

SEMINAR SERIES

HIGHLIGHTS IN ENERGY RESEARCH

11.04.2019, 16:00 - 17:00, EPFL Valais, 4th floor, ZEUIZER room

Electrochemical CO₂ Reduction Across Scales: From Mechanistic Pathways to Practical Applications

Prof. Wilson A. SMITH

Department of Chemical Engineering, Delft University of Technology, The Netherlands

Host : Prof. Raffaella Buonsanti

Electrocatalytic CO₂ 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 CO₂. 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 CO₂ reduction processes to industrially-relevant current densities by using pressurized electrolytes, gas-diffusion electrodes and membrane-electrode assemblies to provide ample CO₂ to the catalyst. The immediate gains in performance metrics offered by operating under excess CO₂ conditions goes beyond a reduction of system losses and high current densities, however, with even simple catalysts outperforming many of their H-cell counterparts. This talk will focus on some of the underlying reasons for the observed changes in catalytic activity, and propose that further advances can be made by shifting additional efforts in catalyst discovery and fundamental studies to system-integrated testing platforms. Recent results will be shown that highlight the use of computational modeling, in-situ/operando spectroelectrochemistry, and reactor engineering to understand and optimize electrochemical systems across many scales.



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 Université 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 CO₂ 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.