

Printable MOF-polymer composites for LOHC separation

Michael Scalzo^{a, b}, Abdollah Khosravanian^{a, b}, Ryan Mulvenna^a, Timothy Scott^a, Matthew R. Hill^{a, b*}

^a Department of Chemical and Biological Engineering, Monash University, Australia

^b Advanced Porous Materials, Manufacturing, CSIRO, Australia

*Corresponding author: matthew.hill@monash.edu

Abstract:

Hydrogen is touted as the future of fuel but it is a flammable gas that requires highly specialised equipment for transport and storage. The development of Liquid Organic Hydrogen Carriers (LOHCs) may permit the distribution of hydrogen at room temperature with existing oil infrastructure. However, separation of LOHCs such as methylcyclohexane and toluene is currently impractical. Organosolvent nanofiltration membranes are an efficient process for separating organic liquids. Therefore, there is interest to develop a membrane with LOHC selectivity. Here, we aim to incorporate LOHC-selective MOFs into a mixed matrix membrane (MMM) for LOHC separation.

To date, a new moisture-stable, contoured MOF has been synthesised: UiO-66-cub. Blending of thiol-ene polymers with allyl sulfide polymers has been shown to have tuneable mechanical (10–1100 MPa) and solubility properties (variable swelling in toluene). We also report on the transport properties of these MMMs.

Keywords: Metal-Organic Framework (MOF), Organosolvent nanofiltration (OSN), Mixed-matrix membrane (MMM), Liquid Organic Hydrogen Carrier (LOHC),