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STRUCTURAL PROPERTIES OF Ti-SBA-15 MESOPOROUS MATERIALS SYNTHESISED BY A NEW "HIBRID" METHOD UP TO HIGH TITANIUM CONTENT

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The development of mesoporous materials, such as SBA-15, broadens the potential applications of Ti-containing porous solids as catalysts in selective oxidation reactions of molecules with kinetic diameters larger than 0.6nm, which are extremely important for the production of valuable intermediates in fine chemistry.

Several factors must be taken into account in the development of titanosilicates to be used as heterogeneous catalysts, such as, extremely high surface area and porosity, narrow pore size distribution, structural stability (hydrothermal, thermal and mechanical), content, nature and coordination of titanium, regeneration and reuse.

Previous studies demonstrated that the influence of synthesis parameters is crucial for the incorporation and the dispersion of titanium in titanium substituted SBA-15 prepared by direct synthesis. Controlling carefully the synthesis conditions, in particular, the hydrochloric acid concentration, silica precursor concentration, and hydrothermal temperature and time, it is possible to prepare Ti-SBA-15 materials with higher Ti content. However, it is difficult to predict the final Si/Ti molar ratio values and the calcined materials exhibit low hydrothermal stability.

The work presented here focuses on the structural characterization of Ti-SBA-15 materials, with different Si/Ti content, prepared by a new "hybrid" method, based on two methods of synthesis previously developed, and their hydrothermal stability after 12h in boiling water under static conditions.

All samples were characterised by X-ray diffraction, nitrogen adsorption at 77K and diffuse reflectance UV-Vis spectroscopy. The Si/Ti values of the calcined materials were determined by ICP analysis.

The results show that this new "hybrid" synthesis method allows the preparation of Ti-SBA-15 materials up to Si/Ti=5. Furthermore, it is possible to delineate, a priori, the final Si/Ti ratio intended for the materials. The increase of Ti content leads to a gradual reduction of the quality of the pore structure and of the pore volumes. However, the SBA-15 structure is still observed for Si/Ti = 5. Regarding the hydrothermal stability, the results show that the final materials are quite stable after 12h in boiling water under static conditions.

Therefore it can be concluded that this synthesis method allows the preparation of Ti-SBA-15 materials with potential to be used as heterogeneous catalysts.

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