

第42回触媒化学融合研究センター講演会

“CO₂ Capture and Proton Conduction in Metal Organic Frameworks (MOFs)”

<講師>

Department of Chemistry
University of Calgary

Prof. George Shimizu



日時: 2017年 3月 13日(月) 16時から17時

場所: 産総研第5事業所 第1本館 第5会議室(5-1 2101室)

<講演概要>

This presentation will concern our efforts towards tailoring MOFs towards two globally relevant energy challenges, CO₂ capture and fuel cells.

In contrast to liquid amines which chemisorb CO₂ and have high energy costs for regeneration, the MOF approach typically gives physisorbed gases and hence more facile release. Despite the weaker binding mode, we will show that high selectivities are possible owing to heats of adsorption over 40 kJ/mol and cooperativity between CO₂ molecules in augmenting binding.¹ Related to this is the need to enhance water stability of the MOF backbone and our efforts to achieve this goal will be presented.^{2,3} Finally, a new MOF with high stability and the ability to actually capture CO₂ in wet gas will be presented.

The second topic concerns an approach to proton conductors for PEM fuel cell membranes.⁴ A major hurdle in these technologies is an electrolyte capable of operating above 100°C. Higher operating temperatures will enhance electrode kinetics and decrease electrode poisoning among several critical operational benefits. In contrast to polymer approaches towards these electrolytes, we have used a MOF strategy to generate crystalline networks with acidic pores. These MOFs present options for higher temperature conduction,⁵ conduction over 10⁻² Scm⁻¹,^{6,8} in a water stable structure.^{7,8}

1) R. Vaidhyanathan et al. *Science*, **2010**, *330*, 650., 2) J. M. Taylor et al., *J. Am. Chem. Soc.* **2012**, *134*, 14338., 3) Gelfand, B. S. et al *Angew. Chem. Int. Ed.* **2016**, *55*, 14614., 4) G. K. H. Shimizu et al. *Science*, **2013**, *341*, 354., 5) J. A. Hurd et al. *Nature Chem.* **2009**, *1*, 705., 6) S. Kim et al., *J. Am. Chem. Soc.* **2013**, *135*, 963., 7) J. M. Taylor et al., *J. Am. Chem. Soc.* **2013**, *135*, 1193., 8) Ramaswamy, P. et al. *J. Am. Chem. Soc.* **2015**, *137*, 7640.

【問い合わせ先】 触媒化学融合研究センター 担当: 白川 TEL: 029-861-2763

E-mail: irc3-kouenkai-ml@aist.go.jp HP: <http://irc3.aist.go.jp/>