The 15th International Conference on Environmental and Public Health Issues in Asian Mega-cities

EPAM 2025

Abstract Book

October 16th – October 18th
East China Normal University, Shanghai, China

Edited by: Bing Xie, East China Normal University, China
Hyunook Kim, University of Seoul, South Korea
Young-Cheol Chang, Muroran Institute of Technology, Japan

The organizers of the conference would like to acknowledge the following supporters:

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PREFACE

The 15th International Conference on Environmental and Public Health in Asian Mega-cities (EPAM 2025) is hosted by East China Normal University, Shanghai, China. As the premier global academic platform in environmental and public health research, the EPAM International Conference remains dedicated to advancing sustainable development in Asia's mega-cities.

It has been held once a year since 2009 in rotation between Japan, Korea, and China. EPAM 2025 will be held from October 16 to 18, 2025, in the most beautiful and magical city, Shanghai, China. On behalf of organizing committee, EPAM 2025 Organizing Committee extends our highest respect to all supporting organizations, academic review board members, and distinguished attendees. Special acknowledgment is given to our strategic partners for their unwavering commitment to advancing global environmental discourse.

Join us in redefining ecological governance for Asia's future cities. We look forward to welcoming you to Shanghai, where academia, policy, and industry converge to shape a sustainable tomorrow. On behalf of the organizing committee, we would like to express our gratitude to our supporters, committees and presenters who made our conference a success. We wish all of you have a wonderful experience during the conference in Shanghai.

Local Chair
Prof. Bing Xie

Co-Chair
Prof. Hyunook Kim

Co-Chair
Prof. Young-Cheol Chang

PROGRAM AT A GLANCE

Oct 17 (Fri)	**Venue**	**Room 188**		
	8:30-8:50	The opening ceremony		
	8:50-8:55	Group Photo		
	8:55-10:25	Plenary session 1		
	10:25-10:40	Coffee Break		
	10:40-12:40	Plenary session 2		
	12:40-14:00	Lunch (Room 288)		
	Venue	**Room 186**	**Room 286**	**Room 310**
	14:00-15:40	Session 1 Environmental Risk and Public Health	Session 2 Emerging Contaminant Control and Management	Session 3 Sustainable Energy and Environment
	15:40-16:20	Coffee Break (with poster presentation, Near Room 186)		
	16:20-18:00	Session 4 Environmental Risk and Public Health	Session 5 Sustainable Urban Development and Resilient Cities	Session 6 Circular Economy and Zero-Waste Cities
	18:00-20:00	Conference Banquet (Room 288)		
Oct 18 (Sat)	**Venue**	**Room 186**	**Room 286**	**Room 310**
	8:30-10:10	Session 7 Environmental Risk and Public Health	Session 8 Emerging Contaminant Control and Management	Session 9 Artificial Intelligence and Environment Mega Data
	10:10-10:30	Coffee Break		
	10:30-12:10	Session 10 Environmental Risk and Public Health	Session 11 Emerging Contaminant Control and Management	Session 12 Carbon Neutrality and Carbon Mitigation
	12:10-14:00	Lunch (24-Hour Restaurant)		
	14:00-18:00	Eco-City investigation		

CONFERENCE ORGANIZATION

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- Hyunook Kim (University of Seoul, South Korea)
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- Dong Wu (East China Normal University, China)
- Xueqin Lu (East China Normal University, China)
- Jisook Kim (University of Seoul, South Korea)
- Qian Sui (East China University of Science and Technology, China)

PLENARY SPEECH

1. **Friday (Oct 17), 8:55-9:25, Room 188**

- **Professor Jiang Guibin**, Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences, China

- **Title:** Toxicology and health risks of new pollutants

- **Biosketch:** Professor Jiang Guibin graduated from Shandong University in January 1982, and received his master's and doctoral degree from the Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences in 1987 and 1991. From 1989 to 1991 and 1994 to 1996, he was a visiting scholar and postdoctoral researcher at the National Research Council of Canada and the University of Antwerp, Belgium, respectively.

Professor Jiang is a leading scientist and pioneer in China in POPs and new pollutants studies. He has been the chief scientist of national 973 program on POPs and the principal investigators for national 863 high tech development plan on Endocrine Disruptors. His work on the new pollutants study in the past 25 years has opened up a new research area in identifying new pollutants in the environment and food. He has contributed more than 1300 papers in peer-reviewed international scientific journals with 70,000 times of citations（web of sciences）and published 27 monographs.

He is currently the founding editor-in-chief of the ACS journal E&H and a co-founding editor-in-chief of the Eleseveir journal EE&H.

2. **Friday (Oct 17), 9:25-9:55, Room 188**

- **Professor Hyunook Kim**, University of Seoul, South Korea

- **Title:** How to implement water-energy nexus concept in water and wastewater infrastructures

- **Biosketch:** Dr. Hyunook Kim is a Professor in the Department of Environmental Engineering at the University of Seoul and currently serves as Director of graduate programs focused on Post-Plastics, Climate Change Adaptation, and Carbon Neutrality. Prior to joining the University in 2002, he worked as an Environmental Engineer at the U.S. Department of Agriculture's Agricultural Research Service. He holds a B.S. in Environmental Engineering from Yonsei University, an M.S. from Johns Hopkins University, and a Ph.D. from the University of Maryland. Dr. Kim's research centers on smart water and wastewater management as well as sustainable environmental and energy technologies. He has served on the Korean government's National Science and Technology Advisory Board and holds editorial positions in leading journals such as Water-Energy Nexus, Chemosphere, and Frontiers in Environmental Chemistry. He is also actively involved in international standardization and currently chairs the Korean Mirror Committee for ISO/TC 224. He has published over 200 peer-reviewed journal papers, holds 92 national and international patents, and has completed approximately 200 R&D projects. His contributions have earned him numerous academic and professional awards, including Korea's National Medal of Honor for advancing environmental science and policy.

- **Abstract**: The water–energy nexus highlights the inseparable relationship between water and energy systems, emphasizing that water is required for energy production and energy is indispensable for water and wastewater services. Implementing this nexus concept in water and wastewater infrastructures is essential to achieving sustainable, resilient, and low-carbon urban development, particularly in rapidly growing Asian mega-cities. In this presentation, a few practical strategies and technologies to operationalize the water–energy nexus are discussed. Topics include energy recovery from wastewater through anaerobic digestion, energy-efficient operational strategies for treatment processes, and integration of renewable energy sources into utility operations. The concept of "water–energy resource recovery facilities" is introduced to illustrate a circular resource framework, transforming traditional water and wastewater treatment plants into sustainable water and energy production hubs. A few case studies from Korea are presented to demonstrate successful implementation models. Finally, the study discusses enabling policies, institutional coordination, and digital tools (e.g., smart sensors, AI-based modeling, and data-driven control) that facilitate real-world adoption. These approaches collectively show how the water–energy nexus can move from theory to practice, advancing both environmental and economic sustainability.

3. **Friday (Oct 17), 9:55-10:25, Room 188**

- **Professor Jun Ma**, Harbin Institute of Technology, China

- **Title:** Low-carbon water purification technologies for urban water quality assurance

- **Biosketch:** Jun Ma, the Academician of Chinese Academy of Engineering, Professor of Harbin Institute of Technology, has long been engaged in research and education in the fields of drinking water treatment and sustainable urban water systems. He has made innovative contributions in areas of pre-oxidation, advanced oxidation and membrane separation technologies for water treatment, which have been applied to address several water crises and safeguard public health for millions worldwide. He is the recipient of China Young Scientist Award, Achievement Award of the National High-Level Talent. He received prestigious awards, including Outstanding Achievements Award in Environmental Science & Technology (2024), Honor Award for Scientific Excellence (2017) by the American Chemical Society, and received Sustainable Water Award (2016) by the Royal Society of Chemistry. Professor Ma has also won two State Technological Invention Award and one State Scientific and Technological Progress Award.

4. **Friday (Oct 17), 10:40-11:10, Room 188**

- **Professor Yu-You Li**, Tohoku University, Japan

- **Title:** New challenges in municipal wastewater treatment plant: decarbonization and energy recovery

- **Biosketch:** Dr. Yu-You LI (Gyokuyu RI) is a Professor in the Department of Civil and Environmental Engineering at the Graduate School of Tohoku University, Japan, responsible for the Lab of Environment Protection Engineering. His research interests and efforts focus on biological wastewater treatment, solid waste management and bioenergy production, especially the anaerobic biotechnologies including AnMBR, bio-methane and bio-hydrogen, anammox processes. He developed the thermal hydrolysis process for upgrading anaerobic sludge digestion in 1992, the recirculated two-phase anaerobic digestion system in 2000, and recently developed a new process for enhanced simultaneous nitrogen removal and phosphorus recovery by anammox-HAP symbiotic granules. He has published over 600 papers with over 500 SCI papers and 20 book chapters. He served as the Chairman of the Anaerobic Biotechnology Committee in Japan Society on Water Environment from 2010 for 10 years and as the Chairman of Environmental Engineering Committee in the Japan Society of Civil Engineers for 2023-2024. He was ranked 3rd in the category of Best Engineering and Technology Scientists in Japan by Research.com.

- **Abstract**: DWastewater treatment plants are energy-intensive and significant sources of greenhouse gas (GHG) emissions. Reducing the energy input and greenhouse gas emissions from the municipal wastewater (MWW) depends significantly on the application of innovative treatment technologies and processes. Using anaerobic biological-based processes to treat MWW has gained increasing interest as they eliminate aeration-associated energy consumption, minimize waste sludge generation, and simultaneously generate biomethane. One of the most promising representatives is the integration of anaerobic membrane bioreactor (AnMBR) and anaerobic ammonia oxidation (Anammox), which not only removes the COD and nitrogen in an energy-efficient manner but also converts a significant proportion of the input COD into bioenergy. This presentation introduces a total of four cases studies using different systems design.

  (1) A case study on a typical activated sludge system with side stream anaerobic digestion achieved 65% energy self-sufficiency based on annual operation, indicating anaerobic digestion is the key technology for energy recovery.

  (2) A novel municipal wastewater treatment process towards energy neutrality and reduced carbon emissions reduction was established by combining a submerged anaerobic membrane bioreactor (SAnMBR) with a one-stage partial nitritation-anammox (PNA), and was demonstrated by pilot plant.

  (3) A new innovative system integrating iron recycle-driven organic capture with a side stream anaerobic membrane bioreactor (AnMBR) was evaluated based on experimental results. Iron-assisted chemically enhanced primary treatment achieved elemental redirection with 75.2% of chemical oxygen demand (COD), captured into the side stream process as iron-enhanced primary sludge (Fe-PS). In this system, 64.1% of the COD in Fe-PS and 48.2% of the COD in municipal wastewater were converted into bioenergy.

  (4) A high load A/O system operated under short solids retention time (SRT) conditions was constructed to increase energy recovery. The treatment performance and resource recovery potential of the system were evaluated by continuous experiments. The system achieved a COD recovery efficiency of 70%, indicating greater energy recovery potential compared to conventional high-rate systems.

5. Friday (Oct 17), 11:10-11:40, Room 188

- **Professor Haifeng Jia**, Tsinghua University, China

- **Title:** Assessment and Optimization on Urban Flood Resilience by Integrating Green Grey-Blue Facility

- **Biosketch:** Dr. Haifeng Jia, Professor and Director of Center for Urban Runoff Control & Stream Restoration, School of Environment, Tsinghua University. He is also the Co-Editor-in-Chief of Water-Energy Nexus and Co-Chair of International Working Group on Urban Streams(IWGUS）, IWA/IAHR JUCD

Dr. Jia has completed 100+ research projects in areas of urban water environmental planning, urban runoff control, water quality simulation modelling, urban river rehabilitation and water resources management. Dr. Jia has published 100+ English peer-reviewed journal papers, 100+ Chinese peer-reviewed journal papers, 70 international conference papers, 50 Chinese conference papers, and 18 books & journal special issues. He has also obtained 18 patents and software copyrights. He has received 39 different level academic and engineering Awards and Honors.
Dr. Jia has engaged in collaborative research extensively with international colleagues: he has served as a Visiting Professor in USA, UK, Germany and Netherlands. He is also very active in participating in international academic activities and international organizations.

6. Friday (Oct 17), 11:40-12:10, Room 188

- **Professor Ning-Yi Zhou**, Shanghai Jiao Tong University, China

- **Title:** Microbial degradation of antidiabetic drug metformin and the story behind it

- **Biosketch:** Professor Ning-Yi Zhou received his Bachelor's degree in Microbiology from Wuhan University and PhD in Microbiology from Imperial College London. Following postdoctoral training at Imperial College and University of Wales, he established his own laboratory at Wuhan Institute of Virology, Chinese Academy of Sciences before joining Shanghai Jiao Tong University as a distinguished professor. His research is focused on the genetics and biochemistry of microbial catabolism of pharmaceuticals, plastics and plant toxins, as well as their ecological impacts, publishing more than 100 papers in this field. Currently, he serves as the director of Environmental Microbiology Committee, Chinese Society for Microbiology and an editor for Applied and Environmental Microbiology.

7. Friday (Oct 17), 12:10-12:40, Room 188

- **Professor Huahong Shi**, East China Normal University, China

- **Title:** Exposure pathways and risks of microplastics to humans

- **Biosketch:** Huahong Shi, Ph.D., is a Professor and Doctoral Supervisor at the State Key Laboratory of Estuarine and Coastal Research, East China Normal University (ECNU). He received his Ph.D. from Jinan University in July 2003 and conducted postdoctoral research at Nanjing University from 2003 to 2005. In 2005, he joined ECNU. In 2008, 2015, and 2025, he was a visiting scholar at the University of Wisconsin, North Carolina State University (USA), and the University of Lincoln (UK), respectively. Currently, his research focuses on analytical methods, environmental behavior, and ecological health risks of micro/nanoplastics. He serves as an Associate Editor for Environmental Science & Technology (ES&T) and ES&T Letters. He has led 11 National Natural Science Foundation of China (NSFC) projects and one key R&D program. Additionally, he has been consecutively named a Highly Cited Researcher by Clarivate Analytics for five years.

