MS59.O02

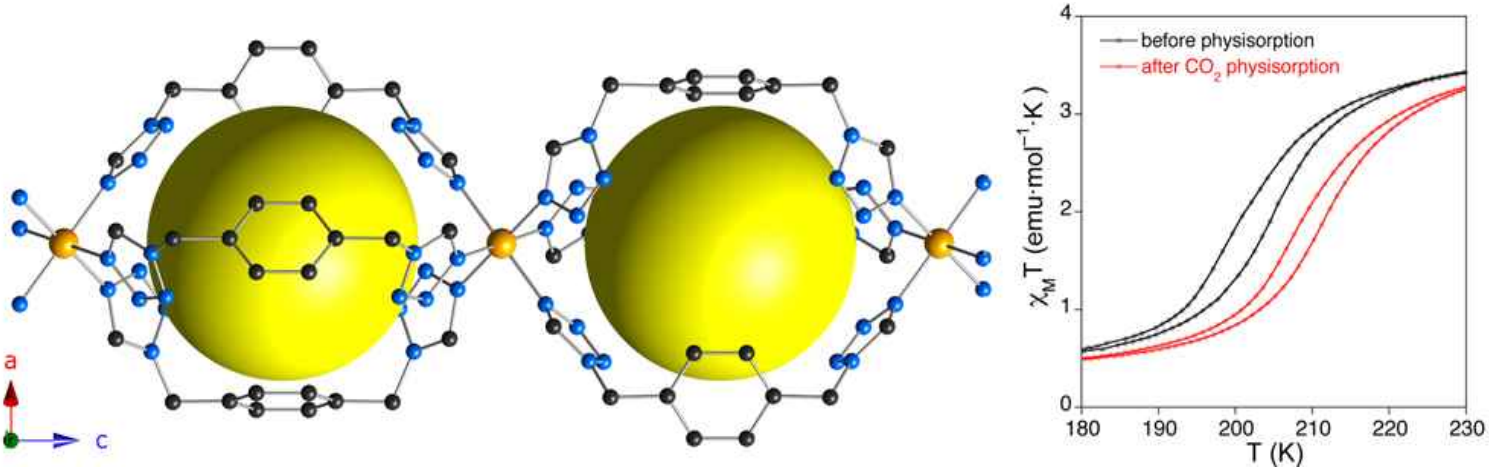
Responsive magnetic coordination polymers: effects of gas sorption

G. Mínguez Espallargas[1], M. Giménez-Marqués[1], N. Calvo Galve[1], E. Coronado[1]

[1]*Universidad de Valencia, Instituto de Ciencia Molecular (ICMol), Valencia, Spain*

Responsive materials for which physical or chemical properties can be tuned by applying an external stimulus are attracting considerable interest in view of their potential applications as chemical switches or molecular sensors [1]. A major source of such materials is provided by the so-called metal-organic frameworks (MOFs), in which physisorption of guest molecules, located in the pores, can cause subtle changes which affect the magnetic properties. Here we present two different approaches to modify the magnetic properties through gas sorption. First, we show that the chemisorption of gaseous HCl molecules by a non-porous one-dimensional coordination polymer instigates drastic modifications in the magnetic properties of the material, switching from strong antiferromagnets to ferromagnets upon gas sorption [2]. These conversions result from profound structural changes, involving cleavage and formation of covalent bonds caused by the removal/addition of ligands from the framework itself, but with no disruption of crystallinity. In a different approach, we present a family of FeII coordination polymers which shows spin-crossover behaviour and selectively sorbs CO2 over N2 [3]. Despite the lack of permanent channels, these non-porous coordination polymers trap CO2 gas molecules into the internal cavities due to the flexible and dynamic nature of the framework. One CO2 molecule is incorporated in each internal cavity of the crystalline material, as unequivocally demonstrated by structural determination after CO2 loading. This physisorption shifts the spin transition producing an increase in the transition temperature of 9 K (see Figure).

[1] *E. Coronado, G. Mínguez Espallargas, Chem. Soc. Rev. 2013, 42, 1525,* ***[2]*** *E. Coronado, M. Giménez-Marqués, G. Mínguez Espallargas, L. Brammer, Nature Commun. 2012, 3, 828,* ***[3]*** *E. Coronado, M. Giménez-Marqués, G. Mínguez Espallargas, F. Rey, I. J. Vitórica-Yrezábal, J. Am. Chem. Soc. 2013, 135, 15986 (selected as monthly highlight by the editors of Nature Chemistry: Nature Chem. 2013, 5, 984).*



Keywords: coordination polymers, magnetic properties, gas sorption