

FA4-MS08-O1

Porous Metal Organic Frameworks: From Synthesis to Applications. Patricia Horcajada. Institut Lavoisier, UMR CNRS 8180, Université de Versailles St Quentin en Yvelines, 45 Avenue des États-Unis, 78035 Versailles Cedex, France.

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Porous hybrid solids are fascinating solids,[1,2] due to their potential applications in catalysis, separation, gas storage, adsorption or drug delivery. If most Metal Organic frameworks (MOFs) exhibit a rigid framework, a few porous hybrid solids possess an unusual behavior with a large flexibility of their structure, resulting in changes in cell volumes depending on their pore content.[2] Our group has reported two types of flexible MOFs built either on chains of metal octahedra, i.e. the metal terephthalates MIL-53(Al, Cr, Fe) (MIL: Material Institut Lavoisier),[3] or made from trimeric inorganic sub-units, i.e. the series of iron(III) or chromium(III) carboxylates denoted MIL-88A, B, C and D and constructed from fumaric acid (MIL88-A), 1,4-BDC (MIL88-B), 2,6-NDC (MIL88-C) and 4,4'-BPDC (MIL88-D).[4] The MIL-53 solids breathe upon hydration-dehydration with a variation in cell volume around 40 % while the MIL-88 solids exhibit a giant and reversible swelling effect which leads to an increase of 85 % (MIL-88A) up to 220 % (MIL-88D) in their cell volumes, far beyond those reported before in the field of porous solids. [5]

Adsorption experiments of green house gases, polar or apolar vapours, liquids and drugs have been performed using these solids.[6] In most cases, in situ XRPD or Infra-red spectroscopy experiments have been conducted to analyse the breathing behavior of the flexible solids upon adsorption of guest molecules. Results suggest that the breathing phenomenon occurs in most cases with a rather selective behavior and that selectivity depends not only on the structure and the organic linker but also on the nature of the metal present in the nanoporous hybrid solid. These results pave the way for new applications in the field of adsorption.

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Keywords: metal-organic compounds; porous solids; adsorption

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MOFs Prepared by Solvent-Free Grinding Reactions. Stuart L. James. School of Chemistry and Chemical Engineering, Queen's University Belfast, Northern Ireland, BT9 5AG, UK.

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The preparation of chemicals and materials by simply grinding together solid reactants in the absence of solvent has obvious appeal from a green perspective. It also presents fundamental challenges to understand and predict reactivity under such conditions.

We are developing the efficient synthesis of microporous metal-organic frameworks (MOFs) by grinding metal salts and bridging organic ligands in ball mills under solvent-free conditions [1-3]. Remarkably, in some case these materials can be obtained by this method in crystalline form within minutes and in quantitative yield.

Recent results of systematic reactivity studies, as well as the preparation of complex, interpenetrated networks will be presented and discussed.

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FA4-MS08-O3

Guest Packing in Channel Coordination Polymers. Mikhail Meilikhov^a, Kirill Yusenko^a, Roland A. Fischer^a. *Inorganic Chemistry II - Organometallic and Materials*, Ruhr-University Bochum, Germany.

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The Coordination Polymers (CPs) with permanent porosity and high thermal stability are a unique class of hybrid solid state materials with bright future [1]. The use of these materials ranges from gas storage, separation and catalysis, to a number of diverse potential applications, including optoelectronics, sensors, smart membranes etc. Also aiming at applications in catalysis we have introduced the solvent-free gas-phase loading of porous CPs via the adsorption of volatile organometallic all-hydrocarbon precursors [2]. There are only few examples of MOF-based absorbate structures were described in literature. Our attention here was concentrated on the packing of the guest's molecules inside the 1D channels of the host structures based on the MIL53(Al), hydrogen bonds and host-guest and guest-guest interactions were analyzed as well. MIL-53(Al), [Al(OH)(bdc)], is a member of a huge family of porous CPs based on chains of *trans*-corner sharing octahedral units {MO₆} cross-linked by bdc (terephthalic acid) which results in a 3D structure exhibiting 1D channels along the *a* axis. Terephthalic acid, methylbenzyl, dimethylbenzyls, ferrocene (Fc) [3], ferrocenealdehyd (Fca), 1,1'-ferrocenedialdehyd (Fcaa), 1,1'-dimethylferrocene (Fcee) and 1,1'-diethylferrocene (Fcmm) were selected as a test guest molecules; also structural effects of the substitute group in the guest molecule were investigated. Our structural data were compared with known literature examples [1, 4].