



Dr. Melanie Hazlett

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11:00 a.m. to 11:50 a.m. in ENW 115

Applications in Environmental Catalysis: Dimethyl Ether Production from Methanol Zeolites at Low Temperature

ABSTRACT

Catalysts are used in 80% of chemical processes, and in 90% of those processes a heterogeneous catalyst is used to make it easier to separate the catalyst from reactants and products. First this talk will quickly introduce the use of heterogeneous catalysts in several environmental applications. Then we will dive further into the particular application of dimethyl ether (DME) production. DME is an important chemical intermediate and a potential molecule to use as an alternative fuel or hydrogen carrier. DME can be produced from green hydrogen and CO₂ from direct air capture through methanol as an intermediate. This research looks at KFI and RHO type zeolites as catalysts for methanol dehydration to DME. The zeolite properties, including crystal structure, particle morphology, and surface acidity, were evaluated using characterization techniques, and their catalytic activity and stability were evaluated by experiments on a bench scale packed bed reactor. The results show that these RHO and KFI are very active at low temperatures (<200 °C) compared to other benchmark catalysts for this reaction, which is important for a direct production process from captured CO₂. The work presented on KFI zeolites has been published in Applied Catalysis A: General, and the work on RHO zeolites is presently under review.

BIOGRAPHY – MELANIE HAZLETT

Dr. Melanie Hazlett is an Assistant Professor in Chemical and Materials Engineering at Concordia University, located in Montreal, Quebec. She received her B.A.Sc. in Chemical Engineering from the University of Waterloo (UW) in 2012 and her Ph.D. in Chemical Engineering from the University of Houston (UH) in 2016. Under the supervision of Dr. William Epling, her Ph.D. research focused on understanding Pt-Pd/Al₂O₃ oxidation catalysts for reducing diesel engine carbon monoxide and hydrocarbon emissions by evaluating reaction mechanisms and performance on catalyst with varying Pt:Pd ratios using bench scale reaction tests, in situ spectroscopy, and other characterization techniques. Subsequently, Dr. Hazlett worked as a postdoctoral associate at the University of Calgary and a Lecturer at the University before starting her current position at Concordia University in 2020. Dr. Hazlett has published seventeen peer reviewed publications, including a book chapter and two review articles. Her most cited paper, "Kinetic and Mechanistic Study of Bimetallic Pt-Pd/Al₂O₃ Catalysts for CO and C₃H₆ Oxidation", has received 130 citations since publication in 2017 and was completed during her Ph.D. at UH in collaboration with scientists at the Oak Ridge National Laboratory. Her review paper, "Heterogeneous Catalyst Design: Zoned and Layered Catalysts in Diesel Vehicle After-treatment Monolith Reactors", was acknowledged as one of the most downloaded articles from the Canadian Journal of Chemical Engineering in 2018-2019