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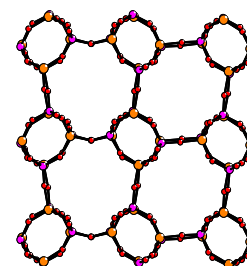
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Research Interests: Synthesis, characterisation and application of porous materials. Zeolites, metal organic frameworks, ionic liquids, medical applications



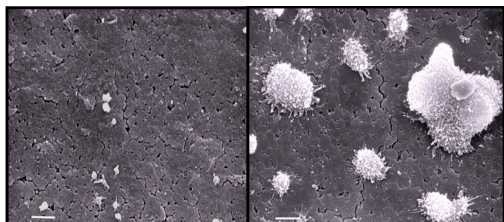
New Synthesis of Porous Solids

Porous and layered solids have many uses in industry. These include many different types of catalysis, ion exchange (e.g. water softeners in washing powder) and gas adsorption. Recently we have developed a new way of making these materials, called ionothermal synthesis, where we use the interesting properties of solvents called ionic liquids to prepare new types of solid that may prove to have important properties. For more information see reference 1 and 2.



(Right) A new zeolite (SIZ-7) made using the ionothermal method

New Applications of Porous Solids



A NO-releasing zeolite inhibits thrombus formation in human blood (left panel). The right panel shows the thrombi formed if no NO is present

Nitric oxide is an amazing molecule, with many potential applications in medicine and biology. Unfortunately as a gas it is difficult to deliver in the right amounts. We are developing new zeolites and metal organic frameworks that can be used to store nitric oxide and deliver it to the correct bit of the body in the correct dosage. We then show, in collaboration with biologists and medics, the action of the nitric oxide on the body (See reference 2 for examples)

X-ray Diffraction and Solid State NMR

We are using very powerful synchrotron X-rays to solve the structures of solids using very small crystals (down to $0.01\text{mm} \times 0.01\text{mm} \times 0.01\text{mm}$). We are also using solid state NMR to probe structures. Recently we have published the first example of a structure solution of a zeolite from NMR data alone and we combine NMR and X-ray diffraction data to get much better structural models for porous solids than any technique can provide on its own. (See reference 3 for example)

SELECTED RECENT PUBLICATIONS

1. *Ionic liquids and eutectic mixtures as solvent and template in synthesis of zeolite analogues* E.R. Cooper, C.D. Andrews, P.S. Wheatley, P.B. Webb, P. Wormald, R.E. Morris *Nature* **430** 1012-1016, 2004
2. *Ionothermal materials synthesis using unstable deep-eutectic solvents as template-delivery agents* E.R. Parnham, E.A. Drylie, P.S. Wheatley, A.M.Z. Slawin and R.E. Morris *Angew. Chemie*, **45**, 4962-4966, 2006
3. *NO-Releasing Zeolites and Their Antithrombotic Properties* P. S. Wheatley, A. R. Butler, M. S. Crane, S. Fox, B. Xiao, A. G. Rossi, I. L. Megson, and R. E. Morris *J. Am. Chem. Soc.* **128**, 502 2006 (see also 'Pollution fighter turns clot buster' New Scientist, 5th February 2005, p 25).
4. *A Solid-State NMR Method for Solution of Zeolite Crystal Structures* D. H. Brouwer, R. J. Darton, R. E. Morris, M. H. Levitt, *J. Am. Chem. Soc.* **127**, 10365, 2005