ORAL PRESENTATION LIST

#	session	Time	Presenter	Affiliation	Title
1	**Session 1** **Environmental Risk and Public Health** **Oct 17** **Room 186**	**14:00-14:20**	**Dong Wu** **(Keynote)**	**East China Normal University**	**Urban airborne antibiotic resistance and inhalation risk**
2		**14:20-14:40**	**Fenglong Fan (Burag) (Keynote)**	**Kyoto University**	**Innovative development of multi-module ozone-cathode microbial fuel cell (O_3-MFC) systems for advanced wastewater treatment targeting antibiotic-resistant bacteria (ARB) and antibiotic resistance genes (ARGs)**
3		14:40-15:00	Hyeran Yang	Seoul Metropolitan Government Research Institute of Public Health and Environment	Research achievements and future strategies for citizen-centric public health and environment in Seoul
4		15:00-15:20	Haeun Oh	University of Seoul	Wastewater forensic for tracking illicit drug use and trade
5		15:20-15:40	Chenchen Wang	Xinjiang Uygur Autonomous Region Center for Disease Control and Prevention	Longitudinal study on Early-Life exposure to environmental pollutants—Xinjiang healthy mother and infant cohort
7	**Session 2** **Emerging Contaminant Control and Management** **Oct 17** **Room 286**	**14:00-14:20**	**Chang Gyun Kim** **(Keynote)**	**Inha University**	**Trends in microplastic research: A domestic and global outlook**
8		14:20-14:40	Jisook Kim	University of Seoul	Nationwide survey of residual pharmaceutical in wastewater
9		14:40-15:00	Monu Verma	University of Seoul	Ultra-rapid removal of per- and poly fluorinated alkyl substances from water using cyclodextrin polymer networks
10		15:00-15:20	Yongqing Zhang	South China University of Technology	Advanced Oxidation Processes based on Persulfate Activation via Biochar and its Application on wasterwater treatment
11		15:20-15:40	Seeun Park	University of Seoul	Fate and behavior of microplastics in drinking water treatment plants
12	**Session 3** **Sustainable Energy and Environment** **Oct 17** **Room 310**	**14:00-14:20**	**Qingran Zhang (keynote)**	**Tongji University**	**High-efficiency solar-to-hydrogen conversion through an integrated concentrator photovoltaic electrolysis**
13		**14:20-14:40**	**Xiang Li** **(Keynote)**	**Donghua University**	**Efficient recovery of high-value added lactate from food waste fermentation**
14		14:40-15:00	Taehwan Kim	Seoul National University of	Development of a 3D-printed PLA scaffold coated with cobalt

				Science and Technology	hexacyanoferrate for selective NH_4^+ recovery
15		15:00-15:20	Benish Zahra	Eulji University	Climate-driven cloudbursts and glacial lake outburst floods in Gilgit Baltistan, Pakistan, 2025
16		15:20-15:40	Jiyun Kang	Seoul National University of Science and Technology	Neuroendocrine safety assessment of DEHCH as a new plasticizer alternative: Insights from green toxicology
17	**Session 4** **Environmental Risk and Public Health** **Oct 17** **Room 186**	**16:20-16:40**	**Xiaolong Wang (Keynote)**	**Nanjing University**	**Plasmid-mediated antibiotic resistance genes: Transmission and mitigation**
18		16:40-17:00	Vijendra Shah	Inha University	Assessment of sophorolipids assisted biodegradation of microplastics by *Brevibacillus parabrevis*
19		17:00-17:20	Qingbin Yuan	Nanjing University	Enhanced reality in assessing antibiotic risks in water using bacterial resistance
20		17:20-17:40	Jihye Kim	Seoul Metropolitan Government Research Institute of Public Health and Environment	Monitoring Irradiated Foods and Labeling Compliance in Seoul
21		17:40-18:00	JaeHeon Jung	Seoul Metropolitan Government Health and Environment Research Institute	Heavy Metal Concentrations in Urban Atmospheric Particulate Matter in Seoul: A Comparative Analysis of PM_{10} and $PM_{2.5}$
22	**Session 5** **Sustainable Urban Development and Resilient Cities** **Oct 17** **Room 286**	**16:20-16:40**	**Dapeng Li** **(Keynote)**	**Suzhou University of Science and Technology**	**Dissecting the negative influence mechanisms of microplastics on plant and microbial mediated nitrogen removal in constructed wetlands**
23		16:40-17:00	George Zaimes	Democritus University of Thrace	Food sustainability and climate resilience through urban gardens
24		17:00-17:20	Wenxing Peng	East China Normal University	Rapid recycling of waste plastics via simultaneous dual carbonyl activation of ethanediylester groups in PET
25		17:20-17:40	Valasia Iakovoglou	American College of Thessaloniki	Education; a tool to sustainably manage urban ecosystems
26		17:40-18:00	Arjay John Barredo Secugal	National University Philippines	Into the floodscapes: A landscape character assessment of Bacoor City's lowland communities
28	**Session 6**	**16:20-16:40**	**Byoung-In Sang (Keynote)**	**Hanyang University**	**Sustainable chemical production via anaerobic fermentation with PLA waste**

29	**Circular Economy and Zero-Waste Cities** **Oct 17** **Room 310**	**16:40-17:00**	**Young-Cheol Chang** **(Keynote)**	**Muroran Institute of Technology**	**Advancing bio-based plastics and functional materials for a circular economy**
30		17:00-17:20	Ai Zhang	Donghua University	Synergistic coupling of plasma with microbubbles for enhancing short-chain fatty acids production from waste activated sludge
31		17:20-17:40	Jingxin Zhang	Shanghai Jiao Tong University	Food waste treatment and energy recovery in Megacities
32		17:40-18:00	Huihui Chen	Shanghai University	Green circular valorization of organic waste through hydrothermal treatment and anaerobic digestion coupling
34	**Session7** **Environmental Risk and Public Health** **Oct 18** **Room 186**	**8:30-8:50**	**Ke Dong (Keynote)**	**Kyonggi University**	**Geomorphic contexts drive divergent microbial succession in antarctic glacier forefields**
35		8:50-9:10	Anjie Li	Beijing Normal University	Enhanced antibiotic degradation and resistance risk mitigation in microalgal-bacterial granular sludge by zero-valent iron-activated carbon: Metagenomic and molecular docking insights
36		9:10-9:30	Xin Huang	Shihezi University	2024 monitoring report on air pollution and population health risks in Urumqi
37		9:30-9:50	Haining Huang	Tongji University	Environmental dissemination of antibiotic resistance genes driven by microbial metabolites
38		9:50-10:10	Yuntian He	University of Science and Technology of China	Co-selection of altered nitrogen metabolism and multidrug resistance in wastewater microbiomes under long-term fluoride stress
39	**Session8** **Emerging Contaminant Control and Management** **Oct 18** **Room 286**	**8:30-8:50**	**Jingyang Luo (Keynote)**	**Hohai University**	**Impacts and control of emerging pollutants on sludge anaerobic biotreatment**
40		8:50-9:10	Maham Fatima	Inha University	Coagulation-adsorption for removal of polystyrene nanoplastics in water treatment strategies
41		9:10-9:30	Yuchen Zhang	University of Shanghai for Science and Technology	Degradation-conversion mechanism in thermophile-driven upcycling of biodegradable plastics into polyhydroxyalkanoates
42		9:30-9:50	Mingizem Gashaw Seid	Korea Institute of Science and Technology	Mitigating micropollutants in stormwater: Insights into biochar-activated advanced oxidation processes
43		9:50-10:10	Muhammad Salam	Chengdu University of Technology	Effect of microplastics on vertical migration of Cr in aquifer beneath the municipal solid waste landfill in red beds soil

44	**Session9** **Artificial Intelligence and Environment Mega Data** **Oct 18** **Room 310**	**8:30-8:50**	**Jungbin Kim (Keynote)**	**Wenzhou-Kean University**	**Optimizing reverse osmosis technology with artificial intelligence for water desalination and reuse**
45		**8:50-9:10**	**Hongguang Guo (Keynote)**	**Sichuan University**	**Research on carbon emission pathways and synergistic effects of pollution reduction and carbon mitigation in china's municipal wastewater treatment under smart data-driven approach**
46		9:10-9:30	Katabarwa Murenzi Gilbert	Tongji University	Machine learning based land surface temperature detection and health risk: A comparative study in Kibera Slum and Nairobi City
47		9:30-9:50	Shanni Liu	Sichuan University	Machine-learning based spatiotemporal heterogeneity analysis for population behavior mining of incentive-based waste segregation
48		9:50-10:10	Muhammad Shahid	Shenzhen University	Modelling the deep learning and hybrid machine learning for indoor air pollution's effect on maternal on maternal and child health in South Asia
50	**Session10** **Environmental Risk and Public Health** **Oct 18** **Room 186**	**10:30-10:50**	**Min Chen (keynote)**	**Shanghai CDC**	**Legionella pneumophila Surveillance in Shanghai: Results and Insights**
51		10:50-11:10	Jinbo Chen	Kyoto University	Identification and quantification of dichloroiodoacetic acid in the chlorinated waters
52		11:10-11:30	Jing Zhou	Xinjiang Medical University	Health risk assessment of heavy metals in atmospheric $PM_{2.5}$ in tianshan district and midong district of Urumqi in 2023
53		11:30-11:50	Xueting Wang	East China Normal University	Reductive-oxidative biodegradation of Bisphenol A under the nitrate-reducing conditions: The interplay with carbon metabolism and nitrate assimilation
54		11:50-12:10	Yijing Gao	East China Normal University	Mitigating perfluorooctanoic acid inhibition in electrochemically-assisted spiral upflow anaerobic membrane reactor for wastewater treatment: EPS interaction-desorption dynamics and metabolic pathway reconstruction
55	**Session11** **Emerging Contaminant Control and Management** **Oct 18**	**10:30-10:50**	**Xiaosong He (Keynote)**	**Chinese Research Academy of Environmental Sciences**	**Research on removal and risk control of antibiotics and resistance genes in landfill leachate**
56		10:50-11:10	Xu Duan	Donghua University	Research on the mechanism and control of simultaneous bisphenol a degradation during sludge anaerobic acidogenesis

57	**Room 286**	11:10-11:30	Zhengming He	University of Shanghai for Science and Technology	Does UV really accelerate the degradation of pollutants by Fe (VI), or is there another reason?
58		11:30-11:50	Prasanna Muddarangappa	Academy of Scientific and Innovation Research (AcSIR) and CSIR-National Interdisciplinary Science and Technology	Characterization of heavy placer minerals on urban over bridge for correlation with neo-contaminates: Case study
59		11:50-12:10	Xueqin Wang	Qingdao University of Technology	Mechanistic insights into benzo[a]pyrene degradation by halotolerant Mn-oxidizing bacteria and biogenic Mn oxides in soil
61	**Session12** **Carbon Neutrality and Carbon Mitigation** **Oct 18** **Room 310**	**10:30-10:50**	**Seth W Snyder (Keynote)**	**S.W. Scientific Investments LLC**	**Enabling transition of carbon neutrality from research to results**
62		10:50-11:10	Jing He	Western Sydney University	Significant boost in energy efficiency of high-tech greenhouse capsicum amid projected climate scenarios
63		11:10-11:30	Siqi Li	Beijing University of Technology	Decoupling mechanisms of high-efficiency nitrogen removal and low sludge production in an encapsulated biofiller system
64		11:30-11:50	Lingyan Wu	Shanghai Jiao Tong University	Ecological assembly and thermodynamic state of dissolved organic matter in a hypersaline lake dichotomized by hydrology
65		11:50-12:10	Lubaba Afzal	New Jersey Institute of Technology	Impacts of climate change and coping mechanisms of urban poor: A case study on the Dhaka City's slum dwellers

POSTER PRESENTATION LIST

No.	Presenter	Affiliation	Title
1	Hajara Sani Labaran	North-Eastern University Gombe	Antibacterial activity of azanza garckeana fruit extract against enteric bacteria for traditional medicine applications
2	Yan Zhao	Muroran Institute of Technology	Influence of plasticizers and arsenic on the microbial degradation of Polyhydroxybutyrate (PHB)
3	Priyanshu Rawat	Guru gobind singh Indraprastha University	Evaluating long-term public health risks from the Yamuna River pollution in Delhi
4	Shihuan Lu	Zhejiang University of Technology	Metformin drives concerns about the transmission of antibiotic resistance genes: A case study in anaerobic digestion system
5	Takuya Tamazawa	Muroran Institute of Technology	Evaluation of PHB biodegradation in Japanese landfill soils
6	Mioto Uno	Muroran Institute of Technology	Isolation of lignin-degrading microorganisms from landfill sites and plastic-contaminated soils
7	Jun-Yan Xi	Sun Yat-sen University	Advancing healthy life expectancy for sustainable urban development: A multisectoral approach to counter demographic challenges
8	Munsuk Kang	University of Seoul	AI-based determination of target pH for carbon dioxide injection in water treatment plant
9	Panliang Wang	Henan Normal University	Microcystin-LR induces intestinal injury and microbiota-derived metabolites dysbiosis in zebrafish (Danio rerio)
10	Yu Zhang	Shanghai Jiao Tong University	Trade-off between electrochemical and microbial nutrient eliminations in iron anode-assisted constructed wetlands: The specificity of voltage level
11	Hyunsun Yu	University of Seoul	Water resource risks under climate change and policy trends for sustainable urban in Seoul water supply
12	Jaeyoung Choi	University of Seoul	Synergistic effects of mixing activated carbon on PFAS adsorption
13	Jimin Kim	University of Seoul	PFAS removal characteristics based on carbonaceous properties of activated carbon
14	Qinglong Shao	Sun Yat-sen University	The low-carbon transition pathway in the post-pandemic era: A doughnut economics perspective
15	Ingi Hong	Seoul National University of Science and Technology	Assessment of climate resilience of urban MSWM to extreme rainfall in South Korea
16	Zhaoyi Fei	Chengdu University of Technology	Corporate strategies for recycling decommissioned wind turbine blades: Insights from an evolutionary game and system dynamics model
17	JongSoo Lee	Seoul National University of Science and Technology	CBPD recycling strategies driven by alternative fuels in the cement industry
18	Dowan Kim	Seoul national university of science and technology	Feasibility assessment of carbon mineralization and potassium recovery using cement kiln bypass dust (CBPD)

19	Youjung Jang	University of Seoul	A Study on fouling control in MBR: Utilization of Quorum Quenching beads
20	Sakshi Vaya	University of Seoul	Enhancing biogas yield of co-digestion with slaughterhouse waste and conventional organic waste
21	Liangmao Zhang	Hubei University of Arts and Science	Airborne pathogens and antimicrobial resistance risks in urban food-waste treatment systems
22	Michael CH Chau	Tung Wah College	Evaluation of toxic heavy metal (Cd, As, Hg, Pb) contamination in shellfish imported from countries with varying levels of industrialization
23	Michael CH Chau	Tung Wah College	Assessment of arsenic, cadmium, and lead levels in dried Agaricus sp. cultivated in China, Brazil, Hong Kong, and Japan by inductively coupled plasma mass spectrometry
24	Feng Wang	East China Normal University	Mechanisms of manganese-modified biochar and white-rot fungi in enhancing compost humification: Boosting polyphenol pathway by lignocellulose degradation
25	Ruirui Pang	East China Normal University	Genome-centric metagenomics insights into the plastisphere-driven natural degradation characteristics and mechanism of biodegradable plastics in aquatic environments
26	Linjie Zhang	East China Normal University	Microplastics and soil greenhouse gas emissions: A critical reflection on meta-analyses
27	Wenyue Wang	East China Normal University	Effect of alkaline-thermal pretreatment on biodegradable plastics degradation and dissemination of antibiotic resistance genes in co-composting system
28	Jiandong Wang	East China Normal University	Composite anode membrane for methane recovery from sludge-food waste co-digestion: Membrane fouling mitigation, antibiotic resistance gene removal, and viral community regulation
29	Ru Fang	East China Normal University	From air to airway: Occurrence regularity and exposure risk of inhalable bacteria in municipal solid waste treatment chain
30	Fengying Li	East China Normal University	Exposure modes determined the effects of nanomaterials on antibiotic resistance genes: The different roles of oxidative stress and quorum sensing
31	Hangru Shen	East China Normal University	Entry pathways determined the effects of MPs on sludge anaerobic digestion system: The views of methane production and antibiotic resistance genes fates
32	Muhammad Salam	University of Padova	Enhancing sustainable organic waste management: Optimal substrates and environmental conditions for black soldier fly larvae performance

