Track 4. Chemistry and Exposure Assessment

Advanced Monitoring and Assessment Approaches for Improved Treatment of Contaminants of Emerging Concern and PFAS in Wastewater

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Water treatment systems, especially in densely populated areas, are under increasing pressure. By 2050, it is projected that more than 2.5 billion individuals globally will be impacted by organic pollutants. A significant portion of these pollutants originates from municipal wastewater discharge and industrial activities. Many Contaminants of Emerging Concern (CECs) are poorly understood and require more attention, especially per- and polyfluoroalkyl substances (PFAS) in relation to their fate and transport in both wastewater discharge and sludge accumulation. PFAS are overwhelmingly found in water treatment plants (WWTP) and present a well-documented risk to aquatic ecosystems and groundwater due to their toxicity, widespread use, and high persistence.

To optimize WWTP efficiency, it is crucial to consider the intricate chemical interactions associated with CECs and PFAS, and to improve monitoring and pre-treatment techniques to pinpoint the sources of upstream pollutants. These strategies should encompass a wide range of CECs and PFAS, rather than focusing solely on a few chemicals. For instance, while advanced treatments like activated carbon filters may effectively remove regulated PFAS, serious question marks remain regarding the removal of less regulated but highly prevalent PFAS. This session will explore strategies such as (1) using spectrometry, chemometric, or effect-based methods to characterize CEC or PFAS dynamics in WWTPs, (2) further investigating the toxicity of lesser-known CECs and PFAS, and (3) developing guidance protocols that can transform wastewater utilities into systems that support population health monitoring through surveillance and monitoring strategies. This session will focus on advancements in detecting, treating, and managing CECs like PFAS in wastewater. We will explore potential solutions for improved monitoring of pollutant discharge, including non-targeted and retrospective analyses. Studies showcasing advanced treatment and pre-treatment strategies to identify major contributors of PFAS are also of interest. These studies are not only relevant for wastewater treatment but also for soil and crops when reusing treated water and sludge. We encourage submissions from experimental work at the laboratory, pilot, and field monitoring studies, as well as modelling of CEC and PFAS removal in pre-treatment, traditional, and advanced wastewater treatment systems to address chemical exposure risks.