Clarkson University
Department of Chemical and Biomolecular Engineering
SEMINAR (ZOOM)

"Sustainable ammonia synthesis under milder conditions"

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Ammonia is the second most produced chemical in the world, with annual production exceeding 180 million tonnes. More than 98% of ammonia manufacturing relies on fossil fuels and is produced through the Haber-Bosch process, which relies on a high-temperature (450 °C) and high-pressure (100-200 bar) thermocatalytic reaction. A more efficient ammonia synthesis at lower pressures and temperatures has long been a proverbial holy grail for scientists and engineers. In this talk, our efforts to produce ammonia under milder conditions will be presented. First, the concept of reaction-absorption will be presented that can promise ammonia production at 10-15 times lower pressure while sustaining the production rates. Ultra-stable supported metal halides can effectively separate ammonia from the synthesis gas at temperatures as high as 300 °C. The second part of the talk will focus on efforts to lower the ammonia synthesis temperature. The ongoing work on designing a lithium-mediated catalyst for ammonia synthesis at 300 °C will be discussed. The seminar will be wrapped up by elaborating on the design of an integrated reactive separation for single-vessel ammonia synthesis under mild conditions.

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https://clarkson.zoom.us/j/97165940584

Mahdi Malmali is an assistant professor of Chemical Engineering at Texas Tech University. He received his M.S. in Chemical Engineering from Sharif University of Technology (2010) and Ph.D. in Chemical Engineering from the University of Arkansas (2014). After a short postdoctoral appointment at MAST Center at the University of Arkansas, Dr. Malmali joined the Chemical Engineering and Materials Science department at the University of Minnesota as a research associate, under Ed Cussler and Alon McCormick (2015-2017). He then joined Texas Tech University in 2018 as an assistant professor. His research focuses on reaction engineering and separation processes. He is particularly interested in intensification of chemical processes through designing advanced materials and interfaces.