragraph 5 of law no. 10 of 2009 which contains "natural attraction is everything that has uniqueness, beauty, and value in the form of diversity of natural, cultural, and man-made assets that become the target or destination of tourist visits." So, it is hoped that Lake Kelimutu Nature Tourism will continue to be maintained and preserved so that it has the potential to advance the economy of the local community and also hoped that security facilities and hygiene facilites around the lake will be improved so that tourists can feel safe and feel comfort to visiting Kelimutu.

KEYWORDS

Society; Natural; Tourism; Potential; Economy

Adapting Attention Restoration Theory through Biophilic Design for the Modernization of Romblon State University Main Campus

Mary Margareth G. Uy*, and Arianne Joy Q. Dullas

School of Architecture, Industrial Design, and the Built Environment, Mapúa University- Intramuros, Manila 1002, Philippines

**Corresponding author：rvbsevilla@mymail.mapua.edu.ph; Tel：+63916-7389-171*

ABSTRACT

Romblon State University main campus has the most students located at Odiongan, Romblon. To address the need for improvements at the university, as well as the number of student suicides and lack of modernization, Attention Restoration Theory must be integrated through Biophilic Design, which conceptualizes and comprehends "nature" in architectural design, as a medium of sustainable development to produce the right environment and support; to produce a greener, more sustainable, and healthier community. This research will only discuss applying attention restoration theory to modernizing Romblon State University's main campus with biophilic design and sustainable practices. It's the only topic. Finding biophilic and sustainable methods, concepts, and practices that can be applied to meet environmental needs and improve user conditions. This study's scope and limitations focus on reorganizing Romblon State University's Main Campus. Analyzing people's attitudes and behaviors quantitatively will motivate the design proponent to propose modernizing Romblon State University's main campus. Researchers survey a large number of users to collect unbiased, quantifiable data about them in relevant situations. This quantitative study will involve students, faculty, and staff. The quantitative study that will inspire the design proponent to propose modernizing Romblon State University's main campus will test assumptions about individual attitudes and behaviors. This descriptive quantitative research involves students, faculty, and staff of the Main Campus of Romblon State University. This research suggests modernizing Romblon State University's main campus with Attention Restoration Theory and Biophilic Design. The university must be modernized to help students, faculty, and staff achieve their academic goals. This study is for university modernization researchers and architects. The researcher suggests that other public universities conduct their own versions of this study to learn about modernization's challenges and opportunities and what they can do to advance.

KEYWORDS

Attention Restoration Theory; Biophilic Design; Modernization; Sustainable development

Company Value of State-Owned Enterprises

Hwihanus, Maulidah Narastri *

Economic and Business Fakulty, Universitas 17 Agustus 1945 Surabaya, Indonesia

**Corresponding author：maulidah@untag-sby.ac.id*

ABSTRACT

This study aims to determine the influence of ownership structure, financial performance, macro fundamentals and Corporate Social Responsibility Disclosure on the Company Value of State-Owned Enterprises. This research method is quantitative with explanatory techniques that explain the causal relationship between variables in a phenomenon. This study uses secondary data on the Indonesia Stock Exchange on State-Owned Enterprises as many as 12 out of 20 companies from 2010 - 2021. The analysis used Structural Equation Model Partial Least Square. The results showed that Corporate Social Responsibility Disclosure (CSRD) on ownership structure has a negative and insignificant effect where the higher the CSRD funds given to the community resulted in the role of ownership structure in this case the government becomes high. CSRD provided by the community has a negative and insignificant influence on the financial performance produced by management in maximizing operational activities. CSRD has a negative and insignificant effect on firm value, if the low CSRD provided by the community will affect the increasing firm value. Macro fundamentals, namely the exchange rate and gross domestic product, have a positive and insignificant effect on the ownership structure that will have an impact on ownership. Macro fundamentals have a negative and significant effect on financial performance, which is stated that the exchange rate and gross domestic product increase will bring decreased financial performance on ROA and ROE. Macro fundamentals have a positive and non-significant effect on firm value. Government-owned ownership structure has a negative and significant effect on financial performance by management to maximize operations. The ownership structure has a negative and significant effect, indicating that strong government ownership of the company's value will increase investor confidence to invest. Financial performance has a positive and significant effect that is in line with the company's operational activities will increase the sustainable value of the company.