Session 1
Environmental Risk and Public Health

- **Day and Location:** Oct 17, Room 186
- **Session Chairs:** Dong Wu, Fenglong Fan (Burag)

Research achievements and future strategies for citizen-centric public health and environment in Seoul

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ABSTRACT
Mega-cities like Seoul face complex health and environmental challenges driven by high population density, mobility and diverse citizens' needs. The presentation outlines the key research achievements and strategic initiatives of the Seoul Metropolitan Government Research Institute of Health and Environment on health and environmental issues in Seoul. Focusing on critical urban challenges, our work encompasses environmental monitoring, including air and water quality, as well as public health issues such as infectious disease control and food safety concerns. We present our data-driven findings supporting relevant policies and discuss future research directions designed to address evolving environmental and health challenges in this Asian mega-city. These efforts are integral to the broader metropolitan governance aimed at improving Seoul citizens' well-being. We also propose directions for future research, which are vital for a sustainable mega-city. Our future strategy includes Seoul's proactive research-based approach to climate change, focusing on developing a resilient "Climate Crisis Safe Special City" and conducting surveillance and prevention for climate-sensitive health issues like mosquito-borne diseases. Additionally, we also show our research expanding into emerging health risks such as micro-plastics in ambient air and drinking water and interdisciplinary field of One Health, which integrates human, animal, and environmental health. Here, we welcome international joint research, mirroring efforts to strengthen global cooperation as well.

Keywords：mega-city; health and environmental issues; emerging health risks; global cooperation

Wastewater forensic for tracking illicit drug use and trade

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ABSTRACT
Globally, the consumption of illegal drugs is increasing rapidly. However, we have witnessed physical enforcement alone has not been able to effectively identify and control illicit drug use and trade. Recently, wastewater-based epidemiology (WBE) has emerged as a good alternative for objectively and rapidly identifying the spread of illegal drug use in a local community. In the EU, WBE is applied more for the influent of wastewater treatment plants (WWTP), which can provide information about socioeconomic characteristics of illegal drug (or narcotics) use in the WWTP service area. In fact, possession or use of illegal drugs is no longer considered as a crime in the EU. Therefore, WEB is utilized to understand regional distribution of illegal drug use: so-called epidemiological information.
However, in a country like Korea where trade, possession, or use of illegal drugs is strictly prohibited, survey of domestic wastewater for identifying illegal content is being performed from a different perspective with the consideration of the fact that only limited number of people have the access to the drugs. The WBE for illegal drugs is being evolved to wastewater-based forensic (WEF) in Korea. In WEF, the sources of wastewater with high content of illegal drugs are tracked to develop a more effective interventions for the users. For the purpose, local sewer networks along with regional socio-economical development are analyzed using a geographic information system. Based on the information obtained by the sewer network analysis, wastewater collection sites are determined; wastewater samples collected at these sites are analyzed for determining contents of different drugs. In addition, past drug-related crimes in the region are analyzed together with the socio-economic information and the result from the analysis of wastewater samples using an AI-based statistical tool for better understanding the sources of illegal drugs in the region. In the conference, we will present in detail how we are carrying out WEF for identifying and understanding the trade and use of illicit drugs in Korea.

Keywords: Wastewater Forensic, illicit drug, GIS, AI-based statistics

Longitudinal study on Early-Life exposure to environmental pollutants—Xinjiang healthy mother and infant cohort

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ABSTRACT
[Background] Perchlorate, thiocyanate and nitrate are widely found in food, water and the natural environment. The three salt ions act as endocrine disruptors, inhibiting the body's ability to take up iodine and causing abnormal levels of thyroid hormones, which are essential for fetal development.
[Objective] A study of the correlation between exposure to the water-soluble inorganic salt ions perchlorate, thiocyanate, and nitrate and thyroid hormone levels in pregnant women.
[Methods] Healthy women before the 28th week of pregnancy who had been in labor and delivery at local medical institutions for a long time were invited to participate in this study in Midong District and Bole City, Urumqi City, from March to August 2023. Whole blood and urine samples of pregnant women who signed informed consent were collected, and the 5 items of thyroid function, urinary creatinine level, and urinary levels of perchlorate, thiocyanate, and nitrate were tested for each study participant. Association between perchlorate, thiocyanate, and nitrate levels in pregnant women's urine and pregnant women's thyroid hormone levels analyzed by generalized linear modeling and weighted quantile and regression.
[Results] In this study, 157 pregnant women were included in Midong District, Urumqi City, and 145 pregnant women were included in Bole City. There was no difference in perchlorate, thiocyanate and nitrate levels in the urine of pregnant women in the two areas. In single ion exposure, the perchlorate content in urine of pregnant women as a whole showed a positive correlation trend with the FT3 and FT4 levels, and the nitrate content in urine showed a positive correlation trend with the FT4 level; the perchlorate content in urine of pregnant women in Bole City showed a negative correlation trend with the TSH level. In the combined exposure of perchlorate, thiocyanate and nitrate, the overall pregnant women's urine content of the three ions in the combined exposure showed a negative correlation trend with the FT3 level, of which perchlorate had the highest weight (0.497); the same negative correlation trend with the FT4 level but thiocyanate had the highest weight (0.442); the Bole pregnant women's urine content of the three ions in the combined exposure showed a negative correlation trend with the FT3 level, of which perchlorate had the highest weight (0.943), and also negatively correlated with TSH level but thiocyanate had the highest weight (0.495). There was no correlation between single ion exposure and combined exposure and maternal thyroid hormone levels in the urine of pregnant women in Midong District.
[Conclusion] Single exposure to perchlorate and combined exposure to perchlorate, thiocyanate, and nitrate are both risk factors for abnormal thyroid hormone levels in pregnant women. Relevant departments should continuously increase their attention to the issue of exposure to water-soluble inorganic salt ions, strengthen monitoring and prevention efforts, and ensure the health of pregnant women and their offspring.

Keywords: perchlorate; thiocyanate ; nitrate; combined exposure; thyroid hormones; pregnancy

Session 2
Emerging Contaminant Control and Management

- **Day and Location**: Oct 17, Room 286
- **Session Chairs:** Chang Gyun Kim, Monu Verma

Nationwide survey of residual pharmaceutical in wastewater

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ABSTRACT
TPharmaceuticals and personal care products (PPCPs) are generally defined as any substance used for personal health care or wellbeing, such as painkillers, antibiotics, contrast media, antipsychotics, stimulants, cosmetics, fragrances, etc. Their continuous use and improper disposal result in contamination of soil and water environments; they are introduced to the environment via various routes, posing potential risks, highlighting the need for developing effective management strategies. One of the main sources of PPCPs is wastewater. As unmetabolized or unused, they are disposed to wastewater, which is collected and flows into a wastewater treatment plant (WWTP). In this study, more than 30 WWTPs in Korea have been investigated for the occurrence of 46 residual PPCPs. The detected PPCPs are analyzed with respect to (i) substance type, (ii) sampling period, and (iii) wastewater characteristics. Among the PPCP groups, painkillers exhibit the highest concentration (48.09 μg/L), followed by contrast agents (12.74 μg/L), antiepileptics (9.05 μg/L), antacids (5.53 μg/L), antibiotics (4.99 μg/L), other compounds (16.33 μg/L). Seasonally, more PPCPs are observed in the Summer, comparing to those in the Fall or the Winter. In Summer, increased prevalence of infectious diseases (enteritis, respiratory tract, and skin disorders) and higher bacterial exposure lead to elevated use of antibiotics and anti-inflammatory agents

Keywords: Pharmaceuticals and Personal Care Products, PPCPs

Ultra-rapid removal of per- and poly fluorinated alkyl substances from water using cyclodextrin polymer networks

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ABSTRACT

Per- and poly fluorinated alkyl substances (PFASs) are emerging contaminants and raising great concern due to their pervasive presence in water resources. Among various treatment techniques, adsorption is the most promising treatment solution for PFASs removal. Herein, we developed a β-cyclodextrin (β-CD)-based polymer (β-CD-TriPod) crosslinked with tripodal amine to demonstrate the synergetic effects in superior adsorption of both short- and long-chain per- and polyfluoroalkyl substances (PFASs). Kinetics studies showed rapid adsorption (~100% for nine PFASs at 1 µg L^{-1}, except PFBA, and >86% at 200 µg L^{-1} individually) within two minutes. Isotherm results showed exceptional adsorption affinity and capacity, with KL = 0.310 ± 0.180 L mg^{-1}, qm = 246.20 ±14.80 mg g^{-1} for PFBS, and KL = 0.980 ± 0.260 L mg^{-1}, qm = 587.10 ± 54.50 mg g^{-1} for PFOS, significantly outperforming traditional activated carbons (ACs) and resins. The adsorbent also exhibited excellent regeneration and reusability, maintaining stable performance (>94%) over five consecutive adsorption-desorption cycles. Additionally, it performed effectively in PFASs-spiked real industrial wastewater with 55-100% removal efficiencies, regardless of the presence of co-contaminants. The adsorption mechanism confirmed the combined role of hydrophobic inclusion within β-CD cavities and electrostatic interactions with amines groups using elemental mapping, composition and FTIR techniques. Overall, this work demonstrates advanced molecular design strategies for rapid PFASs removal, establishing β-CD-TriPod as a highly regenerable and promising adsorbent for the rapid and efficient treatment of PFASs-contaminated water and industrial wastewater.

Keywords: Short-chain PFASs; β-CD polymerization; Adsorption affinity; Wastewater treatment.

Fate and behavior of microplastics in drinking water treatment plants

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ABSTRACT
PPublic concern about the occurrence of microplastics (MPs) in drinking water has been increasing. In this study, we examined the occurrence of MPs from raw to finished water to better understand how they behave at each unit process in drinking water treatment plants (DWTPs). For this purpose, 100-L water samples were collected at unit processes from eleven DWTPs nationwide. Four of the 11 DWTPs consist of conventional treatment processes, five have additional advanced treatment processes (i.e., ozonation and granular activated carbon filter) before chlorination, and two are based on membrane filtration. At all DWTP sites, the same sampling and filtering protocol was applied. During sampling, MPs in water were fractionated using an on-site filtration system capable of sequentially separating particles at 100, 20, and 5 μm. Fractions of MPs sized ≥ 20 μm were analyzed by FTIR spectroscopy, and 5–20 μm by Raman microscopy. Using the results of the analyses, the performance of DWTPs was evaluated in terms of MP removal efficiency. In addition, MPs detected at different unit processes were characterized for particle size, morphology, and polymer types, and their fates across unit processes were evaluated. In short, DWTPs efficiently reduce MPs in raw water before supplying finished water to consumers. The results will be discussed in more detail at the conference.

Keywords: Microplastics, Drinking water, DWTPs, FITR, Raman microscopy, Removal efficiency

Session 3
Sustainable Energy and Environment

- **Day and Location:** Oct 17, Room 310
- **Session Chairs:** Qingran Zhang, Xiang Li

High-efficiency solar-to-hydrogen conversion through an integrated concentrator photovoltaic electrolysis

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ABSTRACT
The photovoltaic-alkaline water (PV-AW) electrolysis system offers an appealing approach for large-scale green hydrogen generation. However, current PV-AW systems suffer from low solar-to-hydrogen (STH) conversion efficiencies (e.g. <20%) at practical current densities (e.g. >100 mA cm-2), rendering the produced H2 not economical.[1] Here, we designed and developed a highly efficient PV-AW system that mainly consists of a customized, state-of-the-art AW electrolyzer and concentrator photovoltaic (CPV) receiver. The highly efficient anodic oxygen evolving catalyst, consisting of an iron oxide/nickel (oxy)hydroxide (Fe2O3-NiOxHy) composite, enables the customized AW electrolyzer with unprecedented catalytic performance (e.g. 1 A cm-2 at 1.8 V, 0.37 kgH2/m-2h-1 at 48 kWh/kgH2). Benefiting from the superior water electrolysis performance and the efficient heat management between CPV and AW devices, the integrated CPV-AW electrolyzer system reaches a very high STH efficiency of up to 29.1% (refer to 30.3% if the lead resistance losses are excluded) at large current densities, which surpasses all previously reported PV-electrolysis systems.[2]

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***Keywords*:** Hydrogen, Carbon Neutralization, Energy, Solar Conversion

Development of a 3D-printed PLA scaffold coated with cobalt hexacyanoferrate for selective NH_4^+ recovery

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ABSTRACT
Ammonium (NH_4^+) in aquatic environments is recognized as a major contributor to eutrophication and air pollution, while concurrently constituting a valuable recoverable resource as a hydrogen carrier. This dual role underscores the importance of technologies capable of both NH_4^+ removal and resource recovery. Prussian Blue Analogues (PBAs), known for their selective cation exchange capability, are promising NH_4^+adsorbents. Previous studies showed that powdered Cobalt Prussian Blue (CoPBA) has excellent performance; however, powder adsorbents exhibit limitations in process application due to recovery difficulty and contamination risk. Therefore, to overcome these limitations, this study aimed to develop a novel adsorbent by utilizing additive manufacturing to create a structurally uniform 3D-printed PLA support and coating CoPBA onto its surface (CoPBA@PLA).
To achieve successful coating on the PLA surface, a surface modification process was conducted to impart physical roughness and crucial functional groups (-COOH, -OH). The CoPBA@PLA composite was then synthesized using a layer-by-layer method. Successful formation and integrity were evaluated by characteristic analysis (SEM-EDS, FT-IR, XRD). Furthermore, continuous column experiments were performed to simulate actual process conditions and quantitatively analyze adsorption-desorption behavior and concentration properties. Subsequently, the structural and chemical stability of the CoPBA@PLA was comprehensively evaluated after long-term column operation.
In conclusion, CoPBA@PLA demonstrated a maximum adsorption capacity of 4.95 mg/g and maintained high selectivity toward NH_4^+ against competing cations (Na^+, K^+). Its uniform 3D structure is expected to enable stable operation in continuous processes. Crucially, the CoPBA@PLA maintained stable adsorption performance over five regeneration cycles. When applied to a column system, the adsorbents achieved an ammonium concentration factor (CF) of 2.66 during long-term operation. These findings indicate CoPBA@PLA possesses both structural stability and high reusability, supporting its potential as a sustainable solution for ammonium recovery.

