RESILIENT RECLAIMED LAND AND WATER SYSTEMS

April - September 2024 Happenings

News And Events

Dr **Mohamed Gamal El-Din** was named a member of the new Oil Sands Mine Water Steering Committee launched by the Government of Alberta in May this year. The committee will look at options to speed up oil sands mine water management and tailings ponds reclamation. Also in May, he presented a talk on Solar-photocatalysis For Organics Degradation In Oil Sands Process Water (OSPW) at the Alberta Innovates Water Innovation Program (WIP) Forum in Calgary.

Dr **Mohamed Gamal El-Din** participated in the Canadian Chemistry Conference and Exhibition in Winnipeg 2-6 June and. He gave two key note talks, Insights Into Advanced Oxidation Processes For The Degradation Of Organics In Oil Sands Process Water: Understanding Oxidation Mechanisms, at the symposium on Redox Reactions and Disinfection in Water Treatment and, Efficient Photocatalytic Degradation Of Pollutants In Oil And Gas And Municipal Wastewater at the symposium on Advanced Materials in Electrocatalysis, Photocatalysis and Photoelectrocatalysis for Clean Fuel Production, where he was a session chair.

PhD student **Abhijeet Pathy** presented his FES research Canola Straw Biochar For Remediation Of Heavy Metals From Oil Sands Process Water at the Canadian Society of Soil Science's Soil Functions for Future Generations Conference held at the University of British Columbia, 9-13 June. Dr **M Anne Naeth** attended the conference to share FES research from our theme.

Dr Dev Jennings presented and discussed ongoing work at the European Group for Organizational Studies conference in Milan, Italy from 4-6 July. The 40th annual conference was themed Crossroads for Organizations: Time, Space and People and held at the University of Milan-Bicocca. Dr Jennings presented Using Climate Change Dystopias And Utopias To Generate New Organization Theory: A Cultural Narrative Approach and was part of a cultural entrepreneurship paper and session on scaling of novel technology.

Dr Gamal El-Din was invited to present at several international workshops and seminars:

- Application Of Char-Based Filtration/Adsorption For Industrial Wastewater Treatment: Design Considerations And Scale-Up. Biochar Workshop on Initiatives to Foster Research on Production and Use of Biochar in Qatar, Doha, Qatar. 7-8 May.
- Sustainable Municipal Wastewater Treatment For Micropollution Control Towards Safe Water Reuse. Institute of Electrical and Electronics Engineers (IEEE) 1st International Conference on Innovation Engineering Sciences and Technological Research (ICIESTR-2024), Muscat, Sultanate of Oman. 14-15 May. Keynote speaker.
- Water Treatment And Reclamation Approaches In The Canadian Oil Sands. Seminar at the China University of Petroleum, Beijing, China. 25 June 2024. Invited speaker.
- Applications Of Advanced Oxidation Processes For The Treatment Of Persistent Contaminants: Towards Sustainability. Seminar at Chinese Academy of Sciences, Beijing, China. 25 June. Invited speaker.
- Photocatalytic Degradation Of Pollutants. Tongji University, Shanghai, China. 28 June. Invited speaker.
- Solar-photocatalysis For Organics Degradation In Oil Sands Process Water (OSPW). Seminar at Shanghai University, Shanghai, China. 1 July. Invited speaker.
- Photocatalysis Applications For Pollutants Degradation. Seminar at East China Normal University, Shanghai, China. 4 July. Invited speaker.

PhD student **Yanan Li** attended the International Water Association's World Water Congress and Exhibition 2024 in Toronto from 11-15 August. Yanan presented her FES research, Floatable ZnO-Coated Micro Glass Bubbles For Sustainable And Renewable Solar Light-Driven Photodegradation Of Micropollutants In Wastewater Treatment.

Research Associate Dr **Muhammad Irfan** presented the latest results from research on poultry feathers as biosorbents. **Irfan** participated in the Science-Rendezvous at the Telus World of Science on May 11, conducting a hands on demo and presenting a poster. In September, **Irfan** presented Determination Of Thermodynamic And Kinetic Parameters Of The Optimized Poultry Feather Biosorbent Used For Wastewater Remediation at the 2024 Canadian Lipids and Proteins Conference held by the Canadian Section of the American Oil Chemists Society in Ottawa. Photos of him at both events are below.

