water@unsw

WEDNESDAY, 16 OCTOBER 2024
UNSW LIBRARY LEVEL 5, ROOM 506

PROGRAM

MORNING SESSION 1
SESSION CHAIR: DR NARAS RAO

Time	Activity	Presenter
9:00 A.M.	Arrivals and Registration	
9:30 A.M.	Welcome	Dr Naras Rao
9:40 A.M.	Guest Speaker Session	Dr Clare Stephens
10:00 A.M.	Artificial Destratification Techniques to Mitigate the Impacts of Reservoir Stratification	Mr Fred Chaaya
10:10 A.M.	Small Islands, Big Ideas – Exploring Pacific Island Approaches to Reduce Flooding Using Nature-Based Solutions	Ms Eleanor Earl
10:20 A.M.	What Do We Know About the Environment Sustainability of Biosolids Processing Systems in Australia?	Mr Jingwen Luo
10:30 A.M.	Determination Of Oxidation Pathways During Pre-Oxidation of Green Algae by Common Oxidants: Impact on Cell Structure and Organic Matter	Dr Xiaoran (Daisy) Chu
10:40 A.M.	Innovative Solutions for Fish Passage	Yoel Jeremy
10:50 A.M.	Break and Morning Tea	

MORNING SESSION 2
SESSION CHAIR: DR RAFAEL PAULINO

Time	Activity	Presenter
11:20 A.M.	Modelling Pollutant Dispersion in Estuaries	Ms Margot Mason
11:30 A.M.	Advanced Algal Oxidation Via Cold Plasma Bubbles Under Varying Bubble Size and Gas Flow Rates	Ms Angelina
11:40 A.M.	Mapping Microfibres: Identifying and Addressing Microfibre Release in Textile Washing Processes	Mrs Marina Corte Tedesco
11:50 A.M.	Make Australian Wetlands Wet Again	Mr Jan Kreibich
12:00 A.M.	Systematic Strategies for Bioremediation of Chlorinated Solvents In Orica Groundwater Systems	Dr Ranjith Kumar Rajendran
12:10 P.M.	Lunch Break	

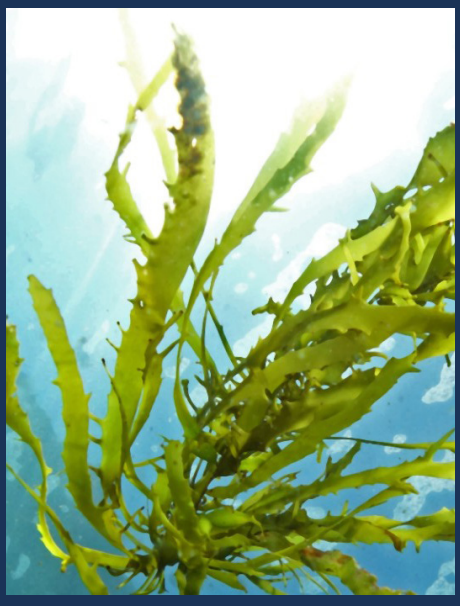
AFTERNOON SESSION
SESSION CHAIR: DR SHAMIM ARYAMPA

Time	Activity	Presenter
1:30 P.M.	Guest Speaker Session	Dr Michael Storey
1:50 P.M.	Gauge-Independent Multi-Source Precipitation Merging Is an Established Alternative for Improving Precipitation Estimation.	Mr Suraj Shah
1:55 P.M.	Oxidative Treatment of Bisphenol A In Municipal Wastewater Reverse Osmosis Concentrate Using Ferrate (VI)	Dr Fitri Widhiastuti
2:00 P.M.	Towards Improved MBR Validation Guidelines: Challenges and Research Needs	Ms Anju Tiwari
2:05 P.M.	Persistence And Concentration of Emerging Contaminants in Wastewater Treatment And Biosolids	Dr Calvin He
2:10 P.M.	Synergetic Hydrogen-Bond Network of Functionalized Graphene and Cations for Enhanced Atmospheric Water Capture	Mr Xiaojun Ren
2:15 P.M.	Assessing Odour Emissions in Biosolids Management: Challenges and Implications for Beneficial Reuse	Miss Thais Nunes Guerrero
2:20 P.M.	Assessing The Operational Conditions for Insitu Uplifting of End-Of-Life Reverse Osmosis Membranes for Water Treatment	Mr John Ogbe
2:25 P.M.	Granular and Biological Activated Carbon for the Management of Biogenic Taste and Odour Compounds	Dr Rafael Paulino
2:30 P.M.	Awards Ceremony	
2:40 P.M.	Living Water Exhibition and Close	Dr Naras Rao