Keywords: Ammonium recovery, 3D-printing, Prussian blue analogue, Selective adsorption

Climate-driven cloudbursts and glacial lake outburst floods in Gilgit Baltistan, Pakistan, 2025

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ABSTRACT
Climate change is a global problem driven by rapidly rising greenhouse-gas emissions. In 2024 the planet registered the warmest year in the instrumental record and 2015–2024 was the warmest decade; warming is intensifying heavy precipitation and "fire weather," while reducing snow and ice and accelerating permafrost thaw. Glaciers are losing mass at a globally significant and faster rate—about 273 ± 16 Gt of ice per year from 2000–2023, with ~36% faster loss in 2012–2023 than in 2000–2011—contributing to sea-level rise and altering seasonal water supplies. These signals are expanding glacial lakes, amplifying short-duration downpours, and raising flood and landslide risk. Although Pakistan emits well under 1% of global greenhouse gases, it is highly exposed. In the north, Gilgit-Baltistan (GB) sits in the Hindu Kush–Karakoram–Himalaya, where a warmer, wetter monsoon is heightening cloudburst and glacial-lake outburst flood (GLOF) hazards. In 2025 alone, a 21 July cloudburst along Babusar Road caused at least five deaths, fifteen missing, and four injuries; a late-July flood cut the Danyore–Sultanabad canal; a predawn 11 August landslide killed seven volunteers repairing the channel; Shishper-fed flows damaged protective works and the Karakoram Highway; and on 22–23 August a major GLOF Event hits Raoshan village and dammed the Ghizer River, forming a ~7 km temporary lake and forcing evacuations.
To match global fairness with local protection, we propose a dual track. Mitigation targets the biggest, fastest levers—coal phase-down, system-wide efficiency, rapid methane and HFC cuts, and black-carbon abatement from diesel, brick kilns, cookstoves, and open burning—to limit further heating that drives cloudbursts and ice loss. Adaptation prioritizes measures communities can run and maintain: finish early-warning coverage with monthly drills and last-mile redundancy (sirens plus mosque/FM alerts); treat canals, bridges, and access roads as critical infrastructure (armoring, debris screens, bypass valves, prepositioned quick-repair kits); enforce no-build flow corridors; and deploy site-specific controls at choke points (controlled lake drawdown via spillways or gravity siphons, debris-flow barriers, bridge-abutment hardening, and culverts sized to 1-hour extremes). GB should maintain an up-to-date glacial-lake inventory, classify potentially dangerous lakes, and proactively lower volumes at critical sites. New operational ideas include valley micro-bund networks optimized with drone/DEM mapping and participatory flow-path walks; a shared Nowcast & Lake-Watch data commons; parametric early-action financing tied to sub-daily rainfall or discharge thresholds; and "bridge-as-spillway" retrofits with safe-to-fail culverts. Provide shelter for impacted people. Together, these actions convert warnings into avoided losses while aligning rapid global emissions cuts with practical, locally maintainable protection for front-line communities.

Keywords: Gilgit-Baltistan; GLOF; cloudburst; early-warning systems

Assessment of sophorolipids assisted biodegradation of microplastics by *Brevibacillus parabrevis*

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ABSTRACT

Perfluorooctanesulfonic acid (PFOS) and Mono-(2-ethylhexyl) phthalate (MEHP) are persistent organic pollutants that pose significant threats to both ecosystems and human health due to their environmental persistence, bioaccumulation potential, and widespread distribution. PFOS, a perfluorinated compound historically used in industrial and consumer products like stain-resistant fabrics and firefighting foams, and MEHP, a primary metabolite of the plasticizer DEHP commonly found in medical devices and food packaging, have become ubiquitous environmental contaminants detectable in human populations worldwide. While their immunotoxic effects have gained increasing scientific attention in recent years, critical knowledge gaps persist regarding the specific mechanisms linking PFOS and MEHP exposure to altered immune function and increased susceptibility to infectious diseases. Our research identified two key immune molecules - interferon regulatory factor 3 (IRF3), a crucial mediator of antiviral responses, and mannan-binding lectin serine protease-2 (MASP-2), an essential component of the lectin complement pathway - as direct molecular targets of PFOS and MEHP binding, respectively. Mechanically, we first elucidated the molecular pathways by which PFOS-IRF3 and MEHP-MASP-2 interactions disrupt immune function using biochemical and cellular assays; second, we determined the structural basis of these pollutant-protein interactions through computational methods; and third, we examined epidemiological associations between exposure levels and infection susceptibility using human biomonitoring data. By combining mechanistic studies with population-level analyses, our research provided critical insights for assessing health risks associated with these environmental contaminants while establishing novel methodologies for studying immunotoxicity of other pollutants. Taken together, these findings suggest that PFOS may suppress antiviral immunity by interfering with IRF3-mediated interferon production, while MEHP could impair complement activation through MASP-2 inhibition, potentially compromising host defense against pathogens. The findings will contribute to evidence-based environmental regulations and public health strategies aimed at mitigating the impacts of these persistent chemicals on human immune function.

Key words: Microplastics; Brevibacillus parabrevis; Sophorolipids; Biodegradation; Biosurfactant; Polyethylene

Enhanced reality in assessing antibiotic risks in water using bacterial resistance

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ABSTRACT
In addition to the direct ecological effects of antibiotics, residuals in the environment contribute significantly to the development and spread of antibiotic resistance, a critical issue that traditional ecological risk assessment frameworks, such as the persistence, bioaccumulation, and toxicity (P–B–T) criteria, fail to address comprehensively. We propose a novel 3M (microflora–microcosm–modeling) framework designed specifically to assess the risk of antibiotics in promoting bacterial resistance within environmental bacterial communities. Our research shows that aquatic microflora in natural water environments exhibit unexpectedly high levels of antibiotic resistance, often comparable to levels found in clinical settings, even though the ambient concentrations of antibiotics are orders of magnitude lower. This finding underscores the importance of considering bacterial resistance as a central indicator in antibiotic risk assessments. Building upon previous studies of microflora in controlled laboratory media, we developed an integrated microflora-based microcosm model, which is combined with advanced ecological and pharmacodynamic modeling to create the innovative 3M framework. This new framework provides more realistic risk thresholds than traditional ecological risk assessment criteria, offering a more accurate reflection of environmental risks. When applied to the Yangtze River, Asia's largest river, the 3M framework identified moderate to high antibiotic resistance risks at 21.7%, 30.6%, and 47.3% of sampling sites in the upper, middle, and lower reaches, respectively. This study presents an adaptable, evidence-based complement to traditional ecological risk assessments, aligning with evolving regulatory requirements for environmental antibiotic risk management.

Keywords: antibiotic, risk assessment, water, bacterial resistance

Monitoring Irradiated Foods and Labeling Compliance in Seoul

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ABSTRACT
This study investigated compliance with food irradiation labeling regulations and the detection of irradiated products in 474 processed food samples collected from retail markets in Seoul between 2020 and 2025. Thermoluminescence (TL) analysis was applied to identify irradiation treatments, and four samples (0.8%) were found to be irradiated without proper labeling, indicating that the domestic labeling system is generally well enforced.
Additionally, regulatory frameworks and the scope of approved irradiated foods were compared across major regions. Globally, most countries adhere to international guidelines, but the range of authorized commodities and applications varies considerably. The United States approves a wide range of products, including meat, seafood, fresh produce, and spices, all requiring explicit labeling under FDA and USDA regulations. EU-wide approvals are limited, but individual member states may expand authorized items: Belgium and France focus mainly on spices and frog legs, with Belgium leading EU irradiation volumes, while the Netherlands operates on a smaller scale. Japan maintains the most restrictive policy, permitting only potatoes. China authorizes a wide spectrum of commodities, including meat, seafood, grains, vegetables, fruits, teas, spices, and medicinal plants, and has rapidly expanded industrial applications. Vietnam, supported by the IAEA, increasingly applies irradiation for tropical fruit exports to markets such as the U.S. and Australia. Australia and New Zealand primarily approve irradiation for tropical fruits and herbs to meet export-related phytosanitary requirements. South Africa serves as a regional hub, focusing on spices, cereals, and seafood to enhance safety and shelf life. Korea authorizes irradiation for selected items, including cereals, vegetables, fruits, and specific processed foods, under a regulatory framework aligned with international standards.
Recent IAEA reports (2020–2023) highlight evolving trends in food irradiation technologies, demonstrating their growing importance beyond food preservation and safety, extending to international agricultural trade. Electron-beam (E-beam) and X-ray irradiation have been emphasized as cost-effective and efficient alternatives to traditional gamma-ray processing, with increasing adoption for microbial reduction, shelf-life extension, and phytosanitary treatments. These advancements have facilitated exports of tropical fruits and meat products in several countries while promoting the concept of “cold pasteurization” to enhance consumer acceptance.
The findings of this study provide valuable insights into domestic labeling practices within a global context and contribute baseline information for future discussions on harmonizing international labeling standards, reducing trade barriers, and supporting consumer confidence.

Keywords: Food irradiation; labeling compliance; thermoluminescence (TL) analysis

Heavy Metal Concentrations in Urban Atmospheric Particulate Matter in Seoul: A Comparative Analysis of PM_{10} and $PM_{2.5}$

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ABSTRACT
This study investigated heavy metal concentrations in PM10 and PM2.5 collected in Seoul from January 2024 to April 2025. Samples were analyzed using ICP-MS/OES for 11 heavy metals. Results showed different correlation patterns between particle sizes during Asian dust events and ultrafine particulate advisories, suggesting the necessity for comprehensive analysis in particulate matter research.

Contents
Urban air pollution, particularly particulate matter (PM), poses significant health risks in metropolitan areas like Seoul. Understanding heavy metal distribution across different particle sizes is crucial for source identification and pollution control strategies. Samples were collected 4-5 times monthly from January 2024 to April 2025 at an air monitoring station in Guui-dong, Gwangjin-gu, Seoul. Mass concentrations were determined using gravimetric methods, and 11 heavy metals (Pb, Cd, Cr, Cu, Mn, Fe, Ni, As, Al, Ca, Mg) were analyzed using ICP-MS and ICP-OES. Data were classified into normal days, yellow dust, and PM2.5 advisory periods.
Results revealed distinct patterns under different atmospheric conditions. Yellow dust events showed dramatic PM10 increases with strong soil-derived element correlations but weak anthropogenic metal correlations, while $PM_{2.5}$ advisories exhibited the opposite pattern with enhanced anthropogenic metal correlations but reduced soil-derived element correlations between particle sizes. The study demonstrates that meteorological conditions significantly influence particle size-specific heavy metal distribution patterns. Comprehensive analysis of both PM_{10} and $PM_{2.5}$ is essential for effective air quality management and provides foundational data for future policy development in urban environments.

Keywords: PM10, PM2.5, Heavy metals, Yellow dust

Session 5
Sustainable Urban Development and Resilient Cities

- **Day and Location:** Oct 17, Room 286
- **Session Chairs:** Dapeng Li, Guangyin Zhen

Food sustainability and climate resilience through urban gardens

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ABSTRACT

A shortage of food was experienced during the Covid-19 lockdown. Many people lost their regular income and the disruption in the food supply chain limited access and availability of food, particularly in urban settings. The Ukrainian war highlighted the European countries food systems vulnerabilities. This was because of their food dependence on external countries. This prompted the EU states to transition to a circular economy model. These shortcomings in the food supply can be further heightened by the inflow of refugees. The EU states will continue to face such challenges; thus, innovative approaches are needed to ensure food security but to promote climate resilience.
Urbanization is expected to further compound food security issues. In 2023, 76% of the EU population lived in urban areas. This percentage of the EU is significantly higher than for the rest of the world (57%). The Urban Heat Island Effect is one of the most serious problems that cities worldwide and in the EU face. Higher air temperatures and more intense heatwaves in urbanized areas are very frequent, and the consequence of the grey intensification, increase energy consumption and air pollution and reinforce climate change. They pose serious health risks to urbanites, particularly minority and low-income communities. Green infrastructure such as green roofs, green walls, rain gardens, street trees parks, gardens, urban riparian areas and wetlands provide an excellent alternative to mitigate these negative effects in urban environments.
Urban gardens, a form of urban agriculture, can address food security, climate change resilience and the Urban Heat Island Effect. It fits within the scope of the circular economy and is an effective nature-based solution. It aligns with the Sustainable Development Goals and meets the European Green Deal. This practice includes growing food and/or raising animals within or near urban areas. It is a solution that needs to be adopted, with the earth's population increasing and with most people living in urban areas. These changes are leading to an exponential increase in food, space, and natural resources usage. Urban gardens can offer local, sustainable food production while enhancing urban environmental sustainability and resilience.
Based on these social and environmental issues, the FEED4FOOD Driving Urban Transitions project has established on-the-ground pilot Living Labs (LL) to promote urban gardening. Three cities have been selected, Drama in Greece, Strovolos in Cyprus and Bucharest in Romania. Through these LL, the utility of sustainable urban agriculture for food security and greening urban areas for climate resilience is showcased. Empowerment and inclusion of vulnerable groups is another priority. FEED4FOOD is promoting the transition towards low-impact and regenerative urban food systems that provide healthy food, particularly for low-income consumers. Successful examples of the effective adoption of urban gardens are implemented to provide tangible proof and their utility to policy makers, communities, innovators, and entrepreneurs across the FEED4FOOD cities and for the rest of EU states.
Keywords: Living Labs; Urban gardens; Climate resilience; sustainability; Food security

Rapid recycling of waste plastics via simultaneous dual carbonyl activation of ethanediylester groups in PET

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ABSTRACT
Efficient recycling of polyethylene terephthalate (PET) plastics is crucial for mitigating environmental pollution and regenerating fossil resources. However, current PET recycling technologies predominantly rely on substantial quantities of unrecyclable chemical reagents, noble metal catalysts, or stringent conditions. Here we report an effective method of depolymerizing PET to terephthalic acid (TPA) and ethylene glycol (EG) by hydrolysis in green ionic liquid cholinium phosphate ([Ch]3[PO4]) under mild conditions. Traditional hydrolysis methods only activate one oxygen atom in PET's ethanediylester group, whereas our approach uses both ends of one choline cation to activate two oxygen atoms of the ethanediylester group simultaneously. This synchronized dual activation significantly enhances the electrophilicity of carbonyl carbons, thus accelerating the hydrolysis process. Theoretical calculation and experimental results show the PET conversion of simultaneous two carbonyl oxygen atoms activation was much higher than that of one carbonyl oxygen atom activation. Concurrently, phosphate anions increase the nucleophilicity of water, making it easier to attack the carbonyl groups, thus facilitating the efficient depolymerization of PET. Meanwhile, [Ch]3[PO4] is recyclable, low in corrosiveness, and harmless, making it highly promising for industrial applications. This work proposes a groundbreaking mechanistic paradigm to effectively depolymerize PET by simultaneously activating the ethanediylester group between its two benzene rings.