KEYWORDS

Company value; Ownership structure; Macro fundamentals; Corporate social responsibility disclosure; financial performance

Chlorinated Ethenes： A Scenario in the Philippines

Donamel M. Saiyari*

Environment and Biotechnology Division, Industrial Technology and Development Institute, Department of Science and Technology, Bicutan, Taguig City, 1631 Philippines

**Corresponding author：dmsaiyari@itdi.dost.gov.ph; Tel：+63-2-83837-750 to 69*

ABSTRACT

Chlorinated ethenes (CE) are ubiquitous in inland surface waters that will eventually go to groundwater. CEs are challenging to remediate due to the recalcitrant properties of the chemicals. Its existence has been a concern for more than five decades as it represents a significant threat to human and ecological health due to its extreme toxicity and carcinogenicity. It also has adverse human health effects, such as dermal and hepatic carcinogenic. In the Philippines in 2019, options for groundwater for drinking water sources were invigorated due to limited surface water sources, especially in Metro Manila and its nearby provinces. Thus, stringent water quality monitoring is necessary to ensure ecological and public health safety. This study assessed the current CEs status in the Philippines. It is good to know that these CEs are already part of the Priority Chemical List of the Department of Environment and Natural Resources-Environmental Management Bureau. Monitoring wells around the Philippine Economic Zones to regularly monitor the potential CEs contamination still needs to be in-placed. The result of the study will postulate knowledge on establishing strategic water quality management, programs, and policies on the water quality effluent pertinent to CEs in various water bodies in the Philippines.

KEYWORDS

Chlorinated ethenes, Health Hazard, Philippines, Priority Chemical List

Biodegradation of Volatile Organic Compounds and Abatement of CO_2 Using Algal-Bacterial Consortia in Photobioreactor： An offramp for Circular Economy Context

Rekich R. Pahunang[2,3,*], Florencio C. Ballesteros Jr.[3], Giuseppina Oliva[1], Tiziano Zarra[1], Vincenzo Belgiorno[1], and Vincenzo Naddeo[1]

[1]*Sanitary Environmental Engineering Division (SEED), Department of Civil Engineering, University of Salerno, via Giovanni Paolo II, Fisciano, SA, Italy*
[2]*Environmental Engineering Program, National Graduate School of Engineering, University of the Philippines, Diliman, Quezon City, Philippines*
Department of Chemical Engineering, University of the Philippines, Diliman, Quezon City, 1101 Philippines
[3]**Department of Environmental Engineering, Western Mindanao State University, Normal Rd, Zamboanga, 7000 Zamboanga del Sur*

**Corresponding author：Pahunang.rekich@wmsu.edu.ph; Tel：+63 949 787 4849*

ABSTRACT

The emission of volatile organic compounds (VOC) in the atmosphere may affect human health and the environment. Moreover, an international treaty was established to further restrain the increase of temperature to 1.5^{o}C above pre-industrial levels. Thus, this study explored the use of an algal-bacterial photobioreactor for the biodegradation of toluene as the model VOC and abatement and CO_2. Dairy wastewater was used as the nutrients for the cultivation of microalgae and bacteria and the biomass produced was evaluated according to total suspended solids and lipid concentration. The result showed that the algal-bacterial photobioreactor has biodegraded the toluene up to 72.48% ±16.94 with an average inlet load of 20.83 g m^3 d^{-1} ±7.25 g m^3 d^{-1}. Further, CO_2 concentrations from the outlet of the algal-bacterial photobioreactor were able to measure at a concentration ranging from 0.22 ±0.16 g m^{-3} h^{-1} to 0.83 ±0.58 g m^{-3} h^{-1} that is lower than the ambient CO_2 concentration. The algal-bacterial biomass produced reached up to 2.30 g L^{-1} ±0.97 g L^{-1} with a lipid concentration of 43.61%. This study presents an alternative technology that supports the context of a circular economy for the degradation of VOC and abatement of CO_2.

KEYWORDS

Algal-bacterial consortia; biodegradation of VOC; algal-bacterial photobioreactor; CO_2 abatement; circular economy

FeS_2 Activated Persulfate for Direct Azo Dye degradation： Key Assisting Process and Mechanism Identification

Chih-Huang Weng*, Chun-Yu Chang, and Yu-Chun Huang

Department of Civil Engineering, I-Shou University, Kaohsiung, Taiwan 84001, R.O.C.

