THE OHIO STATE UNIVERSITY

Environmental Science Graduate Program Student Seminar Series

Fouling and scaling control in membrane-based desalination processes

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Abstract

Membrane fouling, which can be of organic, inorganic, or biological origins, is a major challenge in all membrane-based separation processes. Fouling and scaling are particularly challenging in desalination processes due to the high concentrations of salts and organics found in the water as well as the low tolerance of desalination membranes to chemical cleaning. In this presentation, we will present novel functional coatings and membrane designs that can mitigate fouling and scaling in membrane-based desalination, focusing on two different membrane systems: reverse osmosis and membrane distillation. First, the use of nanotechnology to enable low-fouling or self-cleaning membrane surfaces will be discussed. Material selection and design will be discussed based on a safe-by-design framework, with specific examples on how to tailor graphene-based materials for enhanced performance and reduced potential risks. Then, we will address how nanotechnology can be used to enable sustainable and off-grid water treatment, using solar energy to mitigate energy costs or reactive surfaces for fouling control. The broader implications of these different applications will be discussed in relationship with the current need for novel water treatment solutions for increased water security.