



Wolfson Department of Chemical Engineering Seminar

Monday, May 11th, 2026 at 13:30

Room 6

Identify benchmark catalysts for deoxydehydration reaction of biomass-derived polyols to olefins

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Final-PhD Seminar

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The deoxydehydration (DODH) reaction of biomass-derived vicinal diols to olefins serves an important pathway for the production of chemicals currently derived from petroleum. Hence, finding selective catalysts that are stable during liquid-phase processing is crucial for the efficient promotion of the DODH. Rhenium-based catalysts have been widely recognized as the most promising catalysts for promoting DODH. However, despite extensive studies of rhenium catalysts across a broad range of substrates, reductants, and reaction conditions, the absence of a community-accepted benchmark catalyst is still a missing piece. The goal of my PhD work is to identify benchmark catalysts for DODH reaction.

In the first part, we evaluated the potential of trioxo(η^5 -pentamethylcyclopentadienyl) rhenium (Cp^*ReO_3) as a homogeneous benchmark catalyst, which received very limited attention despite being the milestone catalyst for DODH reaction. We rigorously investigated the effect of chemical environment on catalyst stability. For the first time, we revealed that the catalyst stability is strongly governed by the solvent polarity and the coordination of diol with Re center. Kinetic study further provides important mechanistic insights into active rhenium species.

In the second part, we synthesized the first example of heterogeneous Cp^*ReO_3 catalysts through immobilization of the Cp^*ReO_3 complex on polymer and silica support, and investigated the effect of local grafting environment. Characterization methods FTIR, TGA-MS and UV-Vis shed light on the relationship between catalytic behavior and catalyst structure. Notably, introducing hydroxyl-rich environments near the Re center on catalysts surface enhances catalytic activity in DODH by 5-fold.

Refreshments will be served at 13:15.