

SEMI-CRYSTALLINE MESOSTRUCTURED OXIDES AS SUPPORTS FOR CATALYSIS

Transition metal oxides play an important role in industry as catalyst, catalyst support or to take advantage of their optical and electronic properties, such as luminescence. However, the compounds existing on the market suffer from their low specific surface ($25 \text{ m}^2 / \text{g}$ for example for TiO_2)¹. Thus, the preparation of structured mesoporous materials which have a large specific surface area is an advantageous solution for better exploiting the inherent properties of transition metals oxides. A collaboration between the Laboratoire Lorrain de Chimie Moléculaire (L2CM) and the Institut de Science des Matériaux de Mulhouse (IS2M), has led to the synthesis of mesostructured titania with 2D hexagonal porous network, having semi-crystalline framework and with high specific surface area ($> 250 \text{ m}^2/\text{g}$). Our synthesis strategy^{2,3} combined EISA with the Liquid Crystal templating pathway. Pluronic P123, an amphiphilic triblock copolymer, is used as pore templating agent and titanium isopropoxide as inorganic precursor. The mesostructure is stable until 500°C . The surfactant is removed by different methods: calcination, flash induction or water extraction^{4,5}. The obtained mesostructured titania have also been used as supports to design of "CoMoS" hydrotreatment catalysts (co-activated MoS_2) which were tested for the conversion of 4,6-dimethyldibenzothiophene (46DMDBT)^{6,7}. This study has been performed in collaboration with the Institut de Chimie des Milieux et Matériaux de Poitiers (IC2MP). Obtained results, stand out from what has been reported in the past. Firstly, mesostructured titania present a high concentration of Brønsted acid sites on the surface. This is very unusual for TiO_2 , which is reputed to be non-acidic. Secondly, a shift towards DDS selectivity in the conversion of 46DMDBT, which is unprecedented in literature, was observed⁷. This change in selectivity allows to consume less hydrogen and thus making the process more eco-friendly. These results show that the amorphous phase involves modifications of the support leading to significant modifications of the catalytic properties (HYD / DDS selectivity ratio), which offers unexplored possibilities in terms of catalyst development.

Our objective during the thesis is to deepen the mechanisms of formation of mesostructured transition metal oxides by studying in particular the influence of the presence of additives (salt, complexing agent, etc.) produced or added during the synthesis on the phase behavior of the surfactant in solution.

We also aim to describe in a rational way the existing relationships between the structural and textural characteristics of the support (in particular the presence of the amorphous phase) and the activity and selectivity of the final catalysts. The catalytic reactions envisaged concern the hydrotreatment and in particular HDS or oxidation reactions such as for example the oxidation of toluene

We are mainly interested in alumina and zirconia. The synthesis methodology will also be extended to MgO which plays an important role in catalysis.

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