

## Tuning Properties and Functionality in the Modulated Self-Assembly of Metal-Organic Frameworks

Ross S. Forgan\*<sup>a</sup>

<sup>a</sup> *WestCHEM School of Chemistry, University of Glasgow, University Avenue, Glasgow G12 8QQ, UK.*

E-mail: Ross.Forgan@glasgow.ac.uk

Metal-organic frameworks (MOFs) are network materials comprised of organic ligands connected by metal ion clusters into multidimensional structures that often have permanent porosity. Their chemically addressable structures, combined with their ability to store large quantities of small molecules within their pores, have led to applications in gas storage, heterogeneous catalysis, sensing, and drug delivery, amongst others. Coordination modulation, the addition of monomeric modulators to synthetic mixtures, can tune particle size from nanometres to centimetres, through capping of crystallites (decreasing size) or coordinative competition with ligands (increasing size).

The talk will cover the development of our own modulation techniques<sup>1</sup> for a range of MOFs, describing the versatility of modulation in controlling physical properties such as interpenetration, defectivity, and porosity.<sup>2</sup> Our techniques provide access to high quality single crystals of many different MOFs, allowing the subsequent characterisation of their mechanical properties,<sup>3</sup> single-crystal to single-crystal postsynthetic modification,<sup>4</sup> and development of fluorescent sensors.<sup>5</sup> Additionally, we will show that protocols can be tuned to downsize materials, producing nanoparticles with fine control of surface chemistry, allowing the assembly of pH-responsive and organelle targeted drug delivery devices.<sup>6</sup>

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