Australian Synchrotron



Contribution ID : 228 Type : Oral

Highly Active Gas Phase Organometallic Catalysis Supported Within Metal-organic Framework Pores

Thursday, 19 November 2020 15:20 (20)

Metal-organic Frameworks (MOFs) possess a set of unique attributes including permanent porosity, large internal surface areas and robust crystallinity which has motivated extensive interest in the field of gas-phase catalysis. In particular, MOFs can act as a platform for the heterogenization of molecular catalysts, allowing easy catalyst recovery and a route towards structural elucidation of the active centres immobilised in a crystalline host. We have developed a unique MOF, MnMOF-1 which features vacant N,N-chelation sites which are accessible via the porous channels that penetrate the structure1,2. In the present work, cationic Rhodium(I) norbornadiene (NBD), cyclooctadiene (COD) and bis(ethylene) complexes have been incorporated into the vacant N,N-chelation sites of MnMOF-1 via post-synthetic metalation and facile anion exchange. Exploiting the crystallinity of the host framework, the immobilised Rh(I) centres were structurally characterised using X-ray crystallography.

The activity of the Rh(I) bisethylene complexes MnMOF-1·[Rh(C2H4)2]BF4 and MnMOF-1·[Rh(C2H4)2]Cl in gas phase butene isomerisation was studied using gas-phase NMR spectroscopy. Under one atmosphere of butene at 46°C, MnMOF-1·[Rh(C2H4)2]BF4 rapidly catalyses the conversion of 1-butene to 2-butene with a TOF of ca. 2000hr-1. Notably, the chloride derivative, MnMOF-1 [Rh(C2H4)2]Cl displays negligible activity in comparison, suggesting that interactions between the chloride anion and the Rh centre impact the catalytic activity.

References

- 1. Peralta, R.A.; Huxley, M.; Young, R.; Linder-Patton, O. M.; Evans, J. D.; Doonan, C. J.; Sumby, C. J. Faraday Discussions 2020.
- 2. Peralta R. A.; Huxley, M. T; Evans, J. D.; Fallon, T.; Cao, H.; He, M.; Zhao, X. S.; Agnoli, S.; Sumby, C. J.; Doonan, C. J. J. Am. Chem. Soc., 2020.

Primary author(s): Mr PERALTA, Ricardo (University of Adelaide)

Presenter(s): Mr PERALTA, Ricardo (University of Adelaide)

Session Classification: Session 8 - Advanced Materials and Hard Matter

Track Classification: Advanced Materials and Hard Matter