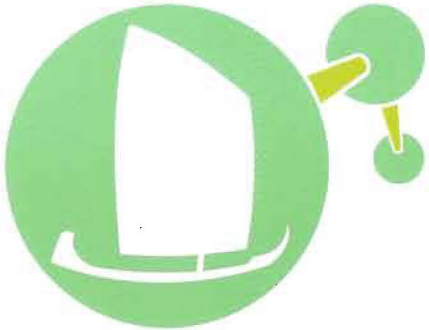

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summary

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Templated mesoporous materials: expectations, facts and challenges

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The interest in ordered mesoporous materials (OMM) had its origin in the absence of materials with pores of highly uniform width in the mesopore range (2-50 nm) as opposed to what already existed for micropores (< 2nm) with, for instance, zeolites or carbon molecular sieves. Although molecular templating was used since the 1960's for the synthesis of microporous zeolites, it was only in 1992 that the unique structural properties of OMM were disclosed for the silicas and metalosilicates of the M41S family, prepared using supramolecular templates. Starting with surfactant micelles as structure directing agents, soon the ability of self-assembly of organic and inorganic precursors in the presence of block copolymers was also reported for soft templating synthesis and later on the idea developed into hard templating preparation (nanocasting) of ordered mesoporous carbons. The variety of acronyms appearing in the literature reflects the present situation of numerous members of the OMM class, yet foreseen to be still incomplete, which is due to the high versatility of the synthesis approach. In fact, by combining the nature of the structure directing agent with careful control of the synthesis parameters, it is possible to tailor the ordering, geometry and surface chemistry of the mesopores, and in particular to fine tune their size to a target dimension. These extraordinary features, associated with the high surface areas and pore volumes, justify the intensive research dedicated to these interesting materials having potential for application in many fields of science and technology, as themselves or as host matrices for immobilisation of bulky species. This presentation will include an overview of the main types of the mesoporous structures that can be generated via template processes, addressing the role of surface chemistry on their formation and implications in their properties and applications. Some aspects to be considered will involve the introduction of catalytic functionalities, the important contributions that these model porous solids brought to the testing of fundamentals underlying gas adsorption, previously developed with common mesoporous materials having broad pore size distributions, and also their potential as molecular sieves for big molecules in the liquid phase. Together with the beautiful aspects, some challenges still to overcome, will also be mentioned.

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