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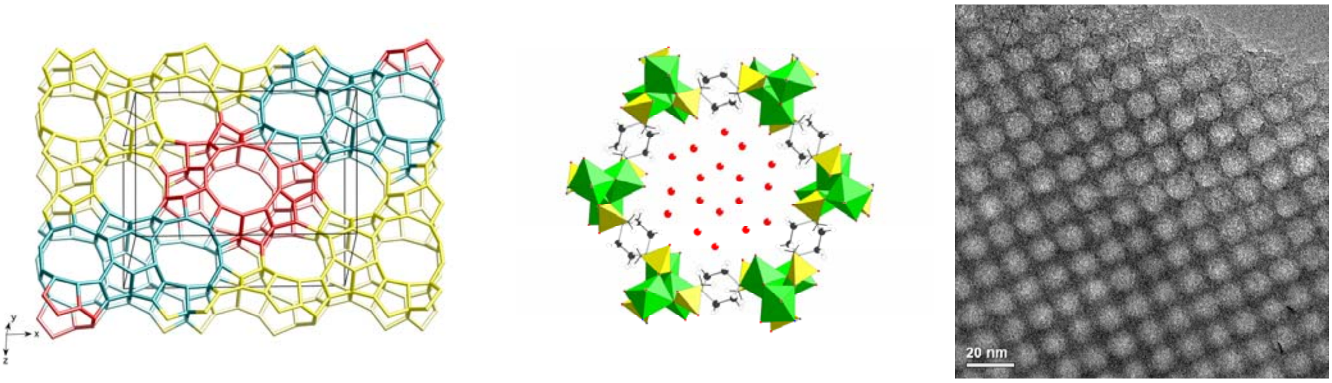
Research Interests: Microporous and mesoporous solids, organic-inorganic hybrids and zeolites, structural studies, adsorption and catalysis

Our research is concerned with the design and synthesis of novel porous framework solids that find applications as functional materials, in particular as adsorbents and catalysts. These include zeolites and related structures, through novel organic-inorganic hybrid solids to well-ordered mesoporous solids. We introduce design into the synthesis of these materials by using molecular templates and inorganic building blocks. Once prepared, these solids must be modified chemically to activate them, by removing the organic template and by introducing additional catalytic sites. Many of the structures are novel, so we need to determine their structures, making use of central facilities (synchrotron X-rays, neutrons) as well as state-of-the-art techniques (solid state NMR, high resolution electron microscopy, single crystal XRD) available at St. Andrews.

Microporous solids have applications in gas separation and storage. We are currently involved in projects to purify hydrogen and separate carbon dioxide from hydrocarbons, using our own STA-n materials and modifying the framework chemistry. These solids are also active catalysts for hydrocarbon transformations. Limitations of conventional zeolites include their restricted range of pore size and chemistry, with highly polar internal surfaces. Metal organic frameworks can be prepared with a much wider chemical range of inorganic and organic groups, and we preparing novel types of these, including phosphonates. We are also studying new structure types of mesoporous solids, which possess regular arrays of pores in the 10-100 Å range, and their use in the synthesis of fine chemicals, for example by immobilization of enzymes active for chiral synthesis.



Novel aluminosilicate zeolites, microporous metal phosphonates and mesoporous silicas (left to right, above) find application in gas storage and separation and catalysis

Selected Recent Publications

1. *A novel large pore aluminophosphate molecular sieve STA-15* Z. Han, A. L. Picone, A. M.Z. Slawin, V. R. Seymour, S. E. Ashbrook, W. Zhou, S. P. Thompson, J. E. Parker and P. A. Wright *Chem. Mater*. 2010, **22**, 338–346

2. *Structural Transformations and Adsorption of a Structurally-responsive Nickel Phosphonate MOF, Ni-STA-12* S. R. Miller, G. M. Pearce, P. A. Wright et al. *J. Am. Chem. Soc*., 2008, **130**, 15967–15981

3. *Co-templating and modelling in the rational synthesis of zeolitic solids* M. Castro, R. Garcia, S.J. Warrender, P.A Wright, P.A. Cox, A. Fecant, C. Mellot-Draznieks and N. Bats, *Chem. Commun.,* 2007, 3470-3472

4. *A microporous scandium terephthalate, $Sc_2(O_2CC_6H_4CO_2)_3$, with high thermal stability* S.R. Miller, P.A. Wright, C. Serre, T. Loiseau, J. Marrot and G. Férey *Chem. Commun.* 2005, 3850-3852

5. *Enzymes supported on ordered mesoporous solids: a special case of an inorganic-organic* H.H.P. Yiu and P.A. Wright *J. Mater. Chem*. 2005, **15**, 3690-3700