Hierarchically Organized Porous and Functional Materials

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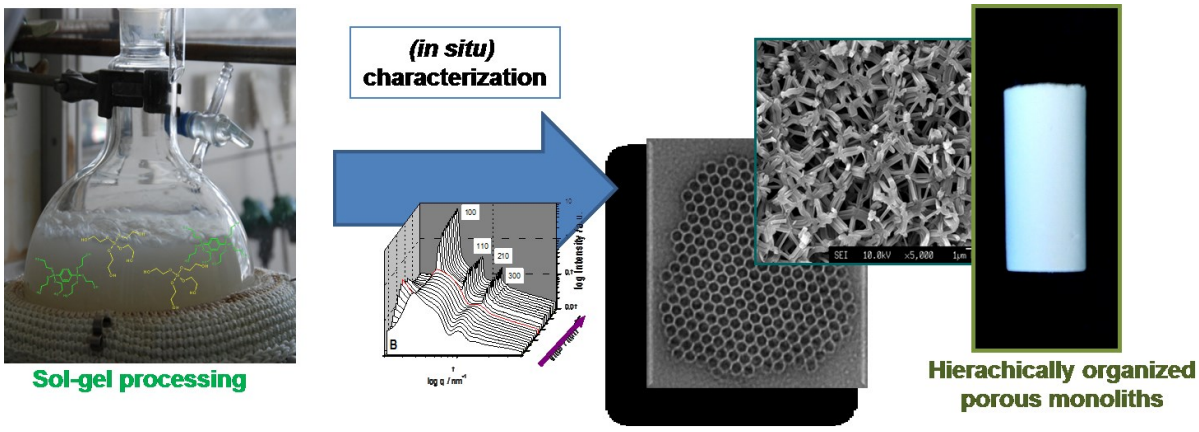
In the last years, significant research was devoted to the synthesis of hierarchical materials with structures that exhibit interconnected pores on different length scales from micro (<2 nm), meso- (2-50 nm), to macropores (>50 nm).[1,2] A simultaneous control over pore sizes from Angstrom to micrometers, pore shape as well as spatial distribution potentially enables the fabrication of hierarchical porous structures exhibiting novel properties and multiple functions. Simple and general methods to prepare functional monolithic materials with well-controlled pore architectures, composition and surface functionalization are therefore highly desired.



Here, we report on the design of highly porous architectures by sol-gel processing of tailor-made silanes in the presence of structure-directing agents and/or high-internal phase emulsions and post-synthesis treatment of the resulting materials, e.g. by magnesiothermic reduction.

[1] Sol-gel synthesis of monolithic materials with hierarchical porosity, A. Feinle, M.E. Elsässer, N. Hüsing, *Chem. Soc. Rev*. **2016**, *45*, 3377-3399. *DOI:10.1039/c5cs00710k*

[2] Chemical phase separation strategies towards silica monoliths with hierarchical porosity, C. Triantafillidis, M. Elsaesser, N. Hüsing, *Chem. Soc. Rev*. **2013,** *42***,** 3833–3846. *DOI:10.1039/C3CS35345A*