**Corresponding author： chweng@isu.edu.tw*

This study was supported fully by the National Science and Technology Council (MOST 109-2221-E-214-008-MY3)

ABSTRACT

Although iron disulfide (FeS_2) has been shown to activate persulfate (PS) to decolour dye, the key assisting process and identification reaction mechanism still need to be clarified. This study used direct red 23 (DR23) as a surrogate to determine the effective process assisting FeS2-activated PS (PS/FeS_2). Results show that both the assist of heat (55℃) or ultrasound (US 88W/cm^2) in the PS/FeS_2 offer great benefits for enhancing the breakdown of the DR23 chromophore structures. Both processes could degrade more than 95% of $5x10^{-5}$ M DR23 within 30 min with 0.2 g/L FeS_2 and $5x10^{-4}$ M PS. The DR23 degradation kinetics follows a pseudo-1st-order model with a relatively low apparent activation energy (46.48 kJ/mol), implying high oxidative affinity in a higher temperature reaction. The quenching tests and electron paramagnetic resonance (EPR) results revealed that both $HO^{\bullet}$ and $SO4^{\bullet-}$ were the main radicals in PS/FeS_2 responsible for dye degradation and the minor $O_2^{\bullet-}$, whereupon both $SO_4^{\bullet-}$ and HO• played an indispensable role in the PS/FeS_2 oxidative process. The couple of O_2 in PS/FeS_2 (PS/FeS_2/O_2) could increase 10% of $SO4^{\bullet-}$ production. The S element on the surface of FeS_2 can reduce the Fe^{3+} to Fe^{2+}, which in turn makes an oxidative reaction cycle for dye degradation more effective. Results also show that adding FeCl3 in PS/FeS_2 can improve dye degradation. It was evidenced that the production of $HO^{\bullet}$ radicals is relatively higher than that $SO4^{\bullet-}$ radicals in PS/FeS_2. However, the $SO4^{\bullet-}$ radicals are substantially increased in PS/FeS_2/$FeCl_3$ and PS/FeS_2/$FeCl_3$/O_2. Subsequently, a cyclic oxidative reaction mechanism was proposed based on the results of EPR, X-ray Photoelectron Spectroscopy (XPS) analysis, and the addition of $FeCl_3$ and oxygen in PS/FeS_2.

KEYWORDS

Iron disulfide; Direct red 23;Ultrasound; Persulfate; Heat; Cyclic reaction

Fluidized-bed homogeneous crystallization technology as a treatment unit before sludge co-digestion to recover magnesium ammonium phosphate in wastewater

Tsan-Huai Huang, Zhen Zong Xiao, Ming-Chun Lu*

Department of Environmental Engineering, National Chung Hsing University, Taichung 71710, Taiwan

**Corresponding author：mmclu@ nchu.edu.tw; Tel：+886-4-22840441 ext 537*

ABSTRACT

Food, energy and climate change are issues that human beings must face and solve together to survive on the earth. COP26 announced： Wood for Good, in addition to greatly reducing fossil energy and accelerating the development of renewable energy, it also reminded that carbon sinks are a positive possible solution to carbon neutrality in 2050. The government has set 2022 as the first year of net zero, and proposed four major axes including carbon dioxide reduction, carbon sinks, green energy, and recycling. In terms of circular development, biogas energy has attracted more and more attention from all over the world in recent years, mainly using biomass biogas energy to generate electricity and develop integrated circular agriculture. Industrial liquid wastewater is rich in nitrogen and phosphorus elements. How to effectively utilize resources and maintain sufficient carbon, nitrogen, and phosphorus ratios in anaerobic co-digestion for continuous reactions can also create new sources of carbon sinks by increasing the organic matter of farmland soil. In this study, ammonium phosphate was generated by fluidized bed homogeneous crystallization technology to achieve the purpose of front-end recycling, and the optimal control parameters were found by recycling material source particles so that the concentrations of phosphorus and nitrogen were between 180 ppm and 20 ppm respectively for anaerobic co-recycling in the latter stage. The application of digestion treatment is expected to improve the problems of high water content sludge and extensive land occupation caused by traditional chemical precipitation methods, so as to synthesize and recover low water content and high purity crystal particles to achieve the purpose of product recycling and resource reuse. And the cross-sectional area loading experiment shows that under the high cross-sectional area loading pH 8.5 reaction, the concentration of phosphate radicals drops from 415 ppm to 192 ppm, the concentration of nitrogen drops from 37 ppm to 20 ppm, and its particle size> 0.72 mm, And maintained in the range of co-digestion treatment, so this cross-sectional area load and pH are regarded as the best parameter conditions in this study.

KEYWORDS

Magnesium ammonium phosphate, co-digestion, fluidized bed reactor, homogeneous crystallization, recycling of resources.

