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BIG energy seminar series

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Enhancing electrocatalytic CO_2 reduction using a system-integrated approach to catalyst discovery and optimization

Wilson Smith,
Associate Professor, Department of Chemical Engineering,
Delft University of Technology

Date: Thursday, October 18th at 1:00pm

Location: SEEC S372

Abstract:

Electrocatalytic CO_2 reduction has the dual-promise of neutralizing carbon emissions in the near future, while providing a long-term pathway to create energy-dense chemicals and fuels from atmospheric CO_2. The field has advanced immensely in recent years, taking significant strides towards commercial realization. While catalyst innovations have played a pivotal role in increasing the product selectivity and activity of both C1 and C2 products, slowing advancements indicate that electrocatalytic performance may be approaching a hard cap. Meanwhile, innovations at the systems level have resulted in the intensification of CO_2 reduction processes to industrially-relevant current densities by using pressurized electrolytes, gas-diffusion electrodes and membrane-electrode assemblies to provide ample CO_2 to the catalyst. The immediate gains in performance metrics offered by operating under excess CO_2 conditions goes beyond a reduction of system losses and high current densities, however, with even simple catalysts outperforming many of their H-cell counterparts. Using recent literature as a guidepost, this talk will focus on some of the underlying reasons for the observed changes in catalytic activity, and proposes that further advances can be made by shifting additional efforts in catalyst discovery and fundamental studies to system-integrated testing platforms.

Bio:

Wilson A. Smith is an Associate Professor in the Department of Chemical Engineering at Delft University of Technology. He earned his BS in Physics from American University in 2005, and his Ph.D. in Physics from the University of Georgia in 2010, where he studied the synthesis and applications of nanostructured photocatalysts. From there he moved to Paris, France as a postdoctoral research associate at the Universite Pierre et Marie Curie/Sorbonne where he studied the defect structure of doped semiconductors for solar water purification. In 2012 he began his independent career at TU Delft, where his group focuses on fundamental and applied aspects of photoelectrochemical water splitting, electrochemical CO_2 reduction and ammonia synthesis. Wilson has been the recipient of the prestigious VENI (2013), VIDI (2016), and ERC Starting (2017) personal grants, which have helped his group bridge scales and disciplines to address practical problems in large scale energy conversion and storage.

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