

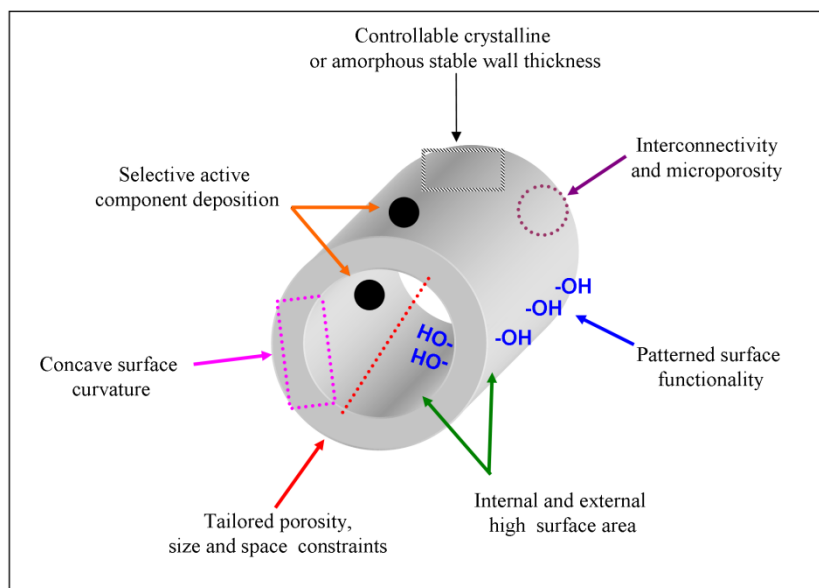
# Synthesis, Characterization and Application of Mesostructured Solid Catalysts

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Porous materials—such as zeolite— play a key role in catalysis for both fundamental studies and also industrial applications. After their discovery in the early 1990s, ordered mesoporous materials (OMMs) have become one of the most widely investigated classes of materials for catalysis.<sup>1</sup> As seen in Figure 1, this progress is a consequence of both the potentially beneficial practical properties, such as extremely high surface areas, high pore volumes, narrow pore size distributions, and ordered pore systems, as well as of the intellectual fascination of these materials, and the opportunities they offer for rational design via templating by supramolecular aggregates.<sup>2,3</sup>

In this advanced module, the history, synthetic strategies, characterization of OMMs and their applications as catalysts will be discussed. In experimental part of the module, the synthesis of OMMs via soft templating (silica based materials like MCM-41, SBA-15 and KIT-6) and nanocasting (preparation of crystalline metal oxides) will be presented. In addition, the characterization of those materials with small angle X-ray scattering (SAXS), N<sub>2</sub> adsorption, transmission electron microscopy (TEM) will be offered. At the final part of the model, application of these catalysts for electro and photochemical water splitting will be demonstrated where the reactor set-ups, catalysts preparation and catalytic data evaluation could be monitored.



**Figure 1.** Properties of OMMs that can lead to exceptional catalytic performance

- (1) Kresge, C. T.; Leonowicz, M. E.; Roth, W. J.; Vartuli, J. C.; Beck, J. S. *Nature (London)* **1992**, 359, 710.
- (2) Tüysüz, H.; Schüth, F. *Advances in Catalysis* **2012**, 55, 127.
- (3) Grewe, T.; Deng, X. H.; Tüysüz, H. *Chem Mater* **2014**, 26, 3162.