SEMINAR

Research Talks from the Resnick Fellows

RESNICK INSTITUTE
science + energy + sustainability

Cody Finke

Resnick Grad. Research Fellow

Using Atomic Layer Deposition to Tune Surface Electronics and Catalytic Overpotentials of a Heterogeneous Electrocatalyst, Applied to IrO_2 as a Chlorine Evolution Reaction Catalyst for Wastewater Treatment in the Developing World

Rational optimization is a critical problem in the field of heterogeneous electrocatalysis, and more tools are needed to be able to rationally create and tune catalytic active sites. By coating the chlorine evolution reaction (CER) catalyst IrO_2 with a small number of TiO_2 atomic layer deposition (ALD) cycles, the catalytic parameters may be tuned in a Sabatier-like manner. Potential of Zero Charge measurements show that adding different numbers of ALD cycles of TiO_2 tunes the surface electronics to an intermediate state between TiO_2 and IrO_2. This is a proof of concept that ALD can be used to tune the surface electronics of a catalyst for the environmentally important CER. Based on this, it may be possible to use ALD to tune the electronic properties of other electrocatalysts for reactions or to tune non-precious metal based catalysts to be active for critical reactions.

Justin Jasper Ph.D.

Resnick Postdoctoral Scholar

Fate of Organic Chemicals during Electrochemical Wastewater Treatment: Pharmaceuticals and Disinfection By-Products

Electrochemical processes holds promise for decentralized wastewater treatment, especially in developing countries where the infrastructure for conventional wastewater treatment is not available. While electrochemical treatment efficiently disinfects wastewater and removes nutrients, its ability to transform wastewater-derived trace organic contaminants, such as pharmaceuticals, is poorly understood. My talk will show that pharmaceuticals are efficiently transformed during electrochemical treatment, primarily via reaction with reactive chlorine species generated on mixed-metal anodes. Halogenated transformation products, which may be more toxic than parent compounds, also typically undergo further transformation during treatment. However, the production of regulated disinfection by-products, including haloacetic acids and trihalomethanes, during electrochemical wastewater treatment remains a cause for concern.

3:00 to 4:00 pm | Wednesday, 10/19/16
Guggenheim 101, Lees-Kubota Lecture Hall
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