"Kaangtánan"： A Redevelopment of Iloilo's Tienda Mayor Through Transformative Continuity

Roselle Baylon*, Triciah Nadine Evangelista, Mary Louise Fermano, and Ar. Ma. Theresa Austria

Department of Architecture, University of San Agustin-Iloilo, Iloilo City 5000, Philippines

**Corresponding author：rbaylon@usa.edu.ph; maustria@usa.edu.ph*

ABSTRACT

For centuries, public markets have been an integral part of the trading system and have had a significant impact on people's cultures. However, due to the ever-changing environment, they frequently underwent demolition. This paper investigated the existing condition and historical significance of the Central Market known as Tienda Mayor in Iloilo City, Philippines. It is a 20th century Art Deco building that underwent renovations in the past decade and is currently recognized as part of the cultural heritage zone. The study utilized a mixed method through post-occupancy evaluation (POE), on-site survey, and interview. The survey respondents consist of 470 people (shoppers, vendors, and tourists), while the interview respondents are building administrators. Results showed that the market's significance lies within its heritage values (historical, cultural, and architectural values) and its authenticity is mainly derived from its local products; however, the integrity of the market attributes is at risk due to deterioration and little patronage from the public. Furthermore, survey respondents recognized that the market's sanitation, floodproofing, accessibility, and ventilation have poor quality. Overall, the study concluded that redevelopment enables the market to adapt to its environment in order to thrive sustainably. Hence it shall consider the preservation, and promotion of its significance based on the market's founded cultural heritage attributes to avoid social neglect. As a conceptual design approach, Transformative Continuity (persistent, autonomous and anticipatory adaptation) was applied requiring preservation of historical landscape and adding of new building elements that conforms to its changing environment. The architectural concept was described as "Kaangtánan" a hiligaynon word which means to connect and refers to a bond of relationship. In context it is the connection and relationship of the society to its market as a cultural heritage.

KEYWORDS

Architecture; Public Market; Heritage Values; Transformative Continuity

Blood-lead levels worldwide from exposure to contaminated drinking water

Gabriel Lloyd C. Malinay[1], Gayle Ann Marie B. Sarmiento[1], Dennisse G. Del Rosario[1] and Carl Francis Z. Lacson[1,2,*]

[1]Department of Environmental and Sanitary Engineering, National University - Manila, Manila 1008, Philippines
[2] Center of Excellence in Environmental Catalysis and Adsorption, Faculty of Engineering, Thammasat University, Pathum Thani 12120, Thailand

**Corresponding author： cfzlacson@national-u.edu.ph*

ABSTRACT

Lead (Pb) is a harmful metal that affects public health through exposure and ingestion. This review paper examined blood-lead levels (BLL) in people worldwide focusing on the USA, China, Europe, Africa, and southeast Asian countries. Moreover, lead exposure from occupational settings was also reviewed such as petrochemical and lead-battery industries, where workers are at high risk of lead exposure. The study compared acceptable BLL set by the World Health Organization and evaluated the importance of BLL in different demographic groups. This revealed that all countries examined exceeded the safe BLL of 5 μg/dL with exposure to Pb associated with neurocognitive health problems. Consequently, this review can call lawmakers, lead industries and other stakeholders to revisit current practices and to develop measures reducing the adverse effect of lead particularly in the occupational setting.

KEYWORDS

Pb, lead toxicity, lead water standards, lead occupational exposure, lead battery, neurotoxicity,

Innovative Revolving Algae Biofilm Reactors for Nutrients and Organic Matter Removal from Wastewater

Vo Thi Dieu Hien[1,*], Nguyen Thi My Duyen[2,3], Le Thi Ngoc Chau[1], Bui Xuan Thanh[2,3]

[1]Faculty of Environmental and Food Engineering, Nguyen Tat Thanh University, Ho Chi Minh City, Vietnam, 700000, vtdhien@ntt.edu.vn
[2]Key Laboratory of Advanced Waste Treatment Technology, Ho Chi Minh City University of Technology (HCMUT), Vietnam National University Ho Chi Minh (VNU-HCM), Thu Duc city, Ho Chi Minh City, Vietnam, 700000.
[3]Faculty of Environment and Natural Resources, Ho Chi Minh City University of Technology (HCMUT), 268 Ly Thuong Kiet street, district 10, Ho Chi Minh City, Vietnam, 700000.