LIVING WATER EXHIBITION

Living Water: 75 years of water research at UNSW connects water research across various environments and disciplines. From sea-grass reforestation to aquafarming, hydrology to art, this research speaks to the multitude of ways water shapes existence and impacts survival. By drawing together breakthrough studies, technological innovations, and community engagement efforts, we gain insight into how scientists, engineers, artists and researchers address complex challenges related to the stewardship of the planet's water systems. Living Water highlights significant contributions made by UNSW toward water governance and security, the support of healthy oceans and resilient coastlines, ensuring safe and equitable access to water, and sharing the knowledge we need to protect this vital resource into the future.

In celebration of UNSW's 75th anniversary, this exhibition is a col-laboration between UNSW Library and UNSW Global Water Institute, with funding support from the Faculty of Arts, Design & Architecture, Faculty of Business, Faculty of Engineering, Faculty of Law & Justice, Faculty of Science and UNSW Library.



Operation Crayweed. Credit: John Turnbull

GUEST SPEAKERS

DR CLARE STEPHENS

Dr Clare Stephens is a post-doctoral research fellow at Western Sydney University's Hawkesbury Institute for the Environment. Her research focuses on modelling hydrologic and landscape responses to climate change. She obtained her PhD from UNSW, researching the performance robustness of hydrologic models in a changing environment. Clare is a Fulbright Scholar, a Westpac Future Leaders Scholar and the 2015 Young Environmental Engineer of the Year (Engineers Australia). Before starting her research career, she worked as a surface water engineer on flood risk management and infrastructure design projects.

DR MICHAEL STOREY

Dr Michael Storey is the Managing Director of Isle Utilities' Asia-Pacific business. Michael has worked across all aspects of science, research and innovation in the local and international water industry. Michael has extensive experience in water quality and public health, customer research and human-centred design, and has led and managed change in often highly regulated environments. Prior to joining Isle, Michael held senior roles at Sydney Water, as well as CSIRO and the Swedish Institute for Infectious Disease Control, Stockholm.

ABSTRACTS

MORNING SESSION 1

FRED CHAAYA - Artificial Destratification Techniques to Mitigate the Impacts of Reservoir Stratification

Thermal stratification of reservoirs has significant water quality impacts. In the reservoir, the release of soluble metals, nutrients and conditions conducive to the growth of toxic blue-green algae degrade water quality. Downstream, the release of cold water significantly impacts fish populations while soluble metals, nutrients and blue-green algae impacts water treatment processes. Artificial destratification mitigates these impacts by artificially mixing a reservoir to ensure heating and oxygenation occurring at the surface of the reservoir reaches the bed. WRL undertook an international review of over 130 artificial destratification systems in more than 110 reservoirs world-wide to quantify their success (or otherwise) in mitigating the impacts of reservoir stratification. Analysis concluded bubble plume artificial destratification as the most widely applicable and practical solution for mitigating these impacts. Historical success was demonstrated with regards to mitigating thermal destratification, low dissolved oxygen concentrations and high iron and manganese concentrations concurrently. While success was mixed, bubble plume destratification was shown to be capable of reducing blue-green concentrations and the occurrence of blooms. Unsuccessful destratification was generally observed in large capacity reservoirs with low air flowrate to reservoir volume ratios, where scaling costs likely resulted in under-designed systems.

ELEANOR EARL - Small islands, big ideas – exploring Pacific Island approaches to reduce flooding using nature-based solutions

Recently, nature-based solutions (NbS) have gained increased attention for their role in flood management. Using natural hydrological and morphological processes, including reforestation and riparian restoration, NbS can manage flood sources and pathways, also known as Natural Flood Management (NFM). Our research aimed to better understand NFM on the high volcanic islands of Rarotonga (the Cook Islands) and Fiji, which often experience flooding. To better understand the factors affecting NFM uptake, 21 interviews with flood and catchment management practitioners were undertaken, including those working in government, NGOs, and academia. To investigate NFM approaches, modelling, and decision-making, interview questions were developed based on the Risks, Attitudes, Norms, Abilities and Self-Regulation (RANAS) approach. The RANAS model is a method for evaluating behaviour change which has been applied elsewhere in the water sector but, until this study, had not been previously applied to NFM. The interviews uncovered a diversity of challenges and opportunities face flood and catchment practitioners on these islands. For example, in some catchments, development had outpaced catchment restoration. Meanwhile, in other places invasive species had damaged ecosystems, increasing runoff. Opportunities to improve governance were also shared, including spatial planning and integration across government. Both the lessons learnt, and research methodology could be used to better inform catchment management - particularly as NFM research is at an early stage globally.

