Thermally induced phase transition behaviour of three new fluorinated metal-organic frameworks

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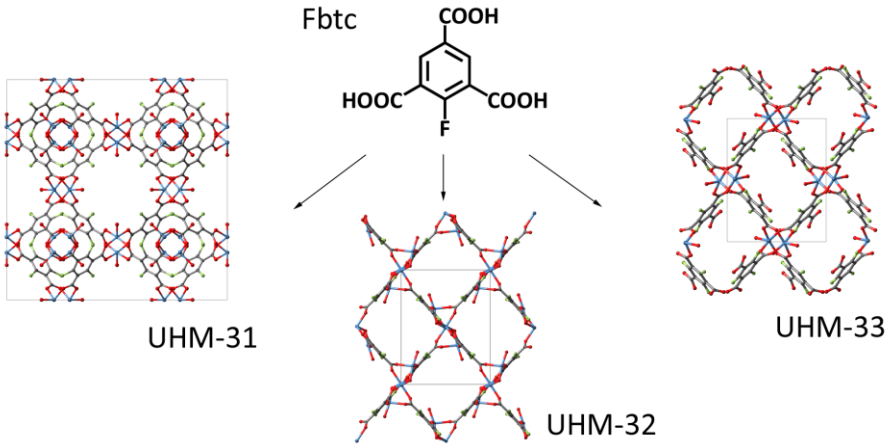
Over the past decade metal-organic frameworks (MOFs) have attracted much attention as they have shown excellent performance in applications like gas storage and separation[1], catalysis[2], sensing[3] and drug delivery[4].
Compared to other microporous materials such as zeolites or activated carbon, MOFs show a great synthetic variability.
Fluorinated MOFs are a relatively new class of porous materials attracting much interest especially in terms of gas adsorption capacities.
Our new linker, 2-fluoro-1,3,5-benzene-tricarboxylic acid (Fbtc), reacts with copper nitrate in N,N-dimethylacetamide to from three different new MOFs, UHM 31, UHM-32 and UHM 33 (UHM = University of Hamburg Materials).[5]



Only small variations in synthesis temperature and the molar ratio of metal to linker lead to the three different structures. This effect is quite rare in the area of MOFs.
To investigate the phase behaviour of the three MOFs and whether they can be transformed into each other we applied thermogravimetric analysis with quadrupole mass spectrometry, differential scanning calorimetry and temperature-dependent powder X-ray diffraction.

[1] (a) R. E. Morris, P. S. Wheatley, *Angew. Chem. Int. Ed.*, **47** (2008) 4966.
(b) J.-R. Li, R. J. Kuppler, H.-C. Zhou, *Chem. Soc. Rev.*, **38** (2009) 1477.
[2] J. Lee, O. K. Farha, J. Roberts, K. A. Scheidt, S. T. Nguyen and J. T. Hupp, *Chem. Soc. Rev.*, **38** (2009) 1450.
[3] (a) M. D. Allendorf, R. J. T. Houk, L. Andruszkiewicz, A. A. Talin, J. Pikarsky, A. Choudhury, K. A. Gall and P. J. J. Hesketh, *J. Am. Chem. Soc.*, **130** (2008) 14404.
(b) L. E. Kreno, K. Leong, O. K. Farha, M. D. Allendorf, R. P. Van Duyne and J. T. Hupp, *Chem. Rev.*, **112** (2011) 1105.
[4] P. Horcajada, R. Gref, T. Baati, P. K. Allan, G. Maurin, P. Couvreur, G. Férey, R. E. Morris and C. Serre, *Chem. Rev.*, **112** (2012) 1232.
[5] K. Peikert, F. Hoffmann, M. Fröba, *Cryst. Eng. Comm,* 2014, Advance Article DOI: 10.1039/C4CE00408F