**Corresponding author：vtdhien@ntt.edu.vn ; Tel：+84-975746299*

ABSTRACT

An innovative algae biofilm technology is being pilot tested for potential application as a sustainable means for nitrogen (N) and phosphorus (P) recovery at wastewater resource recovery facilities. This technology uses revolving belts that extend vertically from the wastewater to provide sunlight for microalgae growth. This revolving algae biofilm reactor (RAB) has demonstrated the ability to recover nutrients in a smaller area than conventional ponds and ditches. The algae biomass is easily harvested from biofilms with a scraping mechanism, providing raw materials to produce bioplastics, fertilizers, biofuels, feed aquaculture and other sustainable products. This study was carried out with the aim of evaluating the ability to remove nutrients, organic matter and produce algal biomass for synthetic wastewater. The results show treatment efficiency (removal rate) achieved 70.8 ± 8.5% (5.6 ± 1.4 mg/L.day) for COD, 52 ± 17.1% (2.0 ± 0.8 mg/L.day) for TKN, 54.6 ± 15.8% (2.6 ± 1 mg/L.day) for NH_4^+-N, 54.3 ± 14.9% (0.8 ± 0.3 mg/L.day) for TP. Yield of *Chlorella vulgarus* algae biomass was 2.8 ± 2.6 g/m^2.day (suspended biomass) and 1.4 ± 1.3 g/m^2.day (attached biomass).This study has demonstrated that the RAB system is an effective method to recover nutrients and algal biomass production from wastewater.

KEYWORDS

Revolving algae biofilm; nutrient removal; algae biomass; wastewater treatment

Effect of different reactor designs on crystallization efficiency of calcium carbonate for carbon dioxide capture

Yu-Chieh Chou, Ming-Chun Lu*

Department of Environmental Engineering, National Chung Hsing University, Taichung 40227, Taiwan

**Corresponding author: mmclu@nchu.edu.tw; Tel: +886-4-22840441 ext 537*

ABSTRACT

Global warming is an increasingly concerning environmental issue that has been brought on by the emissions of greenhouse gases, primarily carbon dioxide, since the industrial revolution. This has caused climate irregularities that can have devastating impacts on the environment, human activities, and life safety, making the reduction of CO_2 emissions an urgent priority. As such, this study aims to investigate the potential of combining carbon dioxide alkaline absorption with fluidized bed homogenous crystallization (FBHC) technology. This process chemically converts carbon dioxide from factory flue gas into carbonate, which then enters the fluidized bed to form calcium carbonate particles with calcium ions. However, the highly concentrated effluent of the absorption reactor can interfere with the reaction of granulation when connected to the crystallization reactor. Thus, two types of reactors have been designed: a one-stage reactor and a two-stage reactor. The tube diameter of part of the reaction zone of the two-stage reactor was increased, providing more space for crystal growth, a buffer zone for flow rate variation, and preventing excessive sediment floating, while also matching the high concentration of the inlet flow. Experiments revealed that when pH, calcium ion cross-sectional area load, and carbonate cross-sectional area load levels were set to 9.0±0.3, 61.8 kg/m^2, and 42.5 kg/m^2, respectively, the two-stage reactor achieved a 98.7% removal ratio and 88.9% granulation ratio, both of which were higher than the one-stage reactor. This indicates that increasing the tube diameter of part of the reaction zone can enhance the homogeneous crystallization reaction efficiency.

KEYWORDS

carbon dioxide capture; FBHC; homogeneous crystallization; calcium carbonate

Design Thinking and Future-Proofing your R&D Framework towards a Sustainable and Circular Economy Agenda

Rose Marie O. Mendoza*

Department of Trade and Industry-Design Center of the Philippines, Pasay City 1300, Philippines

Corresponding author：rosemarie.mendoza@designcenter.gov.ph; Tel：+639171273728

ABSTRACT

With the global exodus on mitigating climate change, sustainability and circular economy, private and public sectors, the industry, research institutions and the academe are faced with the immense responsibility of generating products, technology, techniques, and processes that does not only technically offer solutions to the problems but also solutions that adheres to sustainability and circularity. These have transformed the way research and development is being implemented requiring present-focused initiatives to prepare it for the coming future. Goods and technology as well as techniques and process are no longer geared to mere functionality but also towards a more compliant, scalable, and flexible outputs, all geared towards closing the loop. Design thinking has been one of the most powerful tools to provide user-centered as well as human-centered and innovative ways of addressing problems of society. Application of design thinking to the research process may lead to a more sustainable and circular approach to impact the community, the economy, and the society.

KEYWORDS

Future-proof, design thinking, design research, sustainability, circular.