JINGWEN LUO - What Do We Know About the Environment Sustainability of Biosolids Processing Systems in Australia?

Australia is undergoing a significant transition in biosolids processing systems in response to regulatory changes addressing emerging contaminants. This transition necessitates a careful evaluation of various factors, including the comprehensive environmental sustainability impacts of such large-scale changes. This study aims to assess the environmental implications of this transition by comparing the current business-as-usual scenario for biosolids processing with future scenarios that incorporate emerging technologies on a national level. Life cycle assessment (LCA) is used to evaluate the environmental impacts and benefits of these scenarios, with a focus on global warming potential, toxicity, and other relevant indicators. The findings indicate that while emerging technologies have the potential to reduce carbon emissions, there are environmental trade-offs across different indicators, with outcomes heavily influenced by the fate of the final products. Additionally, the study identifies critical data gaps that must be addressed to refine the assessment and ensure the results are tailored to the Australian context. This research contributes to the broader discourse on the environmental implications of biosolids management at a national scale.

XIAORAN (DAISY) CHU - Determination of oxidation pathways during pre-oxidation of green algae by common oxidants: impact on cell structure and organic matter

Harmful algal blooms have become more prevalent globally and pose challenges to both drinking water and wastewater treatment plants. While most research focuses on cyanobacterial cells and metabolites, understanding of eukaryotic green algal cell treatment remains scarce. However, they also accumulate within water treatment plants, impairing performance and affecting water reuse. This study aims to improve understanding of oxidation effects on the green alga Chlorella vulgaris and the consequent AOM release and degradation using three conventional oxidants. Chlorella vulgaris cells were oxidised for 168 hours with 0 to 20 $mgL^{-1}H_2O_2$ and $KMnO_4$ and two hours with 0 to 5 $mgL^{-1}Cl_2$. Physiological changes in cells after oxidation were determined by flow cytometry, and the characteristics of AOM were measured using advanced organic characterization methods. Four stages of changes in C. vulgaris cells were observed: simultaneous cell membrane damage and inactivation, Chl-a scavenging, structural damage, and complete cell rupture and removal. Among the three oxidants, complete cell rupture and removal were only evident with KMnOâ„„ oxidation; for example, ~12% cell removal was seen with 2.5 $mgL^{-1}KMnO_4$ for 72 h. $KMnO_4$ treatment also caused the highest release (0.41-2.09 mgL^{-1} of AOM compared to the other two oxidants (<0.52 mgL^{-1}), indicating that complete cell rupture was the main cause for AOM increase rather than low-degree cell membrane damage.

JEREMY YOEL - Innovative solutions for fish passage

Freshwater fish populations are currently declining at one of the fastest rates of any vertebrate group. This is largely due to anthropogenic barriers, such as dams and weirs, obstructing fish passage across rivers and critically inhibiting freshwater fish migration. To address this challenge, our research explores the feasibility of novel, closed-conduit fishways that aims to enable fish migration over barriers. The innovative tube fishways are being developed by hydraulic engineers and fish biologists to meet the multi-disciplinary demands of designing new fishways. A summary of ongoing research is described, encompassing investigations in the laboratory and the field. Outcomes from laboratory experiments span the optimisation of entry conditions to improve volitional fish attraction into piped fishways, safe lifting of fish in laboratory models, and establishment of hydrodynamic thresholds for injury-free fish passage through closed conduits. Field experiments have accomplished the successful operation of a tube fishway at low-head weirs, achieving fish attraction and lifting during short-term field deployment. Current operations of tube fishways are promising to enable efficient fish transport across barriers and research is ongoing to further optimise the fishways through combined hydrodynamic assessments and live fish trials with a range of fish species.

