

ABSTRACT

Zeolites and related zeotypes are microporous materials formed by interconnected TO_4 tetrahedra ($T = Si, Al, P...$), creating pores and cavities of molecular dimensions. The ability of controlling the chemical composition and pore topology of zeolites allows their use in different industrial applications, such as separation/gas adsorption, ion exchange and catalysis.

This thesis focuses on the synthesis of different microporous crystalline materials (zeolites, zeotypes) with the appropriate framework topologies and chemical compositions, for their application as catalysts in different industrially-relevant chemical processes.

The first two parts of the present thesis deal with the synthesis of small pore zeolite materials containing large cavities in their structure, with controlled physicochemical properties for their use in particular industrial applications. To achieve this purpose, it has been first proposed the combined use of metal complexes with specific organic structure directing agents (OSDAs). This methodology would allow the “one-pot” preparation of small pore zeolite materials containing selective metallic active sites, which may show adequate catalytic properties for the selective catalytic reduction (SCR) of NO_x . On the other hand, it has been proposed the use of bulky and rigid aromatic molecules as OSDAs, to favor the crystallization of small pore zeotypes with large cavities. These aromatic molecules would be able to form bulky soluble self-assembled dimers in the synthesis gel through π - π interactions, allowing the crystallization of small pore zeolites with controlled acidic properties for their application in catalysis.

The last part of the thesis describes the synthesis of zeolites presenting extra-large pores. These materials with high pore accessibility would allow their use in catalytic processes involving bulky molecules, reducing the diffusion pathways of reactants and products. In order to synthesize this type of microporous materials, it has been proposed the use of bulky aromatic proton sponges as OSDAs for the first time. This synthesis methodology has allowed the synthesis of the ITQ-51 zeotype.