Evaluation of Driven Precast Concrete Pile Capacity from Dynamic Load Test

Maria Cecilia M. Marcos, Vuangh Erick B. Barrantes, and Edward Caezar D. Alimorong*

Civil Engineering Department, Adamson University, Manila 1000, Philippines

**Corresponding author：edward.caezar.alimorong@adamson.edu.ph; Tel：+63 977 781 4617*

ABSTRACT

A driven precast concrete pile is a pre-fabricated concrete column constructed using ordinary reinforcement. Driven precast concrete (PC) piles are widely used as deep foundations for high rise buildings, towers, highway structures, and others. Pile capacity is the total strength of pile, which is an amalgamation of both frictional resistance of the shaft and end bearing of the toe and estimated using analytical models. To validate this prediction, pile load test is normally conducted. The most commonly used methods of pile load tests are static and the dynamic pile testing. In this study, pile capacity derived from dynamic load tests through Case Pile Wave Analysis Program (CAPWAP) were thoroughly examined to assess their relative merits and reliability for both drained and undrained loading condition. Based on the statistical results, driven PC pile capacities generated from PDA test is in good arrangement with static load test interpreted capacities for both drained and undrained loading condition. The analysis provides acceptable COV values ranging from 0.28 to 0.44 and 0.27 to 0.72 for drained and undrained loading condition, respectively. Furthermore, in undrained loading condition, graphical results show that dynamic load test is reliable and acceptable in estimating pile capacity for both end of initial drive (EOD) and beginning of restrike (BOR) stages, wherein the regression analysis result (r-quared) is ranging from 0.72 to 0.84. On the other hand, regression analysis provides a fair r-squared values of 0.47 to 0.75 in drained loading condition for EOD and BOR stage.

KEYWORDS

Driven Pile; Precast concrete; Pile capacity; Pile foundation; Case Pile Wave Analysis Program; Dynamic load test

Pulverized Glass as a Partial Replacement for Sand in Non-Load-Bearing Concrete Hollow Blocks with Malunggay Seed (Moringa Oleifera) as an Additive

Angela Santos, Danica Mae Sasaki, James Brylle Subista, Jerome Jordan Famadico, Crispin Lictaoa* and Eon Meraña

Department of Civil Engineering, Adamson University, Manila 1000, Philippines

**Corresponding author：crispin.lictaoa@adamson.edu.ph; Tel：+632-917-1861874*

ABSTRACT

The Philippines, a tropical country, is known for having many moringa trees that can usually grow almost everywhere. The researchers decided to study the Moringa oleifera seed as an additive, these natural resources are usually and easily found in backyard gardens in the Philippines and are frequently disposed of as waste. Due to the local related studies of Moringa oleifera, its industry in the Philippines is being developed and improved for its production (Palada, 2017).

This study aims to determine the physical and mechanical properties of concrete hollow blocks with malunggay seed as an additive in terms of water absorption, density, and compressive strength and finally determine the optimum percentage inclusion of malunggay seed in concrete hollow blocks. The concrete hollow blocks are produced with 0.2%, 0.4%, and 0.6% malunggay seeds as an additive and substituting 10%, 15%, and 20% pulverized glass as a partial replacement for sand. The test results showed that 0.2% of malunggay seed added to hollow blocks provided the best compressive strength. Additionally, the study discovered that hollow blocks with an additive of 0.2% malunggay seed were the best choice in terms of density and water absorption.

KEYWORDS

concrete hollow blocks, additive, malunggay seed, water absorption, and compressive strength

Evaluation of sodium persulfate sustained release rod application within low permeability silty soil

Justine Kei T. Lim [1], Chenju Liang [2], Mark Daniel de Luna [3]

[1] Environmental Engineering Graduate Program, University of Philippines-Diliman, Quezon City 1800, Philippines
[2] Department of Environmental Engineering Graduate Program, National Chung Hsing University, Taichung, Taiwan 402, R.O.C.*
[3] Department of Chemical Engineering, University of Philippines-Diliman, Quezon City 1800, Philippines

