

Séminaire Prof. Clifford Kubiak

« Carbon dioxide reduction by rhenium and manganese bipyridyl complexes: Mechanistic insights and new strategies to lower overpotentials. »

Abstract :

Electrocatalysts for the reduction of CO₂ (CO₂RR) are of interest in the production of solar fuels, and as a means of mitigating atmospheric CO₂. Of the systems that electrocatalytically reduce CO₂, the Re(bpy-R)(CO)₃Cl family of compounds is one of the most robust and well-characterized systems known to date. Recent studies of X-ray Absorption Spectroscopy (XAS), stopped flow kinetics with infrared detection, and theoretical studies will be reviewed. The high selectivity of these catalysts for the reduction of CO₂ in the presence of weak acids will be discussed in light of these recent experimental and theoretical studies. XAS studies on the analogous Mn bipyridyl complexes give additional insights into the unusual electronic structures of the group 7 [M(bpy)(CO)₃]⁻ catalysts. The much more earth-abundant Mn catalysts are capable of reducing CO₂ at *ca.* 400mV lower overpotentials than their Re counterparts. The lowering of overpotentials for CO₂ electrocatalysts remains as the major challenge in this field. Recent attempts to lower overpotentials through electrostatic, dielectric medium, artificial metalloprotein, and mechanism redirection strategies will be described.