MORNING SESSION 2

MARGOT MASON - Modelling pollutant dispersion in estuaries

Sewage overflows occurring into estuaries in which oyster farming occurs often trigger temporary closures to oyster harvesting areas. To aid decision making about the need for closures after overflows, models of 11 NSW estuaries have been created in the RMA modelling suite. Modelling pollutant transport in these areas requires consideration of dispersion, and how dispersion is captured in our models. Pollutant dispersion in estuaries is caused by multiple processes, including shear mixing, gravitational mixing, mixing in turbulent eddies and other processes. Numerical models represent the portion of this mixing which is happening above the scale of the model by explicitly representing the physical processes. The mixing that is happening below the scale of the model (such as in eddies smaller than the model resolution) is represented as dispersion, a conceptual simulation of mixing which (except on a molecular scale) is not based on an individual physical process. Hence, choice of appropriate dispersion coefficients is dependent on a combination of model resolution and the mixing processes being represented. We measured real world dispersion through 38 rhodamine dye release experiments and found results largely matched dispersion rates between 0.1 and 2 m^2/s. We found dispersion coefficients of this order of magnitude to be appropriate for modelling pollutant plumes in high resolution two- and three-dimensional finite element models in NSW estuaries.

ANGELINA - Advanced algal oxidation via cold plasma bubbles under varying bubble size and gas flow rates

Cold plasma is a novel approach in drinking water treatment and there is interest in deploying plasma for pre-oxidation of algae and cyanobacteria. It uses atmospheric gases and electrical discharge to produce active species including radicals, electrons, ions, long-lived species and UV lights. Studies has shown that delivering these active species through bubbles can improve their dissolution and thus enhance energy efficiency. Plasma bubbles efficiency depends on factors such as bubble size and gas flow rates. To investigate these effects, we employed varying air flow rates to produce different bubble sizes using a Venturi-plasma bubble generator, targeting Chlorella vulgaris. Flow cytometry was utilized to evaluate cell number, integrity, and viability, while scavenger tests were conducted to assess the role of active species in the oxidation process. Experimental findings revealed: 1) Higher gas flow rates resulted in larger bubbles due to increased turbulence and bubble coalescence; 2) Larger bubbles produced by higher gas flow rates were more effective in cell removal, inactivation, and damage; and 3) Superoxide had the most significant impact on cell degradation, particularly with high gas flow rates (>375 mL/min) and average bubble sizes between 540-560 Âµm. In conclusion, optimizing bubble size and gas flow rates is crucial for maximizing the effectiveness of cold plasma in algae treatment, with superoxide being a key factor in enhancing cell degradation.

MARINA CORTE TEDESCO - Mapping Microfibres: Identifying and Addressing Microfibre Release in Textile Washing Processes

Microfibres are a ubiquitous emergent contaminant. These tiny particles (<5 mm) contaminate aquatic and terrestrial environments, affecting both highly populated and remote areas. They can pose significant threats to wildlife and human health. Despite the growing body of research on the impacts of microfibre pollution, the mechanisms of their release remain poorly understood, with domestic washing believed to be the primary source. This study investigates the contributions of industrial laundries compared to domestic washing in generating microfibre pollution from textiles. We quantify and characterize fibre emissions, evaluating their contributions to wastewater systems and biosolids. Our findings aim to provide critical data on the predominant sources of microfibres, which can inform the prioritization of resources and the development of targeted policies. This research is particularly beneficial to the water industry, as it offers insights into the origins of microfibre pollution, enabling water utilities to implement more effective treatment processes and mitigation strategies. By identifying key sources of contamination, our work supports the development of abatement technologies and enhances the overall management of wastewater, ultimately contributing to the protection of water resources and public health.

JAN KREIBICH - Make Australian wetlands wet again

Wetlands, among the most productive and biologically diverse ecosystems, are severely threatened from water resource management and climate change worldwide. Flow regime alterations due to dams and reservoirs disrupt the connectivity between river channels and their floodplain habitats, significantly degrading ecological health. We investigated the effects of river regulation and projected climate change on the Lowbidgee Floodplain (3,250 km^2), the largest wetland ecosystem on the Murrumbidgee River, Australia's second longest river, within the Murray-Darling Basin. This floodplain has a rich Aboriginal cultural heritage tracing back thousands of years and supports a range of threatened and endangered native species. We used Landsat and Sentinel satellite imagery to map wetland inundation patterns from 1988-2023. Additionally, through the analysis of discharge data from the floodplain's river gauges, we modelled historic (1890-2022) and projected future (2046-2075) inundation regimes under various river regulation and climate change scenarios (CMIP6, SSP2-4.5 and SSP5-8.5). Few studies have provided such an extensive historical record and future projections of floodplain inundation regimes under both altered and natural flows. Our models and findings aim to inform restoration actions, particularly environmental flow management designed to mimic natural flow regimes, supporting the distinctive 'boom-and-bust' habitats and their flood-dependent native biodiversity.