** Corresponding author：cliang@nchu.edu.tw; Tel：+886-4-22856610*

ABSTRACT

Desorption and back diffusion of a chlorinated solvent such as trichloroethylene (TCE) from the low permeability zone (LPZ) to the transmissive zone in the subsurface exhibits a challenge in remediation. The study was to investigate the in situ chemical oxidation (ISCO) using a sodium persulfate sustained-release rod (SPS SR-Rod) for potential remediation application of TCE contamination in the LPZ within a two-dimensional sand tank. The objective was to determine the SPS concentration distribution contour when placing the SPS SR-Rod atop and within the LPZ. A laboratory scale, 2D tank system (100 cm L x 5 cm W x 50 cm H) represents a distinct type of LPZ in the geologic settings, exhibiting a saturated dual permeability porous media. The SPS SR-Rod placed within the LPZ released an average ~338 mg/L concentration contour from at least 10 to 15 cm lateral distance from the rod. When the placement of the rod was atop LPZ, continuous determination of persulfate concentrations at an average value of ~57 mg/L within the LPZ was observed comparably at low and high hydraulic gradients of 0.01 and 0.05, respectively. The persistence of persulfate in the LPZ and its slow release in the subsurface supports that the SPS SR-Rod may serve as an efficient controlled release material in extending the ISCO remediation into LPZ and its surrounding environment.

KEYWORDS

Groundwater contamination; Controlled release; Trichloroethylene; In Situ Chemical Oxidation (ISCO); Long term remediation; Contaminant rebound

Automatic activated carbon adsorption and regeneration system for on-site treatment of groundwater and gas contaminated with organic compounds

Chenju Liang[1,*], Chi-Wei Wang[2], Fang-Jyun Lin[1]

[1] *Department of Environmental Engineering, National Chung Hsing University, 145 Xingda Road, Taichung, 402, Taiwan*
[2] *Department of Environmental Engineering, Da-Yeh University, 168 University Road, Dacun, Changhua, 515006, Taiwan*

**Corresponding author：cliang@nchu.edu.tw; Tel：+886-4-2284-0441*

ABSTRACT

Organic contaminants are a major environmental concern in Taiwan, with around 70% of contaminated sites affected by them. Of these, 32% are contaminated with chlorinated aliphatic hydrocarbons (CAHs), making their remediation a crucial issue. Pump and Treat (P&T) and Soil Vapor Extraction (SVE) are common methods for remediating soil and groundwater contaminated with organic compounds. P&T actively pumps contaminated groundwater, while SVE removes volatile organic compounds from the vadose zone. However, the significant concentration variation in exhaust gas extracted by SVE means that available air pollution treatment instruments like thermal oxidation systems cannot be used in conjunction with a single SVE system. Therefore, activated carbon (AC) adsorption has become the most prevalent method for treating SVE exhaust gas, due to its effectiveness, efficiency, and convenience. The AC adsorption/regeneration system with persulfate activation process was developed to treat exhaust gas from SVE and effluent from P&T at the remediation site. The AC treatment system can reduce remediation costs and effectively control and treat stationary pollution sources, such as exhaust gas from SVE operations or liquid discharge from P&T. This system can enhance the efficiency of P&T and SVE methods, preventing secondary environmental contamination.

KEYWORDS

Pump and Treat; Soil vapor extraction; Organic contaminant; Activated carbon; Regeneration

Developing machine learning models of two anaerobic granular sludge bioreactors for whiskey distillery wastewater treatment

Cheng-Shu You[1], Justin Chun-Te Lin[2,*]

[1] *Department of Applied Mathematics, Feng Chia University, Taichung 40724, Taiwan, R.O.C.*
[2] *Department of Environmental Engineering and Science, Feng Chia University, Taichung 40724, Taiwan, R.O.C.*

** Corresponding author's email：jlin0623@gmail.com ; Tel：+886-4-24517250 # 5216*

ABSTRACT

Anaerobic granular sludges (AnGS) were applied for the treatment of wastewater mixing high-strength spent wash (soluble COD has been measured as 37,750 $mg \cdot L^{-1}$) from malt whisky manufacturing with daily sewage at a distillery in Taiwan. Two full-scale high-rate bioreactors, namely expanded granular sludge bed (EGSB) and external circulation sludge bed (ECSB), containing AnGS was continuously running in parallel since 2017. Both bioreactors have similar structure with the same diameter of 6.5 m, but the ECSB was higher (15.9 m) than the EGSB (14 m) and has an additional neutralization tank for external circulation. Differences of the two bioreactors are two gas–liquid–solid (GLS) separators in the former with higher upflow velocity (5 $m \cdot h^{-1}$), while the latter only possess one GLS separator and lower upflow velocity (2 $m \cdot h^{-1}$). Even though high variance of batch whisky manufacturing wastewater, the bioreactors need stable feed, which is the challenge for the local operational engineers have to dealing with. As machine learning (ML) models are developing rapidly in the recent years, we would like to apply artificial intelligence (AI) technologies and algorithms for an aid as a practical reference for local engineers and managers in the daily operation. In the searching of feasible ML models in the MBRs, we tested multiple methods, including Linear/Ridge/Lasso Regression, Support Vector Regression (SVR), Random Forest, and neural networks. 75% of overall data are used to train ML models and 25% are spilled to validate the developed models. Five wastewater parameters, including chemical oxygen demand (COD), volatile acidity (VFA), alkalinity (Alk), pH and temperatures, of influent and effluent as well as SVI_5 for characterizing settling of sludges are both monitored for the two full-scale bioreactors. The accumulated data from the last six years are used as input and output parameters in this study. The models' performance is evaluated using statistical metrics including R2 score, root mean squared error, and mean absolute error. Accordingly, we would like to develop a feasible ML model as a practical guide for quick response to emergency conditions in the distillery and as a reference for the operations of similar wastewater treatment plants.