Our theme's HQP are finishing their FES positions and moving to the next steps in their careers.

- Dr **Muhammad Arslan** completed his FES post doctoral fellow program and will be commencing a positon as Environmental Assessment Coordinator with Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC) in Iqaluit, NU in January 2025.
- Former post doctoral fellow Dr **Yihan Zhao** is an Assistant Lecturer with the Department of Renewable Resources.
- Former PhD student Dr **Stephanie Ibsen** has accepted a PDF position on high elevation grassland reclamation post mining with Dr M Anne Naeth.
- Former PhD student Dr **Monsuru Suara** is working as a Research Assistant with Dr Mohamed Gamal El-Din.

We welcomed new and old HQP to our FES theme.

Post doctoral fellow Dr **Ehiaghe Elimian's** FES research focuses on the development of sustainable materials designed for the continuous removal of contaminants of emerging concern (CEC) from wastewater using the solar advanced oxidation process. She is also exploring the interactions of microcontaminants and their intermediates with coexisting species in waste water. Ehiaghe earned her PhD in Engineering from the Department of Chemical and Environmental Engineering at the University of Nottingham, China and a MSc from the Department of Biosciences, University of Exeter, UK.

PhD student **Dong Wang**'s FES research centres on the development of nanofiber materials and advanced treatment processes for water and wastewater remediation. He is currently working on the design of a catalytic membrane with high conductivity for wastewater remediation through the combination of electro oxidation and membrane separation. He received a MSc in Light Industry Technology and Engineering from Fujian Agriculture and Forestry University in China.

Dr **Irum Zahara** has returned to our theme as a post doctoral fellow with Dr M Anne Naeth and is continuing the research on coal derived humic materials for soil and water and remediation. She is currently developing local coal derived humic materials for removal of a range of metals of concern, including selenium, from waste water.

We wish to thank **Pamela Chelme-Ayala** for her considerable contributions to the theme as co-coordinator since 2017. We wish her all the best.

Achievements

In April, PhD student **Abhijeet Pathy** was the recipient of a 4-year Vanier Canada Graduate Scholarship. He also received the Andrew Stewart Prize for excellence in doctoral research, and a Canadian Soil Science Society Travel Award to present at their conference in June.

In June, Dr **Mohamed Gamal El-Din** received the Albert E. Berry Award by the Board of Directors of the Canadian Society for Civil Engineering. This is a prestigious award that is granted to a civil engineer who has made outstanding contributions to the field of environmental engineering in Canada.

Two PhD thesis defenses occurred. We wish the students much success in their next steps.

- **Jerico Fiestas Flores**. Essays on reclamation economics: optimization, preferences and validation. 5 July 2024. Supervisors: Vic Adamowicz and Mohamed Gamal El-Din.
- **Stephanie Ibsen**. Soil invertebrates as success indicators for land reclamation monitoring. 19 September 2024. Supervisor: M Anne Naeth.

Fourteen peer reviewed scientific papers were published in the past 6 months.

An, Z., **I. Sánchez-Montes**, **P. Chelme-Ayala**, C. Chen and **M. Gamal El-Din**. 2024. Efficient degradation of naphthenic acids in water using a sustainable engineered biochar/ZnO composite under simulated solar light. Chemical Engineering Journal 489:151308 DOI: 10.1016/j.cej.2024.151308

Arslan, M., C. Benally, J.A. Müller, **M. Usman**, J. Hanna and **M. Gamal El-Din**. 2024. Empowering indigenous resilience with treatment wetlands. Cell Reports Sustainability 8:100149 DOI: 10.1016/j.crsus.2024.100149

Chen, N., **J. Kwak**, **C. Nzediegwu**, **S. Wang** and **S.X. Chang**. 2024. Feedstock type and pyrolysis temperature drive lead(II) adsorption on magnetite-impregnated biochar in aqueous solutions. International Journal of Environmental Science and Technology DOI: 10.1007/s13762-024-06106-5

Ju, Y., C. Liu, **S. Ganiyu**, Y. Zhao and **M. Gamal El-Din**. 2024. Electrochemical reclamation of oil sands process water: Two and three-dimensional electrode configuration systems structured with different anode materials. Journal of Environmental Chemical Engineering 12:112661 DOI: 10.1016/j.jece.2024.112661

