

# Poster Presentations

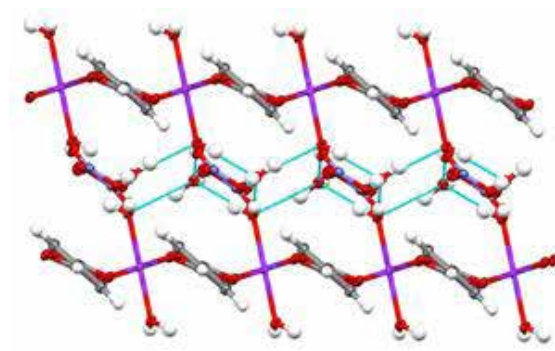
## [MS24-P20] Engineering Hydrogen-Bonded Architectures of Magnesium-Organic Complexes

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Hybrid metal-organic complexes are versatile crystalline materials with applications including molecular adsorption, gas storage/separation and catalysis. Magnesium is an attractive choice of metal for the synthesis of inorganic-organic crystalline complexes not only due to its high abundance and availability, but with the additional benefit of producing low density adsorbent materials due to its low formula weight.<sup>1</sup> Despite this, such complexes featuring magnesium are uncommonly reported relative to those of the transition metals and lanthanides. Group 2, and specifically magnesium metal complexes, are thus our area of interest. The function of a material is determined by its internal structure which is shaped by the interactions between the constituent parts. Hydrogen (H-) bonds are hugely effective for directing the structure due to their directionality and predictability. We have produced a range of magnesium and calcium-organic complexes, synthesised by a self-assembly process, featuring H-bonds that connect and play a role in stabilising the structure. Here we report new complexes and our efforts to design and further develop magnesium-organic complexes in several different ways.  $\text{Mg}(\text{pic})_2(\text{NO}_3)_2(\text{H}_2\text{O})_4$  (**Mg1**) (pic = 2-pyridine carboxylic acid) is an example of the complexes formed to date, Figure 1. **Mg1** consists of 1D coordination polymer chains of zwitterionic picolinic acids bridging octahedral magnesium centres. The chains are connected by extensive H-bonding – including a bifurcated hydrogen bond – between the ligands and uncoordinated nitrate ions and water molecules. **Mg1** has a melting point in the range of 80 – 90°C and there is visible release of water

during heating. To develop this work towards functionality of the synthesised complexes, we are investigating the use of pyridine dicarboxylic acid ligands to coordinate to the metal increasing the H-bonding capabilities of the coordination motif. The new material can then be combined with various diamines, allowing for stronger amine – carboxylate H-bonds to link the coordination chains as opposed to the weaker interactions between the associated water molecules. This will develop work carried out by Beatty *et al.*<sup>2</sup> towards our target porous group 2 metal complexes. As another approach to advance this structure, the metal can be combined with supramolecular units, adapted from those identified in our group's previous work. This involves investigations of organic crystals with pre-determined H-bonding motifs formed by the self-assembly of methylpyridine isomers and chloranilic acid.<sup>3</sup> The new supramolecular units can be prepared from pyridine carboxylic or dicarboxylic acids with chloranilic acid prior to metal coordination to form similar supramolecular motifs as reported previously, but with carboxylic acid functionalities. This fragment can then be combined with a magnesium salt in a similar fashion to that which produced **Mg1**. The work to be discussed targets the synthesis of group 2 metal-organic complexes with more open architectures and potentially increased surface areas and stabilities due to the extra organic component. These materials have the potential to display useful physical properties, such as the uptake of guest molecules.



**Figure 1.** 2D chains of **Mg1** connected by H-bonds.

[1.] M. Dinca, J. R. Long, *J. Am. Chem. Soc.*, 2005, **127**, 9376-9377. [2.] G. A. Hogan, N. P. Rath, A. M. Beatty, *Cryst. Growth Des.*, 2011, **11**, 3740-3743. [3.] M. S. Adam, A. Parkin, L. H. Thomas, C. C. Wilson, *CrystEngComm.*, 2010, **12**, 917-924

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