RANJITH KUMAR REJENDRAN - Systematic Strategies for Bioremediation of Chlorinated Solvents in Orica Groundwater Systems

Chlorinated Volatile Organic Compounds (CVOCs) are ubiquitous environmental pollutants impacting groundwater ecosystems, owing to their extensive industrial application and improper disposal. In situ bioremediation is routinely applied to remediate hazardous waste sites, as it is technically viable, less expensive, and relies on natural processes to treat contaminants as compared to traditional methods. Organohalide-respiring bacteria (ORHB) facilitated reductive dehalogenation offers a promising approach for in situ bioremediation of sites contaminated with CVOCs. The goal of this project was to design treatment strategies to achieve CVOC biodegradation in groundwater samples from the Botany Industrial Park in locations where contaminant mass loss has been sluggish. Results indicated that out of 21 groundwater samples, only one sample exhibited solvent degrading activity in unamended anaerobic groundwater microcosms after 9 months of incubation. However, the addition of emulsified vegetable oil (EVO) as a fermentable carbon and energy source to pH-adjusted groundwater samples significantly enhanced the degradation performance of indigenous bacteria after 6 months. Furthermore, bioaugmentation with OHRB for groundwater containing high solvent concentrations resulted in the dechlorination of CVOCs to ethene in 3 months. The outcomes of this project are being used to design pilot-scale bioremediation trials to clean up one of the most infamous contaminated sites in the world.

AFTERNOON SESSION

SURAJ SHAH - Gauge-Independent Multi-Source Precipitation Merging Is an Established Alternative for Improving Precipitation Estimation.

Existing approaches primarily reduce uncertainty in precipitation magnitude, often neglecting rain/no-rain classification error. Moreover, these frameworks often rely on products with short temporal coverage resulting in biased merging weights, leading to suboptimal precipitation magnitude estimates. Here, we present a two-stage merging framework, the Generalized Signal-to-Noise Ratio Optimization (G-SNR) framework that addresses two existing challenges: uncertainty in rain/no-rain classification and bias in precipitation magnitude. First, the Categorical Triple Collocation-Merging (CTC-M) method is employed for binary merging (rain/no-rain classification). The merged rain/no-rain classification enables estimation of precipitation magnitude using the Signal-to-Noise Ratio Optimization. Our results indicate that G-SNR outperforms parent data and existing alternatives for both the binary (rain or no-rain) case as well as for the precipitation magnitude case. More importantly, error magnitude is improved across all percentiles, indicating superior performance across low and high extremes. This project introduces a two-step method for satellite and reanalysis precipitation merging. Initially, it employs binary merging, followed by the application of the SNR-opt method for magnitude merging, using the binary merged product as a reference. The innovation of this approach lies in its selective inclusion of only the contributing products from the input data. Unlike existing merging algorithms, which consider all input products indiscriminately, this method avoids unnecessary inclusion of non-contributing products, which leads to produce more correct merged satellite precipitation product especially in data scared regions.

FITRI WIDHIASTUTI - Oxidative treatment of bisphenol A in municipal wastewater reverse osmosis concentrate using Ferrate(VI)

