Institute of Advanced Chemistry of Catalonia
Seminars

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Preparation and characterization of mesostructured titania : Application for the hydrodesulfurization of 4,6-dimethyldibenzothiophene

Date
11:00 am
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Location
"Sala de Actos" room
Institute of Advanced Chemistry of Catalonia (IQAC-CSIC)
C/Jordi Girona 18-26, 08034 Barcelona

Abstract

Titania is a semiconductor widely used for its photocatalytic properties, but also as catalyst or as promoter or carrier for metals and their complexes. Since photocatalysis and catalysis are surface processes, a huge literature is devoted to the control of the titania's properties to enhance its activity. Among the different characteristics, many efforts are focused on the increase of the specific surface area. Besides the control of the specific surface area, another trend to improve the performances of the mesoporous TiO2 catalysts deals with the introduction of a second level of porosity. Indeed, the hierarchal combination of pores can reduce transport limitations and blockage, resulting in higher activities and better control over selectivity. Here combining the sol-gel process and the surfactant templating method, we have reported the preparation and characterization of mesostructured titania with high specific surface area (> 250 m^2/g).
We have also shown that a higher DDS selectivity for the HDS of 46DMDBT was observed over CoMoS supported over mesostructured TiO2. This shift towards DDS selectivity in the transformation of 46DMDBT is unprecedented in literature. We have demonstrated that a higher HDS selectivity for the HDS of 46DMDBT was observed over CoMoS supported over mesoporous TiO2. To better address the change of selectivity and the contribution of the various ways (HYD and DDS), we have shed some light on the mechanism involved in the HDS of the model compound (46DMDBT) using the mesostructured titania-based catalysts. Prior the investigation

of the catalytic activity, a detailed characterization of the impregnated supports and of the catalysts by Raman, XPS, XRD and so on has been performed to explore and identify the contribution of the various parameters. The catalytic results are also compared with the ones obtained using the conventional CoMoS/Al2O3 catalyst and the CoMoS/P25 one, used as a reference titania support. To the best of our knowledge this is the first time that a preferential conversion of 46DMDBT by the DDS route is observed using mesostructured TiO2 materials. This behavior has been correlated to the intrinsic acid properties of the supports. Indeed, we have shown that not only Lewis sites but also Brönsted ones are present in the dual mesoporous titania. The designed catalysts are therefore more eco-friendly since they consume less hydrogen. This implies a better use of the fossil resources and open new perspectives for other hydrotreating reactions such as HDN.