Keywords: Polyethylene terephthalate; Dual carbonyl activation; Hydrolysis; Ionic liquid; Recycling

Education; a tool to sustainably manage urban ecosystems

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ABSTRACT
Our planet is increasingly facing biophysical challenges that associate with phenomena like frequent droughts, water scarcity, wildfires, soil degradation, pollution. Safeguarding ecosystems is a necessity and a demanding task, particularly when dealing with issues related to biodiversity. Education is a powerful tool to help retain healthy ecosystems and alleviate those problems. By understanding their structure and function, it enables their sustainable manage. Specifically, terrestrial Mediterranean ecosystems, are characterized by high levels of biodiversity, with only one eighth of them being preserved. For urban ecosystems, the level of biodiversity is higher due to the additional planting of alien exotic species. Research has indicated that for the Greek urban areas, such as parks and school yards, there are plant species that can cause substantial health problems to humans. Laureus nobilis, is one of them that can even cause death. Another species that is fatal to humans but has extremely beautiful dark green foliage and fleshy red small fruits is Taxus baccata. Consequently, actions such as “planting the right species at the right spot” and “continuous monitoring” help maintain heathy urban environments for humans. With no doubt, education is a powerful tool that results to well trained professionals that can transfer knowledge and inform the public on those environmental issues and practices that enable detect and alleviate those problems.

Keywords: Biodiversity, Climate Change, Conservation, Ecology, Endangered species, Restoration

Into the floodscapes: A landscape character assessment of Bacoor City's lowland communities

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ABSTRACT

Bacoor City in Cavite, Philippines, lies within a flood-prone landscape where lowland communities experience recurrent inundation due to rainfall, poor drainage, and the convergence of waterways at the city's lowest points. Urban sprawl, land use conversion, and high-density residential development further exacerbate flooding, limiting open spaces for natural absorption and complicating conventional engineering solutions. As waterways inevitably flow toward the lowest points, Bacoor's lowland settlements bear the greatest flood burden. These communities face compounding vulnerabilities that threaten both livelihoods and long-term resilience. However, existing flood management strategies remain largely reactive and infrastructure-driven, often overlooking the spatial and ecological dimensions of the lowland environment.

This research uses Landscape Character Assessment (LCA) to analyze the city's lowland floodscapes. By mapping landscape character units and integrating land use patterns, hydrological features, and settlement dynamics, LCA provides a framework for understanding the relationship between landscape character and flood vulnerability. Data collection includes spatial analysis, desk review, community inputs, and hazard mapping to identify opportunities for adaptive interventions. The study also suggests the exploration of adaptive landscape strategies such as multifunctional drainage corridors, retention ponds, rain gardens, bioswales, urban greenways, and integrated landscape-based design. By examining Bacoor's floodscapes through LCA, this study demonstrates how landscape-sensitive planning can inform a more adaptive and sustainable flood management plan. The findings contribute to shaping resilient lowland communities and provide insights applicable to other Philippine cities with similar conditions.

Keywords: Floodscapes; Landscape Character Assessment (LCA); Lowland Communities; Flood Resilience; Landscape-based Design

Session 6
Circular Economy and Zero-Waste Cities

- **Day and Location:** Oct 17, Room 310
- **Session Chairs:** Byoung-In Sang, Young-Cheol Chang

Advancing bio-based plastics and functional materials for a circular economy

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Abstract
Achieving a sustainable society and addressing global environmental challenges are among the most critical imperatives of our time, as articulated in the United Nations Sustainable Development Goals (SDGs). In particular, goals such as “Responsible Consumption and Production,” “Climate Action,” and “Life Below Water” highlight the urgent need to transform the ways in which we produce, use, and dispose of materials.
Plastic pollution is a major global concern, primarily due to the persistence of petroleum-based plastics that resist degradation and contribute to environmental contamination and greenhouse gas emissions. In response to this issue, our research focuses on developing a low-energy, sustainable technology for the production of biodegradable plastics, specifically polyhydroxyalkanoates (PHAs), using recalcitrant aromatic organochlorine compounds and industrial carbon dioxide (CO_2) emissions as raw materials.
The proposed process integrates two key innovations. First, an electrochemical dechlorination reaction is conducted under mild conditions, converting hazardous organochlorines into phenolic compounds. These compounds are then utilized as substrates by specially isolated bacteria capable of biosynthesizing PHAs. Second, the system incorporates CO_2 captured directly from industrial flue gases as an additional carbon source, enabling effective carbon recycling and cost-efficient production.
Unlike conventional methods that require high temperatures, high pressures, or rare resources, our approach utilizes recyclable functional electrodes and selective catalysts. This offers significant advantages in terms of both environmental sustainability and economic feasibility. In addition, we are exploring the health-promoting potential of 3-hydroxybutyrate, a key degradation product of PHA, which could further improve the overall value of the process.
This integrated approach provides a promising solution to multiple challenges, including carbon recycling, chemical pollution mitigation, and the promotion of circular economies. By using actual industrial exhaust and aligning with Japan’s goal of achieving carbon neutrality by 2050, the technology demonstrates strong potential for broad application in both industrialized and developing regions. Ultimately, by upcycling resources such as sewage, toxic compounds, and carbon dioxide, we aim to establish a platform for producing biodegradable plastics and health-beneficial substances, contributing to the realization of a circular and sustainable society.

Keywords: polyhydroxyalkanoates (PHAs); bioplastic; CO_2 utilization; electrochemical dechlorination reaction; sustainable society

Synergistic coupling of plasma with microbubbles for enhancing short-chain fatty acids production from waste activated sludge

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Abstract
The use of waste activated sludge (WAS) fermentative short-chain fatty acids (SCFAs) as the excellent carbon source of wastewater biological nutrient removal has drawn much attention recently as it can reuse WAS organics and reduce WAS production. This study developed a novel, efficient, and environmental-friendly approach combining atmospheric pressure plasma jet with microbubbles (plasma/MBs) for WAS pretreatment.
Batch experiments were conducted using waste activated sludge (WAS). The novel pretreatment combined an atmospheric pressure plasma jet (500 W, 3 min) with a microbubble generator (7.9 mg/L DO). Following pretreatment, anaerobic fermentation was performed in parallel reactors at 35°C for 25 days. Key parameters including SCOD, proteins, polysaccharides, and SCFAs were quantified. The synergistic mechanisms were investigated using radical scavengers and Electron Paramagnetic Resonance (EPR) to identify reactive species (e.g., •OH, ONOO-). Microbial community dynamics and metabolic pathways were analyzed via 16S rRNA gene sequencing and Tax4Fun.
Compared with the control, plasma/MBs pretreatment enhanced SCFA generation by 92% and acetic acid proportion by 21% with plasma discharge power at 500 W and MBs dosage at 7.9 mg/L dissolved oxygen. The plasma/MBs combination motivated the reaction of various reactive species (such as O3, NOx, $ONOO^-$, •OH, e^-, $^1O_2$, and $•O_2^-$) and enhanced the activity of physical energies (such as light and heat). This synergy promoted sludge cell lysis and biodegradable substance release, significantly boosting acetic acid-enriched SCFA generation from fermentation. Moreover, plasma/MBs pretreatment increased the expression of key genes for SCFA production during fermentation, which also contributed to the production of SCFAs. Besides, plasma/MBs pretreatment favored WAS dewatering, heavy metal removal, and organic pollutant degradation, providing a new approach to advancing WAS resource recovery through innocuous management.

Keywords：Non-thermal plasma; Waste activated sludge; Microbubbles; Sludge anaerobic fermentation; Short-chain fatty acids

Food waste treatment and energy recovery in Megacities

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ABSTRACT

Effective management and treatment of food waste is an increasingly prominent issue for countries around the world. Approximately 50 million tonnes of food waste were generated in China. The amount of food waste generated is expected to further increase with growing population and economic activity. Besides the resources needed to collect and dispose it, food waste contaminates recyclables, compromises recycling efforts, and causes odour nuisance and vermin proliferation if not managed properly. Due to the high moisture content and high biodegradability of food waste, the disposal of food waste has caused severe environmental pollution in many countries. In view of rising costs for waste disposal as well as depleting energy resources, the anaerobic digestion (AD) of food waste was found to be a more sustainable treatment method due to the high degree of waste stabilization and methane generation. During AD, anaerobic microorganisms degrade organic waste through metabolic processes while recovering energy in the form of methane, thus serving as a crucial means for pollution reduction and carbon mitigation. However, the lengthy metabolic cycle and low conversion efficiency of methanogens result in suboptimal methane yields, thereby impeding the progress of organic waste valorization. Recent studies have demonstrated that the addition of iron/carbon materials as electron mediators can significantly enhance microbial metabolic processes and improve methane production. Nevertheless, the mechanism of interfacial electron transfer between iron/carbon materials and microorganisms remains unclear. Interfacial electron transfer is closely related to microbial metabolism and energy utilization. The varying characteristics of different iron/carbon materials result in distinct electron mediator-microorganism interfacial transfer efficiencies, limiting their effectiveness in addressing specific environmental issues. Understanding the electron mediator-microorganism interfacial electron transfer mechanisms mediated by iron/carbon materials during anaerobic methanogenesis is crucial for enhancing interfacial reactions. Additionally, leveraging these interfacial electron transfer relationships to address microbial-microbial electron transfer issues is an important approach to improving the efficacy of iron/carbon materials. Therefore, it is essential to investigate the unique electron transfer properties of iron/carbon materials in the context of real environmental problems to enhance methane production efficiency in AD.

To address these issues, our study focuses on three common iron/carbon materials: zero-valent iron (ZVI), iron oxides, and biochar. Based on their shared conductive properties and distinct electron mediator characteristics, the study investigates the limitations of intracellular and extracellular interfacial electron transfer in AD. The research examines the mechanisms and energy flows of microbial intracellular and extracellular interfacial electron transfer mediated by iron/carbon materials in different environmental contexts. The aim is to regulate intracellular and extracellular electron transfer pathways, enhance interfacial electron transfer efficiency, and promote methane production by anaerobic microorganisms. This study seeks to provide a scientific basis for enhancing the efficiency of methane production in AD through iron/carbon materials, thereby accelerating the efficient and stable valorization of organic waste.

Keywords: Anaerobic digestion; Biogas; Extracellular electron transfer; Iron; Biochar

Green circular valorization of organic waste through hydrothermal treatment and anaerobic digestion coupling

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The diversified utilization of biomass energy has gained substantial attention in recent years. Among various technologies, hydrothermal treatment (HTT) is highly effective for processing organic solid waste with high moisture content and low biodegradability while facilitating the fixation of organic carbon. However, HTT produces hydrothermal wastewater (HTWW) as a by-product, which differs from conventional wastewater due to its high concentrations of phenols, ketones, pyridines, and other refractory compounds that are challenging to degrade. Addressing this issue is critical for advancing sustainable waste management.

To achieve dual resource and energy recovery in organic solid waste treatment, we propose integrating HTT with anaerobic digestion (AD) to enable comprehensive waste processing. This study systematically investigated the characteristics of HTWW under varying raw material types and hydrothermal conditions. The results revealed that higher hydrothermal temperatures and longer residence times generate more refractory compounds, which adversely affect the efficiency of subsequent anaerobic digestion.

To enhance the performance of coupled AD technology, we evaluated four strategies: optimization of process conditions, separation of refractory compounds, hydrochar enhancement, and coagulation-adsorption pretreatment. Each approach demonstrated potential in improving anaerobic digestion efficiency to varying degrees. This work provides a theoretical framework for optimizing HTWW treatment through AD and offers practical insights for enhancing biomass conversion efficiency.

Keywords：Organic Waste; Hydrothermal wastewater; Anaerobic Digestion; Biorefinery

Session 7
Environmental Risk and Public Health

- **Day and Location:** Oct 18, Room 186
- **Session Chairs:** Ke Dong, Haining Huang

Geomorphic contexts drive divergent microbial succession in antarctic glacier forefields

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ABSTRACT
Long-term glacier recession is closely linked to post-glacial geomorphic evolution, resulting in distinct landscape types—such as Holocene raised beaches formed through isostatic rebound and exposed slopes or hilltops revealed by glacier recession in highland regions. To determine whether the temporal succession of soil microbial community differs between these geomorphic contexts, we assessed bacterial and fungal community changes along the chronosequences of two typical post-glacial landscapes in Antarctica: Ardley Island (AI), featuring soils ranging from 200 to 7,200 years, and the Barton and Weaver Peninsulas (BP), with soils spanning 1,000 to 15,500 years in age. Although both regions exhibited clear temporal gradients in soil development, microbial successional trajectories differed significantly across geomorphic backgrounds. On Ardley Island, bacterial communities showed distinct, directional shifts in diversity and composition over time, whereas no clear temporal trends were observed in the Barton Peninsula. Fungal communities in both regions displayed no significant temporal changes. At both sites, elevation emerged as a stronger predictor of microbial community variation rather than soil age. The assemblies of microbial communities at both sites were consistently dominated by stochastic processes, with their relative contributions remaining stable over time. Yet, as pedogenesis processes, species interactions within microbial communities became increasingly complex—except for fungal communities in BP—and microbial functional profiles exhibited predictable changes with advancing soil age across both glacier retreat areas. Our findings highlight the role of geomorphic differences in shaping the patterns and mechanisms underlying microbial community succession in post-glacial landscapes, providing a new perspective for understanding microbial dynamics across diverse glacial landforms.
Keywords: glacial foreland, succession process

Enhanced antibiotic degradation and resistance risk mitigation in microalgal-bacterial granular sludge by zero-valent iron-activated carbon: Metagenomic and molecular docking insights

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ABSTRACT
In recent years, the widespread use of antibiotics has led to their frequent detection in wastewater, while also inducing the emergence of antibiotic resistance genes (ARGs). Both are recognized as emerging contaminants and have become critical issues affecting environmental and public health. Algal-bacterial granular sludge (MBGS) technology has demonstrated high potential for efficient antibiotic removal. In this study, sulfamethoxazole (SMX), a typical sulfonamide antibiotic, was chosen as the target contaminant. Two identical sequencing batch reactors (1.4 L) were established: an experimental reactor amended with 2 g/L zero-valent iron-activated carbon (ZVI-AC) (R2) and a control reactor (R1). Both were operated for 80 cycles with synthetic municipal wastewater containing 10 μg/L SMX. The degradation mechanism of SMX was analyzed by metagenomic sequencing and molecular docking, aiming to explore the effect of ZVI-AC-enhanced MBGS system on the degradation efficiency of antibiotics and the risk of ARGs transmission. The results showed that compared with the control group, the addition of ZVI-AC promoted the chlorophyll transformation and accumulation of chlorophyll b (3.89 mg/g vs. 2.26 mg/g) in MBGS, enhanced biomass (4.06 g/L vs. 3.67 g/L) and conductivity (875.52 μs/cm vs. 830.17 μs/cm), thereby improving SMX degradation. The degradation rate constant increased from 0.0334 h^{-1} to 0.0565 h^{-1} (an increase of 69.2%). The effluent quality met the Grade A standard of municipal wastewater. Metagenomic analysis revealed that the addition of ZVI-AC promoted the enrichment of cytochrome P450 family genes involved in drug metabolism and reduced the generation of the harmful compound TP163 (among 9 metabolites). Molecular docking further indicated that the CYP102 enzyme (a P450 family member) exhibited enhanced binding affinity with SMX (binding energy: −8.6 kcal/mol), facilitating more efficient degradation. Specifically, the enrichment of CYP450 genes and enhanced electron transport activity drove hydroxylation and S–N bond cleavage, promoting the generation of smaller molecular metabolites. Furthermore, with the addition of ZVI-AC, the biological toxicity (inhibition rate of Escherichia coli) of system effluent was significantly reduced by 83.96 ± 10.42%. The abundance of g_Leptolyngbya (a potential host of ARGs in MBGS) markedly decreased. The abundances of ARGs (sul1, sul3) and class I integron (intI1) were reduced by 47.3%, 31.4%, and 63.3%, respectively, and 12 fewer ARG subtypes were detected, which greatly reduced the risk of horizontal transfer of ARGs. These findings indicate that the addition of ZVI-AC can facilitate the establishment of an MBGS system capable of pollutant removal, toxicity reduction, and resistance inhibition, thereby providing an engineerable technological paradigm for the efficient removal and risk control of antibiotic emerging pollutants in wastewater treatment.

