Salen metal complexes in Metal-Organic Frameworks and Porous-Organic Polymers for the electrochemical reduction of CO_2

Marcello B. Solomon(a,^); Tamara L. Church(a); Danielle F. Kennedy(b,); Seth M. Cohen(c); Clifford. P. Kubiak(c); Katrina A. Jolliffe (a); Deanna M. D'Alessandro(a)*
(a) The University of Sydney, NSW, Australia (b) CSIRO, Manufacturing; (c) The University of California, San Diego, USA

Presentation Preference: Poster

Aligned with Science Focus: CO2 utilisation, general catalysed processes, renewable energy storage

Abstract:

Since the industrial revolution, the consumption of fossil fuels has been increasing to cater for the needs of an ever-growing world population. In recent years, research has expanded to mitigate CO_2 emissions from fuels by focusing on its sequestration from the atmosphere, and for its conversion to a chemical feedstock for the production of commodity chemicals.[1] The salen ligand occurs in catalysts that convert CO_2 to other feedstocks and is a particularly attractive option in this instance due to its ease of synthesis and the extensive variations that may be made to its core.[2] The ligand's functionalisation allows for its immobilisation into the solid state – a pathway that has been shown to improve the catalytic conversion of CO_2.[3]

This presentation will detail the drive to create multifunctional materials with high surface areas and extended catalytic activity. Metal-Organic Frameworks (MOFs) and Porous Organic Polymers (POPs) containing salen ligands that chelate various metals (M= Mn(III), Co(III), Ni(II), Fe(II), Pd(II), Pt(II)) were synthesised and have been tested as agents for the electrochemical reduction or high throughput hydrogenation of CO_2. Efforts have been made to scale up the most promising materials and to determine any major products formed. Spectroelectrochemical techniques have been employed to establish the redox processes of the salen core to better understand their redox properties.

References
1. Olah, G.; Prakash, G.; Goeppert, A. *J. Am. Chem. Soc.* **2012**, *133*, 12881–12898
2. Yoon, M.; Srirambalaii, R.; Kim, K. *Chem. Rev.* **2012**, *112*, 1196–1231
3. Yan, P.; Jing, H. *Adv. Synth. Catal.* **2009**, *351*, 1325–1332

Biographical Statement of speaker:

Marcello Solomon obtained his B Sc. (Adv. Maths) at The University of Sydney in 2012. He has recently completed his Ph.D. under the supervision of A/Prof. Deanna D'Alessandro and Prof. Katrina Jolliffe, in which he studied the synthesis and electrochemical properties of salen metal complexes and their MOFs.