KEYWORDS

Anaerobic granular sludges; Machine learning models; High-strength wastewater treatment; Whiskey distillery; Full-scale operation.

Green roof for domestic wastewater treatment and enhanced green area in the tropical city: A case study

Cong-Sac Tran[1], Thi-Kim-Quyen Vo[2], Phuong Thao Nguyen[1], Quang-Huy Hoang[1], The-Luong Ha[1], Trong-Huy Nguyen[1], Thong Dang[1], Thi- Kim-Ngan Nguyen[1], Xuan-Thanh Bui[1*]

[1]Key Laboratory of Advanced Waste Treatment Technology & Faculty of Environment and Natural Resources, Ho Chi Minh City University of Technology (HCMUT), Vietnam National University Ho Chi Minh (VNU-HCM), Ho Chi Minh City 700000, Vietnam.
[2]Faculty of Environment - Natural Resources and Climate Change, Ho Chi Minh City University of Food Industry (HUFI), 140 Le Trong Tan street, Tay Thanh ward, Tan Phu district, Ho Chi Minh city, 700000 Vietnam

* Presenter： Cong- Sac Tran *(transac@hcmut.edu.vn)*&
Corresponding author：*Xuan – Thanh Bui (bxthanh@hcmut.edu.vn)*

ABSTRACT

In developing countries, improperly controlled urbanization exacerbates water and air pollution, causing deterioration in the quality of life and urban landscape. Green roofs (GRs), which are one of the nature-based solutions available, could help to achieve sustainable urban development, and improve human health and well-being. GRs have long been acknowledged as a cost-effective method of treating wastewater and increasing urban greenery. In this study, the GRs with *Vernonia elliptica* and *Campsis radicans* were evaluated for their performance in pollutant removal and biomass development. The plants investigated could grow under extensive GRs conditions using domestic wastewater as a feed source. Physical support in the form of oyster shells and charcoal is also successfully employed as a filter material and for clogging control. This study also suggests improvements for future research on GRs technology.

KEYWORDS

Extensive green roof, urban heat island, domestic wastewater, Vernonia elliptica, charcoal.

Zeolite as an electrolyte additive for Water-Activated Metal Air Fuel Cells

Rose Marie O. Mendoza*, Erison C. Roque

College of Engineering, Graduate School, Adamson University, Manila, Philippines

**Corresponding author: rosemarie.mendoza@adamson.edu.ph / rosey1926@gmail.com; Tel: +639171273728*

ABSTRACT

The effectiveness of zeolite without any pretreatment as an electrolyte additive to water-activated metal air fuel cells was evaluated. Preliminary tests on zeolite, a mineral generally comprised of hydrated oxides of silicon, aluminum, magnesium in aggregate or complex crystalline was used as an electrolyte additive to a laboratory-scale water-activated metal air fuel cell. The addition of zeolite as an electrolyte additive onto used cells has improved the output voltage and current of the cell by 25-30% and light intensity by around 40% - 50%. The use of zeolite as an electrolyte additive onto new cells has doubled its life from 7 days to 15 days before being consumed. Used cells are actually cells that were already used and refilled or replaced with fuels. This means that possibilities of cathode passivation and pitting were already present, bringing the cell to near end of life phase. The cathodes are only visually inspected before the zeolite trial for breakage and tear, while new metal anode plates are used to ensure interference on performance based on anode integrity. Zeolite was found to significantly improve the performance of the used cells regardless of the metal anode used indicating a potential for a more efficient performance and economy of used of the said cells.

KEYWORDS

zeolite, electrolyte additive, water-activated cells, metal air fuel cell, sustainable energy.