Keywords: Algal-bacterial symbiosis; Emerging contaminants; Sulfamethoxazole; Antibiotic resistance genes

2024 monitoring report on air pollution and population health risks in Urumqi

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ABSTRACT
This study aimed to establish an air pollution health monitoring network in Urumqi to characterize pollution and its health impacts, thereby providing a basis for interventions. Monitoring was conducted in Tianshan and Midong Districts (2024 data). We collected environmental and meteorological data ($PM_{2.5}$, PM_{10}, etc.), analyzed $PM_{2.5}$ components (PAHs, heavy metals), and gathered health data (mortality, emergency room/outpatient visits, student health). Generalized Additive Models (GAM) and Spearman correlation were used to analyze pollution-health links and protection effectiveness. Midong District recorded the highest annual $PM_{2.5}$ concentration (51 μg/m³), with the most significant exceedance of standards occurring in February (exceedance rate: 35.07%). Fluoranthene (16.68%) and pyrene (11.75%) were the dominant PAHs. The average concentration of Benzo[a]pyrene was 0.617 ng/m³, below the standard limit. Arsenic and chromium posed excess lifetime cancer risks (1.74×10^{-5} and 1.19×10^{-5}, respectively), exceeding acceptable thresholds. $PM_{2.5}$ and PM_{10} concentrations were positively correlated with respiratory mortality ($r=0.134$, 0.141; $P<0.05$) and outpatient visits (CO excess risk: 59.73%). Throat symptoms among students (Midong: 67 cases, Tianshan: 91 cases) were significantly associated with pollution levels ($P<0.05$). Public education initiatives reached over 50,000 people, effectively improving awareness. This research reveals that Urumqi's winter $PM_{2.5}$ pollution is severe, with heavy metals like arsenic and chromium and PAHs posing significant health risks, necessitating enhanced multi-sectoral coordination and public health protection to reduce population exposure. Consequently, stricter controls on $PM_{2.5}$ components, particularly PAHs and heavy metals (As, Cr), are urgently needed. We recommend enhancing cross-departmental data sharing, strengthening technical capacity at the grassroots level, and expanding the coverage of health education.

Keywords: PM2.5;Health Monitoring；Polycyclic Aromatic Hydrocarbons；Heavy Metals

Environmental dissemination of antibiotic resistance genes driven by microbial metabolites

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ABSTRACT
The dissemination of plasmid-mediated antibiotic resistance genes (ARGs) in the environment has become a global threat to ecological security and human health. In contrast to previous studies focusing mainly on abiotic factors such as coexisting pollutants affecting plasmid conjugation, this study reveals for the first time that typical microbial metabolites of carbon (CO_2), nitrogen (NO), and sulfur (H_2S) are important yet overlooked biological drivers facilitating the spread of ARGs. These metabolites modulate the efficiency of plasmid conjugation by inducing various microbial stress responses, including oxidative, nitrosative, and reductive stress, which alter the cell surface properties of donor and recipient bacteria, intracellular key ion levels, and amino acid metabolism. Taking H_2S as an example, even at environmentally relevant concentrations, it significantly enhances the conjugation frequency of plasmid RP4 within sewage microbial communities and expands its transmission range. Mechanistic investigations demonstrate that H_2S exposure activates the plasmid RP4-encoded protein Upf32.8, thereby relieving the suppression of genes encoded by plasmid RP4 and intensifying its hijacking of glutamine metabolism in donor bacteria. Notably, evolutionary analysis shows that GlsS32.8 is conserved across globally prevalent IncP-1α plasmids, underscoring a universal risk of ARG spread in H2S-rich environments. These findings provide novel theoretical perspectives and a scientific basis for understanding and controlling the environmental spread of antibiotic resistance genes.

Keywords: antibiotic resistance genes; microbial metabotites; plasmid conjugation

Session 8
Emerging Contaminant Control and Management

- **Day and Location:** Oct 18, Room 286
- **Session Chairs:** Jingyang Luo, Yuchen Zhang

Coagulation-adsorption for removal of polystyrene nanoplastics in water treatment strategies

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Abstract
Nanoplastics (NPs) in aquatic ecosystems pose serious environmental and public health problems due to their origin of toxicity and persistent ability attracting various adsorbable contaminants on their surfaces. This study evaluated a hybrid coagulation-adsorption process in series for the removal of amidine-functionalized polystyrene (PS) NPs in water. Coagulation was first performed using Ferric Chloride, removing the PS NPs. An art from, adsorption test was conducted at varying PS concentrations demonstrating that PS NPs undergo chemical adsorption onto granular activated carbon (GAC), as evidenced by pseudo-second-order kinetics (R2 = 0.991-0.999), showing that intra-particle diffusion was not the only rate-limiting step. Other rate-limiting steps include boundary layer diffusion and surface adsorption, both of which contribute significantly to the overall adsorption process. The process was better fit by the Langmuir isotherm model (R2 = 0.985) than by the Freundlich model (R2 = 0.927), indicating that monolayer adsorption might be predominated on a homogeneous surface. Nanoparticle tracking analysis (NTA) showed that coagulation, adsorption, and the combined of two removed them at 30.0%, 98.0%, and 99.4%, respectively. Turbidity and total organic carbon (TOC) revealed that they were removed in a similar manner as shown in those of NTA. The combined treatment process could achieve the highest removal rate. It demonstrates the effectiveness of integrating coagulation and adsorption in series for PS NP removal in water treatment which highlight properly arraying unit treatment process optimally to maximize the removal efficiency.

Keywords: Adsorption; Coagulation; Granular activated carbon; Nanoparticle tracking analysis; Nanoplastics; Polystyrene; Raman Spectroscopy; Zeta potential.

Degradation-conversion mechanism in thermophile-driven upcycling of biodegradable plastics into polyhydroxyalkanoates

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ABSTRACT
The lack of recycling technologies for biodegradable plastics (BDPs) has led to significant resource wastage and limits its sustainable expansion. The inherent biodegradability of BDPs enables their depolymerization into low-molecular-weight intermediates, particularly under thermophilic conditions, which are subsequently channeled into microbial metabolic pathways for targeted conversion. Polyhydroxyalkanoates (PHA), a category of microbially synthesized BDPs characterized by high economic value and growing demand, offer a promising strategy for upcycling waste BDPs. This study focuses on Chelatococcus thermostellatus, a thermophilic PHA-accumulating microorganism that exhibits dual capabilities for simultaneous BDPs degradation and PHA biosynthesis under thermophilic conditions. This project employs thermophiles as chassis microorganisms for BDPs biorecycling. The thermophilic degradation mechanisms and bioassimilation pathways of various types of BDPs for PHA biosynthesis are systematically investigated, accompanied by characterization of the structural configurations and material properties of the synthesized PHA. Subsequently, a synthetic microbial consortium is constructed to regulate metabolic intermediates, with particular emphasis on elucidating the regulatory impacts of carbon source allocation in metabolic pathways on PHA synthesis efficiency. Process optimization is further implemented through the strategic modulation of operational parameters and environmental variables to enhance production performance. Additionally, the synergistic compatibility between mild chemical depolymerization and biological recycling is explored to establish an integrated system for improving PHA recovery efficiency. The findings are anticipated to provide theoretical foundations and technical frameworks to advance the high-value circular utilization of BDPs.

Keywords: Biodegradable Plastics; Upcycling; Thermophile; PHA

Mitigating Micropollutants in Stormwater: Insights into Biochar-Activated Advanced Oxidation Processes

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ABSTRACT
Emerging micropollutants (MPs) in environmental matrices have attracted growing attention due to their adverse impacts on aquatic ecosystems. Stormwater has recently been identified as a significant source of MPs entering receiving waters, highlighting the urgent need for green stormwater infrastructure in megacities to enhance contaminant removal during stormwater harvesting and urban runoff. Biochar-based advanced oxidation processes (AOPs) have emerged as a promising solution for degrading MPs in various effluents. This study investigated the occurrence of 50 MPs—including 8 perfluorinated compounds (PFCs), 23 pharmaceuticals, 2 pesticides, 4 endocrine-disrupting chemicals, 7 nitrosamines, 2 corrosion inhibitors, and 4 preservatives—in stormwater canals and retention ponds. Concentrations ranged from 4.7 to 7,851 ng/L, with pharmaceuticals, corrosion inhibitors, PFCs, and pesticides being the most prevalent. The study further explored degradation patterns of MPs in three biochar-based hybrid systems: biochar/Fe(VI), biochar/chloramine, and biochar/persulfate. Among these, the biochar/persulfate system demonstrated the most effective overall removal, while biochar/Fe(VI) showed enhanced degradation of endocrine-disrupting chemicals, and biochar/chloramine effectively degraded amine-containing MPs. Sole biochar exhibited strong sorption capacity for PFCs, whereas biochar/persulfate moderately accelerated their degradation. Overall, this work provides comprehensive insights into the occurrence, removal efficiency, and potential risks of MPs in urban stormwater. Incorporating biochar-based AOPs into stormwater infrastructure presents a practical strategy to mitigate MP migration into receiving waters through in situ remediation.

Keywords: Micropollutants; Stormwater runoff; Biochar; Advanced oxidation processes ; Perfluorinated compounds ; In situ remediation

Effect of microplastics on vertical migration of Cr in aquifer beneath the municipal solid waste landfill in red beds soil

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ABSTRACT
Microplastics (MPs) and heavy metals are emerging environmental contaminants of increasing concern due to their potential synergistic impacts on subsurface ecosystems. This study examined the combined influence of MPs—polyethylene (PE), polypropylene (PP), and polyethylene terephthalate (PET)—on the adsorption–desorption dynamics and vertical migration of hexavalent chromium [Cr(VI)] in aquifer systems underlying municipal solid waste (MSW) landfills. Batch experiments demonstrated that red-bed soils exhibited a high adsorption capacity for Cr(VI) (101.83 $mg \cdot kg^{-1}$), primarily governed by chemisorption and partial reduction to Cr(III). However, the presence of MPs disrupted these processes, reducing adsorption efficiency by up to 16.46% while enhancing desorption by 20.92%. Column transport experiments further revealed that MPs significantly accelerated Cr(VI) migration, particularly at higher concentrations (5–10%) and with larger particle sizes. The maximum migration rate reached 0.079 $cm \cdot h^{-1}$, representing a 51.92% increase compared with the control, while the penetration time was reduced to 25 days. Redox analysis indicated that MPs inhibited the transformation of Cr(VI) to Cr(III), thereby weakening the natural attenuation capacity of the soil. Collectively, these results demonstrate that MPs intensify the mobility and persistence of toxic heavy metals in subsurface environments of landfill systems. The findings underscore the potential environmental risks associated with co-contamination, highlighting the need for integrated risk assessments and management strategies that account for interactions between MPs and heavy metals in landfill-affected aquifers.

Keywords: Microplastics; Chromium; Landfill; Adsorption-desorption; Red beds soil; Groundwater contamination.

Session 9
Artificial Intelligence and Environment Mega Data

- **Day and Location:** Oct 18, Room 310
- **Session Chairs:** Jungbin Kim, Hongguang Guo

Optimizing reverse osmosis technology with artificial intelligence for water desalination and reuse

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Abstract
Global climate change has intensified droughts, leading to severe water scarcity in various regions. With conventional freshwater supplies proving increasingly inadequate, exploring alternative water resources has become indispensable. Thus, desalination and water reuse have become key strategies for ensuring a reliable and sustainable water supply. In particular, reverse osmosis (RO)-based membrane technology plays a central role in this transition, as it effectively removes bacteria, micropollutants, and dissolved solids, producing high-quality water suitable for urban reuse applications. However, despite its technical advantages, RO faces fundamental barriers to wider implementation, such as high energy consumption and membrane fouling. Energy requirements remain one of the most significant contributors to operating cost and environmental burden, while fouling processes reduce membrane efficiency, shorten lifespan, and complicate system operation. Artificial intelligence (AI) provides new opportunities to address these limitations. AI-based algorithms enable the identification of optimal operating conditions that minimize specific energy consumption while maintaining high recovery and water quality. Also, machine learning enables predictive fouling analysis, allowing early detection of fouling and formulating effective mitigation strategies. Building on such AI-driven insights, identifying fouling mechanisms can further guide system design for improved efficiency. This study highlights the potential of AI integration with RO technology as both a means to lower energy demand and enhance membrane reliability, and as a pivotal pathway toward sustainable urban water management in the face of climate change.

Keywords: Desalination; water reuse; reverse osmosis; artificial intelligence; process optimization.