Reverse osmosis concentrate (ROC) from municipal wastewater recycling processes poses significant environmental and health risks as it contains significant concentrations of harmful compounds, including phenolic chemicals, bisphenol A (BPA). In this study, effect of ferrate(VI) (Fe(VI)) oxidation on degradation of BPA (50 ÂµgL-1) in ROC matrix was investigated. The influence of process variables including [Fe(VI)]/[BPA] ratios (7-50), initial pH (5.0-8.0), and reaction temperature (15-25°C) was studied. Fe(VI) was found to be highly effective in degrading BPA in complex ROC matrix with various operating conditions. At 25°C, over 90% degradation of BPA was achieved at [Fe(VI)]/[BPA] ratio of 50, and an initial pH of ROC at 8.0 after 90 min of reaction. The reduction in dissolved organic carbon (DOC) was found to be 34% accompanied by 95% reduction in UV254 absorbance (initial value 0.750 cm-1) with 96.4% SUVA reduction. Additionally, residual concentration of Fe(III) at pH 8.0 was the lowest compared to other pH conditions at a fixed [Fe(VI)]/[BPA] ratio of 50. Fluorescence regional integration (FRI) analyses revealed that Fe(VI) preferentially react with fulvic acid-like and humic acid-like compounds, and aromatic protein II in ROC. The effectiveness of Fe(VI) in degrading BPA in ROC demonstrates the potential of using Fe(VI) as an efficient oxidant to remediate the micropollutants present in water and wastewater..

ANJU TIWARI - Towards Improved MBR Validation Guidelines: Challenges and Research Needs

Membrane Bioreactors are extensively used in wastewater recycling. The WaterVal MBR validation protocols (WaterSecure,2017) provided a tiered approach accrediting MBRs with pathogen log removal (LRV) credits, to ensure it reliability and compliance in recycling trains. Tier-1 grants default LRVs (Protozoa:2,Bacteria:4,Virus:1.5) under defined operating conditions. Tier-2 offers a challenge testing protocol for claiming higher LRVs. Tier-3, hypothetically proposed continuous monitoring approach.Despite comprehensive guidelines, gaps exist. This study, after numerous surveys and meetings with Australian stakeholders, identified their concerns regarding the uncertainty when operations deviate from Tier-1 operating envelope, impact of membrane ageing/damage and highlighted the need of development of Tier-3. This presentation reports the investigation of the impact of operation-deviation on the LRV and validity of operational envelope, provide clearer recommendations for mitigation measures when MBRs operate outside the validated range. After a systematic review, new considerations of deviating from the operating envelope have been identified, which requires scientific and statistical demonstration. Moreover, this present study also focuses on developing greater reliability of online monitoring of turbidity to provide long term trends,which will assist understanding the pathogen-removal performance of aging membranes, promote informed and early decision-making for replacement. It will help in the development of Tier 3, by establishing strong correlation between the existing online monitoring parameters with the LRVs by comparing and selecting appropriate machine-learning and statistical methods.

CALVIN HE - Persistence and Concentration of Emerging Contaminants in Wastewater Treatment and Biosolids

Biosolids are the solid by-products generated by wastewater treatment. Due to their carbon and nutrient content, biosolids may be beneficially reused by applying them to land for agriculture and forestry purposes as an alternative to chemical fertilisers and to improve soil health. However, a challenge to land application of biosolids is the growing risk and concern of chemical contamination from unknown sources and species. The recent awareness of PFAS being recognised as a highly persistent organic contaminant has highlighted that there are a vast array of chemicals that are being introduced to wastewater treatment systems. The physiochemical properties, persistence and concentrations in biosolids of a variety of pharmaceuticals, consumer products, industrial chemicals, hormones and disinfection by-products were assembled from peer-reviewed literature. Chemicals identified to be resistant to degradation in the natural environment include carbamazepine, galaxolide, tonalide, triclocarban and triclocarban. For triclocarban, triclosan, 4-n-nonylphenol and hormones as a class, their concentrations in biosolids were recognised to potentially exceed biological effect levels, although this may vary due to wastewater influents and treatment processes. Finally, statistical analysis of the degradation of gemfibrozil, ibuprofen and hormones has revealed that these species are resistant to anaerobic degradation. These findings help biosolids producers monitor for novel contaminants and implement low-cost interventions.

AFTERNOON SESSION (CONT.)

