Design of Porous Bilayer Compounds Containing 1D Channels

Kjell Ove Kongshaug, Helmer Fjellvåg, *Department of Chemistry, University of Oslo, Oslo, Norway.* E-mail: k.o.kongshaug@kjemi.uio.no

In the concept of reticular synthesis of porous metal-organic framework (MOF) structures [1], the inorganic secondary building units (SBU) described most often consist of a limited number of metal centres. However, larger structural motifs may also lead to porous MOF structures. In particular, Kitagawa et al. [2] have shown how 2D layered structural motifs can be pillared into 3D porous structures.

Recently, Wu et al. [3] reported a novel MOF structure based around infinite 2D layers of tetrahedral Zn and 5-aminoisophthalic acid (aip) ligands showing a dense triangular topology. By introduction of 4,4-bipyridine, 1,2-di(4-pyridyl)ethylene, 1,2-di(4-pyridyl)ethane and 1,3-di(4-pyridyl)propane, respectively, into mixtures of dimethylformamide and water with $Zn(NO_3)_2$ and aip, we are able to synthesize a series of isostructural pillared bilayer compounds built around these triangular Zn(aip) layers. In all four compounds, the pillars are creating spaces inside the bilayers resulting in 1D channels with dimensions of 3.5x6.7 $Å^2$. Inside these channels there are water molecules that can be removed upon heating to 150^{o}C. The structural integrity of the compounds is maintained after removal of the water molecules, resulting in porous structures with estimated free volumes in the range of 20.7 to 25.5% of the unit cell volumes.

[1] Yaghi O.M., O'Keeffe M., Ockwig N.W., Chae H.K., Eddaoudi M., Kim J., *Nature*, 2003, **423**, 705. [2] Kitagawa S., Kitaura R., Noro S., *Angew. Chem. Int. Ed.*, 2004, **43**, 2334. [3] Wu C.D., Lu C.Z., Yang W.B., Zhuang H.H., Huang J.S., *Inorg. Chem.,* 2002, **41**, 3302.

Keywords: single-crystal structure determination, coordination polymers, porous materials