

Thin films of Metal-organic frameworks

Tatjana Ladnorg, Osama Shekhah, Christof Wöll

Karlsruhe Institute of Technology, Institute of Functional Interfaces

*Tatjana.Ladnorg@kit.edu
www.ifg.kit.edu*

Metal organic frameworks (MOFs) are a new class of highly crystalline micro-porous materials consisting of metal precursor nodes which are linked with each other by organic ligands. As particulate system this class of material is already applied in the field of nanotechnology, as e.g. gas storage and gas separation, catalysis, delivery of therapeutic agents and sensor devices^[1]. An epitaxial growth of MOFs on the surface of substrates (SURMOFs) by the layer-by-layer (LBL) method was developed in our group, which show highly selective growth on self-assembled monolayers (SAMs)^[2] terminated by functional groups like COOH-, OH- and pyridine.

SURMOFs are highly oriented nano-porous films with a narrow and well defined pore size distribution and thicknesses. The size of the pores can be controlled by the length and the size of the organic ligands, while the thickness is proportional to the reaction cycles of the epitaxial growth of the LBL-method. As SURMOFs are not polycrystalline and the pores are accessible without hindrance they can be used as model systems to get detailed understanding e.g. of the kinetics of sorption/desorption processes or as active sites for sensor systems^[3].

Here we show an overview of MOF and in particular the advantages and applications of SURMOF and the synthesis of these materials on a pre-patterned surface produced by micro-contact printing and nanografting.

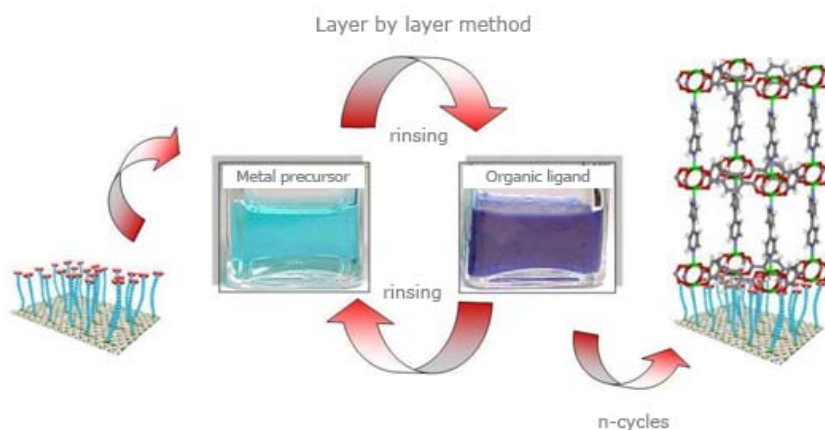


Figure 1 Schematic synthesis of a MOF built up by layer-by-layer method

- [1] R. J. Kuppler, D. J. Timmons, Q.-R. Fang, J.-R. Li, T. A. Makal, M. D. Young, D. Yuan, D. Zhao, W. Zhuang, H.-C. Zhou, *Coordination Chemistry Reviews* **2009**, 253, 3042.
- [2] C. Munuera, O. Shekhah, H. Wang, C. Woll, C. Ocal, *Physical Chemistry Chemical Physics* **2008**, 10, 7257.
- [3] O. Shekhah, H. Wang, S. Kowarik, F. Schreiber, M. Paulus, M. Tolan, C. Sternemann, F. Evers, D. Zacher, R. A. Fischer, C. Wöll, *Journal of the American Chemical Society* **2007**, 129, 15118.