XIAOJUN REN - Synergetic hydrogen-bond network of functionalized graphene and cations for enhanced atmospheric water capture

Water molecules at the solid-liquid interface display intricate behaviours sensitive to small changes. The presence of different interfacial components, such as cations or functional groups, shape the physical and chemical properties of the hydrogen bond network. Understanding such interfacial hydrogen-bond networks is essential for a large range of applications and scientific questions. To probe the interfacial hydrogen-bond network, atmospheric water capture is a powerful tool. Here, we experimentally observe that a calcium ion on a calcium-intercalated graphene oxide aerogel (Ca-GOA) surface captures 3.2 times more water molecules than in its freestanding state. From experimental Van't Hoff estimation and density functional theory (DFT) calculations, we uncover the synergistically enhanced hydrogen-bond network of the calcium ion-epoxide complex due to significantly larger polarizations and hydrogen bond enthalpies. This study reveals valuable insights into the interfacial water hydrogen-bond network on functionalized carbon-cation complexed surfaces and potential pathways for future atmospheric water generation **technologies.**

THAIS NUNES GUERRERO - Assessing Odour Emissions In Biosolids Management: Challenges And Implications For Beneficial Reuse

As a by-product in wastewater treatment, sludge requires stabilisation before reuse. After stabilisation processes -- such as anaerobic or aerobic digestion, composting, thermal or chemical treatment -- sludge is called biosolids. Due to population and economic growth, large amounts of biosolids are produced annually; in Australia alone, the ANZBP estimated 1.4 million tonnes in 2021. Reusing biosolids is a beneficial alternative to disposal, but odour emissions pose significant challenges, increasing operational costs and reducing community acceptance. This study aimed to assess the influence of wastewater treatment processes and land application practices on odour emissions from biosolids. Samples of biosolids were collected from Resource Recovery Facilities in New South Wales, Australia. Emission assessments were conducted at UNSW Sydney over 15 days using a dynamic flux chamber. The gas extracted was analysed for volatile sulfur and organic compounds, using a GC-SCD and ODP coupled to TD-GC-MS. Expert panellists evaluated odour descriptors and intensities (from 1 - weak to 4 - strong), providing insights into the sensory aspects of odour emissions. Variations in concentration, frequency, and intensity of odour events were observed in the results, across different stages of wastewater solids processing and laboratory storage. The interplay between wastewater treatment processes and odour emissions is complex thus requiring targeted strategies such as analytical and sensorial methods to address odour-related challenges in biosolids management.

JOHN OGBE - Assessing the operational conditions for insitu uplifting of End-of-life reverse osmosis membranes for water treatment

End-of-life (EoL) reverse osmosis (RO) membranes are mostly considered as waste and incinerated or discarded as landfills after reaching their useful life. Due to the increasing number of large desalination plants using membrane technology, the resulting number of EoL modules discarded is becoming a serious environmental challenge. Although, potential reuse and recycling have been considered as an alternative to address this environmental waste problem. Herein, we assessed â€˜upliftingâ€™ as a possible option of addressing EOL membranes by investigating the operation condition for fabricating a new polyamide layer via interfacial polymerization (IP) after downcycling to an ultrafiltration (UF) like membrane. Results showed that varying monomer concentration during IP on recycled membrane enhanced pure water permeance (PWP) by >8% compared to a conventional brackish water membrane. Increased performance is simply attributed to the increase in trans-interface diffusivity of amines and hydrophilicity of the new PA layer. Further evaluation of separation performance with protein mix using liquid chromatography organic carbon detector (LC-OCD) indicated that uplifted membrane exhibited a good separation by rejecting >70% of biopolymers and humic substances respectively. This work offers a promising solution to address environmental waste from EOL membranes by creating an alternative for application in water treatment and further promoting membrane technology..

RAFAEL PAULINO - Granular and Biological Activated Carbon for the Management of Biogenic Taste and Odour Compounds

Biogenic taste and odour (T&O) events pose a series of challenges to drinking water treatment plants, increasing treatment costs, and influencing customer perception of water quality. Granular activated carbon (GAC) is effective at removing these compounds from drinking water through adsorption; and the development of a biofilm on the surface of the granules turns the system into a biological activated carbon (BAC) and extends its lifetime. This study developed and applied a methodology to compare the adsorption capacity of commercially available GACs and conducted a series of experiments to assess biofilm development and biofiltration performance. The proposed methodology revealed that the volume in pores smaller than 2 nm was the carbon characteristics with the most impact on adsorption of T&O. The removability of dissolved organic carbon by GAC rapidly declined over time, but removability of T&O compounds remained high throughout operation. Pre-exposure to T&O compounds had a small effect on their removability. Intermittent exposure to T&O did not significantly affect T&O removability, attesting for the BAC resilience to periods of non-exposure. Two potential novel microbes capable of degrading geosmin and 2-methylisoborneol, the most common T&O compounds, are proposed.