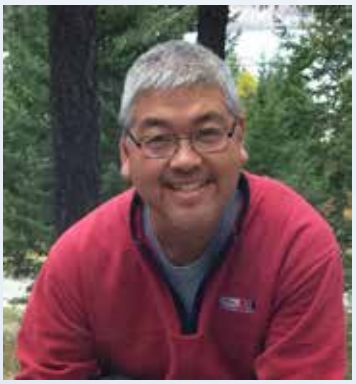
ITbM-IGER-RCMS Seminar



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CO_2 Capture and Proton Conduction in Metal Organic Frameworks

Date: May 17, 2017, Time: 14:45 - 16:15

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Language: English

Metal organic frameworks (MOFs) represent tunable molecular scaffoldings that can be adjusted for a breadth of applications. This presentation will concern our efforts towards tailoring MOFs towards two globally relevant energy challenges, CO_2 capture and fuel cells. The first topic concerns MOFs as proton conductors.[1] In this light, MOFs offer several interesting prospects stemming from their modular syntheses and tunable pore structures. MOFs have been shown to be able to conduct protons over 10^{-2} Scm^{-1}, [2] conduct above the boiling point of water,[3] and also to be robust in humid atmospheres[4] – an ongoing challenge is to merge all desirable properties in one material. Even when the properties of the MOF may not meet a required industrial standard, the crystallinity of the MOF can allow for added insights to designing better materials and as a foothold for modelling studies. [5] This aspect of the talk will cover some recent work to fine tune proton conduction but also efforts to make robust materials.

For the carbon capture portion, the talk will concern the factors that both make a solid an academically interesting capture material and also those that carry forward to more practical application. In contrast to liquid amines which chemisorb CO_2 and have high energy costs for regeneration, the MOF approach typically gives physisorbed gases and hence more facile release. [6] This topic will cover factors affecting CO_2 affinity in MOFs. [7] Finally, we will present a new MOF with high stability and the ability to capture CO_2 via a physisorptive mechanism in wet gas. [8]

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6. a) Sumida, K. et al. Chem Rev. 2012, 112, 724. b) Patel, H. A. et al, CHEMSUSCHEM, 2017, DOI: 10.1002/cssc.201601545
7. a) R. Vaidhyanathan et al. Science, 2010, 330, 650. b) Gelfand, B. S. et al Angew. Chem. Int. Ed. 2016, 55,14614.
8. Shimizu, G. K. H. unpublished.

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