Li, J., **M. Usman, M. Arslan** and **M. Gamal El-Din**. 2024. Molecular and microbial insights towards understanding the anaerobic biodegradation of anionic polyacrylamide in oil sands tailings. Water Research 258:121757 DOI: 10.1016/j.watres.2024.121757

Mehravaran, F., M. Arslan, X. Fan, and **M. Gamal El-Din**. 2024. Desorption and migration of dissolved organics from oil sands tailings to capped water: demonstration pit lake. Chemical Engineering Journal 493:152595 DOI: 10.1016/j.cej.2024.152595

Meng, L., Z.T. How and **M. Gamal El-Din**. 2024. Solar photocatalytic degradation of model naphthenic acids mixtures by Bi_2WO_6 and Bi_2WO_6/NiO/Ag: exploring the influence of inorganic fraction of oil sands process water. Chemical Engineering Journal 499:156084 DOI: 10.1016/j.cej.2024.156084

Mokarizadeh, H., I. Sánchez-Montes, S. Paul, N.A. Hussain, K. Moghrabi, J.L. Stafford and **M. Gamal El-Din**. 2024. Solar-activated tin oxide photocatalysis for efficient naphthenic acids removal and toxicity reduction in oil sands process water. Journal of Environmental Chemical Engineering, 12:114168 DOI: 10.1016/j.jece.2024.114168

Yang, L., A. Bekele and **M. Gamal El-Din**. 2024. Comprehensive characterization of organics in oil sands process water in constructed mesocosms utilizing multiple analytical methods. Environmental Research DOI: 10.1016/j.envres.2024.118972

Zhao, Y. and **M.A. Naeth**. 2024. Cd(II) and Zn(II) adsorption on lignite derived humic substances and cattle manure biochar. CLEAN – Soil, Air, Water 52:2400226 DOI: 10.1002/clen.202400226

Zhao, Y. and **M.A. Naeth**. 2024. Synergistic effects of coal waste derived humic substances and inorganic fertilizer as soil amendments for barley in sandy soil. Heliyon 10:e29620 DOI: 10.1016/j.heliyon.2024.e29620

Zhao, Y., M.A. Naeth, S.R. Wilkinson and **A. Dhar**. 2024. Phytoremediation of metals in oil sands process affected water by native wetland species. Ecotoxicology and Environmental Safety 282:116732 DOI: 10.1016/j.ecoenv.2024.116732

Zhao, Y., M.A. Naeth, S.R. Wilkinson and **A. Dhar**. 2024. Potential of biochar and humic substances for phytoremediation of trace metals in oil sands process affected water. Chemosphere 361:142375 DOI: 10.1016/j.chemosphere.2024.142375

Zheng, M., I. Sánchez-Montes, J. Li, X. Duan, B. Xu and **M. Gamal El-Din**. 2024. Attenuation of phenylnaphthenic acids related to oil sands process water using solar activated calcium peroxide: Influence of experimental factors, mechanistic modeling, and toxicity evaluation. Water Research 263:122188 DOI: 10.1016/j.watres.2024.122188

Notices And Reminders

Future Energy Systems' Global Energy Systems Conference – Save The Date

The Future Energy Systems programs at the University of Alberta and the University of Calgary will be hosting a Global Energy Systems Conference 3-5 June 2026. Please save these dates as our theme will be participating through presentations, panel discussions, and other forums.

More information on the conference to be posted on their website www.gesc2026.com/.

More information on how our theme will participate will be communicated through email and future editions of this newsletter.

New U of A Chemical Inventory And Hazardous Waste Management System

Health, Safety and Environment (HSE) is leading a safety initiative that will enable the university to effectively manage its chemical materials inventories and hazardous waste disposal via a centralized Chemical Inventory & Hazardous Waste Management (CIHWM) system. As of December 2024, laboratory chemical inventories must be completed and as of spring-summer 2025, waste must be transitioned from Chematix to the new software.

Details on this program and upcoming deadlines can be found here.

Acknowledgement Of FES Funding

The below statement must be included in acknowledgements for all papers or presentations resulting from your FES research.

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