Machine learning based land surface temperature detection and health risk: A comparative study in Kibera Slum and Nairobi City

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ABSTRACT
Rapid urbanization in Nairobi City has led to the expansion of informal settlements, with over 60% of the population currently living in slums including Kibera. Consequently, this unregulated growth, characterized by inadequate infrastructure, congested high-density housing made of galvanized iron sheets, impervious surfaces, and extremely limited greening, has been linked to elevated Land Surface Temperature (LST), thereby imposing significant environmental and health risks. Several scholars globally have verified the effectiveness of Machine Learning (ML) in analyzing the relationship between spatio-temporal expansion of urban areas and the LST. In addition to that, recent studies on temperature in informal settlements in Nairobi city have relied on field-based mobile sensors, overlooking time-series analysis and comparative modeling of slums and the city using ML techniques. Therefore, this study integrates ML and remote sensing to assess urban LST dynamics in Kibera Slum and Nairobi City from 2002 to 2025. Specifically, it aims to (1) analyze spatio-temporal dynamics of Kibera slum and Nairobi city using ML algorithms, (2) examine LST trends using MODIS-LST data and (3) investigate the correlation of LST with NDVI, NDBI, population, and population density. Accordingly, Landsat 7, 8, and 9 imagery (30-meter resolution) were processed in Google Earth Engine (GEE) using Random Forest, with 70% of samples for training and 30% for testing. The model achieved overall accuracy of 94.87% for Kibera slum, and 96.21% for Nairobi city. In addition, MODIS-LST data (250-meter resolution) for January were extracted for both locations. Moreover, NDVI and NDBI samples (10 and 50 points in Kibera slum and Nairobi, respectively) were taken and analyzed in areas transitioning from non-built-up to built-up. Results reveal substantial urban expansion and demographic pressure: (i) Kibera slum's population grew by 204% from 134,829 to 406000, with density rising from 53,932 to 162,400 persons/km²; Nairobi city's population increased by 141% from 2,388,000 to 5,767,000 with density rising from 3,430.00 to 8,283 persons/km². This caused Built-up expansion by 16.58% in Kibera slum and 19.66% in Nairobi city, while non-built-up declined by 16.56% and 19.76%, respectively. (ii) Also, LST increased by 8.03°C in Kibera slum, compared to the 3.05°C increase in Nairobi city. (iii) Correlation analysis showed strong associations in Kibera slum between LST and built-up (r2= 0.91), population density (r2= 0.91), and NDBI (r2=0.86), with NDVI negatively correlated (r2=-0.89). Nairobi city exhibited weaker but consistent trends. NDVI declined from 0.35 to 0.10 in Kibera slum and from 0.23 to 0.16 in Nairobi city, while NDBI increased from -0.09 to 0.14 in Kibera slum and -0.04 to 0.20 in Nairobi. These findings highlight the intensification of LST in Kibera slum due to extreme population density, poor housing, and lack of biophysical buffers. The study aligns with prior research linking elevated LST to increased mortality among children and the elderly in Kibera slum. It recommends the demolition of informal settlements, development of model villages for slum dwellers, and equitable distribution of biophysical infrastructure to mitigate LST effects.

Keywords: Machine Learning; Land Surface Temperature; Health Risk; Informal Settlements; Remote Sensing

Modelling the deep learning and hybrid machine learning for indoor air pollution's effect on maternal on maternal and child health in South Asia

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ABSTRACT
Over the past ten years, the significance of indoor air quality as a determinant of health outcomes has gained considerable international attention, with women and young children being the most vulnerable. Moving beyond conventional analytical techniques, this research applies a novel Bayesian Neural Network (BNN) model to investigate the complex drivers of nutritional deficits in mother-child pairs across South Asia, with a specific focus on exposure to contaminants from domestic fuel use. The probabilistic framework of the BNN, implemented via the PC algorithm, identifies a robust link between the use of solid fuels for cooking and worsened nutritional status, confirming that such pollution is a major aggravating factor for malnourishment.
The model's architecture further elucidates critical conditional relationships. The nutritional health of both mothers and their offspring is shown to be directly influenced by household air pollution, an effect that is modulated by the type of residence (urban or rural). Other factors, including a mother's workforce participation, her educational attainment, and the household's water and sanitation facilities, also demonstrate a conditional effect on nutrition that is dependent on the economic status of the family. For maternal outcomes specifically, health is conditionally shaped by the frequency of prenatal healthcare visits and the household's wealth index, with the setting of residence acting as a key modifier. A child's nutritional status, meanwhile, is conditionally dependent on the mother's Body Mass Index and the child's birth order, with the magnitude of these effects being influenced by the mother's employment and education levels. These nuanced findings offer a new perspective distinct from earlier work. The study concludes by highlighting the urgent necessity for public health strategies that accelerate the transition to cleaner household energy sources throughout the region.

*Keywords***:** Bayesian neural network, Deep learning, Undernutrition, Indoor air pollution, SHAP Analysis, Boruta Method, South Asia.

Session 10
Environmental Risk and Public Health

- **Day and Location:** Oct 18, Room 186
- **Session Chairs:** Min Chen, Xueqin Lu

Legionella pneumophila Surveillance in Shanghai: Results and Insights

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ABSTRACT
Environmental water samples were systematically collected from public venues in urban and suburban districts of Shanghai from 2011 to 2020 for Legionella pneumophila (LP) surveillance. All the identified LP isolates underwent a series of testings including serotyping, pulsed field gel electrophoresis (PFGE), sequence-based typing, and antimicrobial susceptibility testing. Among 6 263 water samples, the LP-positive rate was 20.93% (1 311/6 263). The positivity rate decreased from 24.98% (287/1 149) in 2011-2012 to 20.02% (1 024/5 114) in 2013-2020 ($\chi 2$=13.92, P<0.001), with the highest monthly positivity observed from June to August (23.79%, 745/3 132). A total of 1 365 LP strains were isolated, of which 912 were further characterized, including 10 serotypes, 149 PFGE patterns, and 33 sequence types (ST). The predominant serotype was Lp1 (86.84%, 792/912), and the dominant ST was ST752 (29.50%, 269/912). ST clustering revealed two major clonal groups CG1 and CG2, accounting for 91.12% (831/912) of the isolates. The 190 LPs involved in the drug sensitivity test showed three resistance profiles: azithromycin resistance (31.05%, 59/190), ciprofloxacin resistance (0.53%, 1/190) and azithromycin+ciprofloxacin resistance (0.53%, 1/190). Azithromycin-resistant strains were predominantly ST1 (64.41%, 38/59). The antimicrobial resistance rate showed a significant decline, from 48.65% (18/37) in 2011-2012 to 28.10% (43/153) in 2013-2020 ($\chi 2$=9.38, P=0.002). In this study, compared to from 2011 to 2012, both the positivity rate and antimicrobial resistance prevalence of LP in public aqueous environments of Shanghai exhibited an overall decline from 2013 to 2020. The predominant types of LP were serotype Lp1 and sequence type ST752, with notable high-level resistance to azithromycin. Measures as enhancing the enforcement of water safety regulations and prioritizing surveillance of azithromycin resistance in LP were recommended to mitigate public health risks.

Keywords: Legionella pneumophila; Pulsed field gel electrophoresis; Sequence type; Etiological surveillance; Characterization of drug resistance

Identification and quantification of dichloroiodoacetic acid in the chlorinated waters

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ABSTRACT
Due to the high toxicity of iodinated disinfection byproducts (I-DBPs), their discovery becomes crucial for drinking water safety. In this study, we identified and quantified a previously predicted yet analytically unclear I-DBP, dichloroiodoacetic acid (DCIAA), which was overlooked in electrospray ionization because of the in-source fragmentation. The molecular formula of DCIAA was confirmed through high-resolution mass spectrometry full scan analysis after the formation, and its structure was determined by product ion scan characterization. 2-iodophenol was selected as the optimal precursor for DCIAA yield during chlorination at pH 8.0. Following isolation and purification, the synthesized DCIAA was quantified by inductively coupled plasma mass spectrometry, with subsequent employment for calibration standard. DCIAA remained stable for two months across pH 2.0-12.0, suggesting its potential persistence in drinking water distribution systems post-formation. The quantification method was developed using multiple reaction monitoring with the optimized m/z transitions at 208.8/126.9, showing superior selectivity through MS/MS confirmation, and Oasis WAX cartridges exhibited optimal recovery for solid-phase extraction of DCIAA. DCIAA concentrations was detected at 18.4-38.8 ng/L and 129.8- 463.1 ng/L in real tap water samples in Japan and chlorinated raw waters prepared in laboratory, respectively, which revealed the prevalent existence and importance of DCIAA in drinking waters.

Keywords: Iodinated disinfection byproduct; chlorinated water; standard preparation; in-source fragmentation

Health risk assessment of heavy metals in atmospheric PM2.5 in tianshan district and midong district of Urumqi in 2023

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ABSTRACT
To assess the health risks posed by heavy metals in atmospheric PM2.5 to the population in Tianshan District and Midong District of Urumqi in 2023, this study referred to the Ambient Air Quality Standards (GB3095-2012) and relevant sections of the U.S. Environmental Protection Agency's Regional Screening Levels (RSL) General Table for ambient air. Toxicological parameters of heavy metals via inhalation were summarized. A benchmark excess cancer risk of 1×10^{-6} and a hazard quotient of 1 were used to calculate screening concentrations and determine whether further assessment was required. Exposure concentrations were computed using relevant formulas, and both carcinogenic and non-carcinogenic risks were evaluated based on the excess cancer risk and hazard quotient formulas. The results showed that the annual average concentrations of 12 heavy metals in PM2.5 in both districts followed the order: aluminum > lead > manganese > arsenic > selenium > antimony > chromium > nickel > cadmium > thallium > beryllium > mercury. Statistically significant differences ($P < 0.05$) were observed in the distribution of seven heavy metals (antimony, aluminum, arsenic, beryllium, lead, nickel, and thallium) between the two districts. The annual average concentrations of lead, cadmium, and mercury did not exceed the national standards. Health risk characterization indicated that the excess cancer risks of arsenic and chromium exceeded 1×10^{-4}. The lifetime excess cancer risks at the 95th percentile in Midong District were 1.43×10^{-4} for arsenic and 1.17×10^{-4} for chromium, while in Tianshan District, they were 1.04×10^{-4} for arsenic and 4.83×10^{-5} for chromium. These levels indicate significant carcinogenic risks to the population, necessitating targeted prevention and control measures to mitigate health risks.

Keywords: PM2.5; Heavy metals; Health risk assessment; Excess cancer risk

Mitigating perfluorooctanoic acid inhibition in electrochemically-assisted spiral upflow anaerobic membrane reactor for wastewater treatment: EPS interaction-desorption dynamics and Metabolic pathway reconstruction

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ABSTRACT
The widespread occurrence of perfluorooctanoic acid (PFOA) in industrial wastewater poses a major challenge to anaerobic treatment systems due to its chemical stability and persistence. Here, an electrochemical spiral upflow anaerobic membrane reactor (EC-SU-AnMBR) was developed by integrating a Ru-Ir/Ti-mesh-wrapped hollow-fiber membrane anode and a spiral Ti-mesh cathode to facilitate PFOA desorption and detoxification. PFOA readily accumulated in tightly bound extracellular polymeric substances (EPS) under open-circuit mode via hydrophobic interactions and electrostatic adsorption, disrupting anaerobic granular sludge (AnGS) structure and impairing microbial functionality. Electrochemical regulation (closed-circuit) effectively alleviated PFOA inhibition, achieving COD removal of 80.7% (vs. 66.7%) and a 1.5-fold higher CH4 recovery (227.7 vs. 140.8 mL/g COD/d). Electric field-migration and bioanode-membrane interception/oxidation together weakened PFOA-AnGS binding capability by altering EPS structural stability and interaction-desorption dynamics, decreasing PFOA retention rate in the bioreactor from initial 60.4% to 2.1% ($p < 0.01$) and reinforcing sludge regranulation. Further analysis demonstrated that the bioelectrocatalysis upregulated the relative abundance of functional genes involved in glucose metabolism (pfk, por, and ackA) and methanogenesis (fwd, mtr, and mcr) by selectively enriching hydrolytic/acidogenic bacteria and syntrophic-methanogenic consortia (Smithellaceae, Kosmotogaceae, and Methanotrichaceae) at both bioelectrodes. This study proposes a promising EC-SU-AnMBR system for the sustainable treatment of PFOA-contaminated wastewater and elucidates the metagenome-informed metabolic adaptation mechanisms under PFOA stress.

Keywords: Anaerobic granular sludge; Bioelectrocatalysis; Extracellular polymeric substances; Microecological evolution; PFOA-containing wastewater

Session 11
Emerging Contaminant Control and Management

- **Day and Location:** Oct 18, Room 286
- **Session Chairs:** Xiaosong He, Xu Duan

Research on removal and risk control of antibiotics and resistance genes in landfill leachate

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ABSTRACT
Antibiotic resistance poses a significant threat to public health, and landfill leachate serves as a major reservoir for pharmaceuticals and personal care products (PPCPs) as well as antibiotic resistance genes (ARGs). Here, we conducted multi-sample analyses of the fate and driving mechanisms of PPCPs and ARGs in common landfill leachate treatment processes ("MBR+NF/RO," "pretreatment + two-stage DTRO," "biological treatment + AOP," "pretreatment + MVR," and "pretreatment + UF + RO + UV disinfection") to comprehensively evaluate their associated risks. Results indicate that among all processes, "pretreatment + two-stage DTRO" achieves highly efficient and stable removal of 93.06–100% of PPCPs while significantly reducing the association between bacterial communities and ARGs in influent. The highest concentrations of ARGs in leachate were observed for multidrug resistance, macrolides, aminoglycosides, glycopeptides, bacillopeptides, and chloramphenicol, with "pretreatment + MVR" demonstrating the most stable removal efficiency for these ARGs. Key potential host bacteria carrying ARGs in the influent were Pseudomonadota, Bacillota, and unclassified_Bacteria, while only Pseudomonadota dominated in the effluent. "pretreatment + two-stage DTRO," "pretreatment + MVR," and "pretreatment + UF + RO + UV disinfection" reduced plasmid-encoded ARGs, but the absolute concentration of chromosomally encoded ARGs increased in all effluents. Furthermore, biological factors (microbes and MGEs) were the primary drivers of ARG presence, indicating that reducing microbial biomass and MGEs effectively enhances ARG removal rates. Our findings highlight that MGEs not only transmit ARGs across treatment processes but also significantly elevate their expression levels, providing crucial data for effective antibiotic resistance surveillance within the One Health framework.

