Hybrid Ordered Porous Materials in liquid phase catalytic reactions: PMOs, MOFs and porous polymers.

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The development of heterogeneous catalysts, in combination with mild and green processes, is an important and extensive area of research. Hybrid (inorganic/organic) porous materials are interesting materials for this purpose and three classes of hybrid materials will be discussed: the Periodic Mesoporous Organosilicas (for acid catalysis), Metal Organic Frameworks (for redox catalysis) and Ordered Mesoporous Polymers that we use for both redox and acid catalysis.

We will discuss the case of the sulphur functionalized ethene-PMOs that can be easily transformed from heavy metal adsorbent to acid catalyst and back [1]. The morphology of these PMOs can be tuned: from small hexagonal pores to ultra large (30nm) cubical ordered spherical pores [2]. Other PMOs are made as thin films as low-k superisolators [3].

It is often assumed that catalysts with saturated metal sites are by definition inactive. We will discuss the case of a completely saturated V-MOF (MIL-47) that shows a remarkable catalytic activity in the cyclohexene oxidation [4]. A catalytic cycle, explaining this catalytic behavior, is proposed.

Ordered porous phenol/formaldehyde (P/F) resins have a remarkable mechanical and hydrothermal stability [5], they can be easily sulfonated for acid catalysis or they can be grafted with metal complexes for oxidation catalysis.

All these materials are evaluated and tested as liquid phase catalysts, focusing on the stability and recyclability of these materials.

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