Keywords: Landfill leachate; Pharmaceuticals and personal care products (PPCPs); Antibiotic resistance genes (ARGs); Removal efficiency

Research on the mechanism and control of simultaneous bisphenol a degradation during sludge anaerobic acidogenesis

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ABSTRACT
The degradation pattern of BPA in the sludge anaerobic acidogenic system was obtained in this study. The alkaline acidogenic system (pH 10) demonstrated the highest BPA degradation efficiency (69.9%), which was 4.5 times higher than that in the blank acidogenic system (15.7%). Simultaneously, the acid production increased by 2.43 times (2,082 mg COD/L vs. 856 mg COD/L). The core taxa of the BPA-degrading microbiome in the acidogenic system were identified. Amplicon sequencing and metagenomic binning revealed that Gram-positive bacteria (Actinomycetota and Firmicutes) were the core taxa of the BPA-degrading microbiome in the alkaline acidogenic system. The representative strains Corynebacterium and Bhargavaea were enriched by 441-fold and 670-fold, respectively, during fermentation, while the abundance of Gram-negative bacteria significantly decreased as fermentation progressed. The BPA degradation characteristics of acidogenic functional strains were elucidated. The acidogenic strains Corynebacterium pollutisoli and Bhargavaea beijingensis achieved a BPA degradation rate of over 51% within 8 days without an external carbon source. Further studies found that polysaccharides and monosaccharides, as co-metabolic substrates, significantly enhanced degradation efficiency, increasing the 4-day BPA degradation rate by more than 47%. A dual-pathway model of "metabolism-co-metabolism" for BPA degradation by acidogenic bacteria was proposed. Acidogenic bacteria can directly metabolize and degrade BPA, while also hydrolyzing macromolecular organic matter to produce small molecules (e.g., glucose) that promote co-metabolism, forming an efficient BPA degradation network. A BPA anaerobic degradation process based on the enhancement of functional microorganisms was developed. Inoculating C. pollutisoli and B. beijingensis into the sludge anaerobic acidogenic system increased BPA degradation efficiency by more than 2.8 times and simultaneously enhanced VFA production by 2.1 times, providing an innovative solution for controlling emerging contaminants during sludge treatment.

Keywords: emerging contaminant; BPA; sludge anaerobic fermentation; VFAs production

Does UV really accelerate the degradation of pollutants by Fe (VI), or is there another reason?

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ABSTRACT

Considering the remarkable oxidation capacity of hypervalent iron (Fe(IV)) and Fe(V)) species, the exploration of pathways for the activation or catalysis of Fe(VI) has been further advanced. This is achieved through the utilization of external energy such as ultraviolet(UV). In recent studies, we have found that some scholars believe that UV can accelerate the degradation of pollutants by promoting the self-decay of Fe(VI) to generate hypervalent iron and hydroxyl radicals . This mainstream view has persisted until now. Although recent studies have shown that UV can effectively promote the generation of hypervalent iron, the UV system has ignored the characteristic that hypervalent iron is extremely unstable under UV irradiation.

Herein, we investigated the stability of Fe(VI) after light exposure through DFT and UV-Vis spectroscopy experiments, and the results showed that Fe(VI) is more prone to decay upon light irradiation. Using methyl phenyl sulfoxide (PMSO) as a probe, we cleverly designed experiments on PMSO degradation and (methyl phenyl sulfone) $PMSO_2$ generation under UV irradiation and non-UV irradiation conditions. It was found that in 1.0 M borate buffer (pH = 9.2), more PMSO was degraded under the combined conditions of UV and Fe(VI) than with Fe(VI) alone (4.58~22.09%), depending on the molar ratio of PMSO to Fe(VI). However, the production of $PMSO_2$ after 10 minutes was less than that in the Fe(VI) alone group, and this gap became more obvious at the end of the 30-minute reaction (about 5.5 μM less $PMSO_2$). What promoted the degradation of PMSO? The study revealed that 50 μM PMSO can be effectively oxidized by ·OH under the condition of 1 mM H_2O_2 with UV (100% oxidation) and can also be efficiently oxidized by ~90.92% in the 200 μM Fe3+ with UV system. In the UV and Fe(VI) system, PMSO is degraded with extremely high efficiency by ·OH rather than by Fe(VI) itself. If that is the case, why not use the photo-Fenton system instead of consuming a lot of energy in the Fe(VI) and UV system? Because in terms of effect, there is not much difference between the two, but the cost of the photo-Fenton system is lower.

Keywords: Ferrate(VI);H2O2;PMSO;UV

Characterization of heavy placer minerals on urban over bridge for correlation with neo-contaminates: Case study

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Abstract

Rare earth elements are emerging as a neo-contaminant as their application increasing in modern technology. Southwest India knows for world class deposits and mining. Present study involves as seasonal wise collection of samples deposits on over bridges in City of Thiruvananthapuram, Southwest India and detailed analysis using Heavy liquid separation, microscopic analyser, XRD and MP-AES.

Total Heavy placer in general is ranging from 2% to 17% and higher concentration observed on over bridges located in placer minerals transport routes and beneficiation industrial area. Seasonal variation result indicating higher Heavy placers on rainy season compared to dry seasons. heterogeneous heavy mineral assemblage noticed, and common heavy minerals are Ilmenite, Rutile, Zircon, Monazite, Sillimanite and high quartz. microscopic studies indicating surface damages on heavy placer that indicating an anthropogenic activity. XRF analysis indicating that TiO2,Fe2O3 are major oxide in bulk samples. XRD analysis revealed multi-modal mineral assemblage. MP-AES analysis indicating that Higher REE content that may arise from occurrence of REE bearing minerals such as Monazite and Zircon. Overall Study indicating that over bridge sand samples will give insight of higher occurrence of REEs that basically derived from anthropogenic in nature. It may help to build a point source contamination spot determination

Keywords: REES, Neo-Contamination, Zircon , Monazite

Session 12
Carbon Neutrality and Carbon Mitigation

- **Day and Location:** Oct 18, Room 310
- **Session Chairs:** Yong Cai & Yang Song

Enabling transition of carbon neutrality from research to results

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ABSTRACT
A U.S. program director in energy research funding agency once said that if you don't commercialize the technology, you won't save any energy. That statement holds true for carbon neutrality, circular economy, and most research areas. Across Asia there are many great universities that are surpassing the West's ability to conduct groundbreaking research. Traditionally the U.S. has had a leadership role in translating that research into start-up companies and later into commercial technologies that save energy, reduce carbon emissions, and promote a circular economy. In 2025 the U.S. is experiencing uncertainty in the support of university research, loss of attraction of the most talented international students, restrictions of funding to support early-stage deployment, and sunsetting incentives to transition to a clean and low-carbon economy. This opens an opportunity for the mega cities in Asia to take a world leadership position in both university research and deploying the world's best clean technologies. The author is a long-term researcher in clean energy technologies, and now an advisor and investor in clean energy and climate technologies. We present opportunities for Asia to take a leadership role in the transition to carbon neutrality. This will happen by supporting top research, identifying the most promising technologies and then fostering the early career scientists and engineers to launch start-up companies to commercialize the technologies from their graduate research. We will provide several case studies to achieve success.

Keywords: climate, carbon neutrality, technologies, commercialization,

Significant Boost in Energy Efficiency of High-Tech Greenhouse Capsicum Amid Projected Climate Scenarios

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ABSTRACT
Global energy constraints demand a clearer understanding of how energy-efficient greenhouse food systems can adapt to future climate change. We analyse multi-year bell-pepper production in a high-tech glasshouse (Sydney, Australia) equipped with pad–fan evaporative cooling and hot-water heating, using 5-minute operational data captured by a Priva control system across four trials. Seasonal heating and cooling demands varied by more than an order of magnitude, driving large swings in energy intensity. Elastic-net regression (with bootstrapping) identified internal/external temperature (and their difference) and solar irradiance as the strongest, season-dependent predictors of energy use, highlighting opportunities for demand-side management (e.g., strategic pre-heating during off-peak tariffs).
We model five cropping windows to test seasonally adaptive strategies: skipping spring, summer, autumn, or winter, and year-round production. Skipping winter minimised energy input (3.92 kWh·kg-1), whereas year-round production maximised total output and economic potential (AUD 26.73 million) for a representative 50,000 m2 facility with a dedicated nursery and packing shed. Labour plus energy comprised over half of annual operating costs, underscoring the dual mitigation and cost-control leverage of energy-efficient scheduling. To demonstrate applicability to Asian mega-cities, we benchmarked economic potential for a comparable facility in Shanghai, China.
Finally, by integrating trial-season regression with CMIP6/IPCC Shared Socioeconomic Pathways (2025-2050), we forecast a general decline in energy per unit yield driven by reduced winter heating demand. Collectively, these results show that seasonally adaptive cropping calendars and targeted energy strategies can enhance the sustainability, carbon efficiency, and resilience of pad–fan greenhouses in a warming climate, while supporting reliable urban fresh-produce supply.

Keywords:Bell pepper; Protected cropping; Resource use efficiency; Greenhouse seasonal planning; Climate change adaptation; Sustainable agriculture

Decoupling mechanisms of high-efficiency nitrogen removal and low sludge production in an encapsulated biofiller system

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ABSTRACT
The concurrent goals of achieving high-efficiency nitrogen removal and minimizing excess sludge production represent a significant challenge in urban wastewater treatment, directly impacting the sustainability and circularity of urban water cycles. This study investigates the underlying mechanisms of an encapsulated biofiller Anaerobic-Anoxic-Oxic-Anoxic (EB-AAOA) system that successfully decouples these two traditionally linked processes. We reveal a multi-layered synergistic mechanism, rooted in both process-level engineering and microbial-level metabolic shifts, that enables a paradigm shift from a proliferation-driven to a maintenance-driven treatment model.
The foundation of this decoupling lies in a strategic carbon flow redirection. The system's front-end was engineered as an "endogenous carbon factory," where encapsulated hydrolytic-acidifying bacteria efficiently converted influent complex organics into volatile fatty acids (VFAs). These VFAs were subsequently consumed in a low-yield anoxic process, effectively intercepting the carbon source before it could fuel the growth of aerobic heterotrophic bacteria (AHB)—the major source of sludge in conventional systems. This design created a severe carbon-starvation environment in the oxic zone, which was found to be the critical prerequisite for both sludge suppression and the establishment of an energy-efficient partial nitrification pathway.
Within this engineered oligotrophic and high-SRT environment, the microbial community demonstrated a profound metabolic adaptation toward self-consumption. The encapsulation technology provided critical niche stabilization, creating a mature ecosystem where internal biomass recycling became the dominant metabolic strategy. This "self-consumption loop" was characterized by three key processes: endogenous respiration, cell lysis followed by cryptic growth, and predation by higher trophic-level organisms. This active, in-situ biomass reduction mechanism explains the net decrease of the system's existing biomass inventory.
The EB-AAOA system maintained >99% nitrogen removal while achieving an exceptionally low observed sludge yield (Yobs) of 0.052 g SS/g COD. This represents a reduction of over 85% compared to conventional activated sludge (CAS) processes, demonstrating a fundamental breakthrough in biomass control. Multi-omics analyses provided a complete chain of evidence, validating the genetic blueprint for the engineered low-yield pathways and the functional reality of the self-consumption response.
In conclusion, by synergistically combining process-level carbon management with the promotion of a microbial self-consumption economy, this system offers a scientifically validated pathway to transform WWTPs. It moves beyond incremental improvements, presenting a robust strategy to fundamentally address the sludge burden, thereby contributing significantly to the goals of developing more sustainable and resource-efficient cities.

Keywords:Sludge minimization; Encapsulated biofiller; Internal carbon valorization; Functional niche stabilization; Endogenous metabolism

Ecological assembly and thermodynamic state of dissolved organic matter in a hypersaline lake dichotomized by hydrology

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ABSTRACT
Hypersaline lakes on the Tibetan Plateau are significant carbon reservoirs, yet the molecular-level processes governing their dissolved organic matter (DOM) remain poorly understood. This study leverages the hydrologically dichotomous Zabuye Salt Lake as a natural laboratory, comparing the 'pulse-driven' North basin with the 'buffered-stable' South basin using ultrahigh-resolution mass spectrometry (FT-ICR MS) and fluorescence spectroscopy. The study uniquely integrates ecological assembly theory with thermodynamic analysis to reveal how hydrological regimes drive divergent biogeochemical pathways of DOM. Results show that the successional patterns of the two DOM pools are starkly different: the North basin exhibits a pronounced 'winter preservation-summer loss' regime, where core molecules shared across all four seasons constitute only 31% of the total pool, while winter-exclusive molecules are as high as 38%, and its DOM assembly displays a seasonal succession from stochastic to deterministic processes. In contrast, the South basin is dominated by strong, year-round deterministic selection, forming a highly stable DOM pool with season-exclusive molecules accounting for less than 3%. This continuous selective pressure leads to the accumulation of thermodynamically recalcitrant (low nominal oxidation state of carbon, NOSC) yet high-energy molecules. Thermodynamic analysis confirms that the buffered-stable South basin acts as a "thermodynamic sieve," selectively enriching for more energy-rich ($\Delta G_{Cox} \approx$ -65 to -60 kJ mol C^{-1}) DOM molecules year-round, whereas the energy landscape of the pulse-driven North basin shows significant seasonal fluctuations. A random forest model indicates that salinity and dissolved oxygen are the primary drivers controlling DOM molecular structure, explaining ~38% of the variation in molecular composition. This study provides direct molecular evidence, deeply elucidating the intrinsic mechanism by which hydrological stability, as a master variable, regulates the ecological assembly, thermodynamic state, and persistence of DOM in extreme environments, which is of great significance for predicting high-altitude carbon cycling under climate change.

Keywords: Dissolved Organic Matter; Hypersaline Lake; Ecological Assembly; Biogeochemical Thermodynamics; Hydrological Regime

Impacts of climate change and coping mechanisms of urban poor: A case study on the Dhaka City's slum dwellers

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ABSTRACT
Dhaka, the capital and only megacity of Bangladesh, is exposed to multiple types of climate-induced hazards including variations in temperature, excessive and erratic rainfall, water logging, heat and cold waves. These hazards negatively effect on city life and livelihoods of the poor. This study is a quantitative study conducted at Dhaka to review climate change effects on the slum people. This study uses two slums in Dhaka- Karail slum at Mohakhali, Basila slum at Mohammadpur, for climate change impacts of the poor livelihood. The study conducted on slum of Dhaka with purposive sample survey, face to face interview of slum people while purposive sample size of 50. The study uses semi-structured interview schedule to collect data from local people in two slums. The result shows that the poor slum dwellers livelihood are usually vulnerable to extreme temperature as well as water logging due to urban institutional inefficiencies. Climate change makes them more vulnerable. The study also shows the trend of gradual and extreme weather change is particularly negative for the livelihood of the urban poor in Dhaka. The major impacts of climate change are damaging of shelter and other household assets, unavailability and polluting of water, suffering from diseases like diarrhea, scabies and fever etc. problem of sanitation and loss of work or income. To cope up with the climate impacts they use saving and sometimes cut off their daily meal. They somehow sustain with the situation as the extreme events are unstoppable and cannot be changed. The increasing problem of water logging, sewerage and sanitation in Dhaka city can be improved by ensuring pre planed urbanization. The study suggests a harsh need to address these challenges institutional and policy perspective.

Keywords: survey, climate change, erratic rainfall, sanitation