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Catalytic oxidation of sulfur compounds over Ce-SBA-15 and Ce-Zr-SBA-15

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ABSTRACT

The catalytic oxidation of different sulfur compounds, commonly present in liquid fuel, was studied over a seriesof ceria and ceria-zirconium based oxidation mesoporous catalysts. SBA-15 was synthesized using sol-gel method and Ce and Ce-Zr were added by two different procedures: i) directly during the synthesis and ii) via post- synthesis method. The catalysts were characterized by XRD, N_2 adsorption isotherms, XPS, DRUV-Vis, TEM, SEM and Py-FTIR. Low angle XRD, N_2 isotherms and TEM confirmed that the structure was not changed after metal incorporation. Wide angle XRD, UV–vis-DRS, XPS and TEM determined that the catalysts prepared by direct synthesis presented higher dispersion of Ce oxides, smaller particle size and isolated Zr^{4+} species. FTIR of adsorbed/desorbed pyridine indicated that zirconium as promoter increases the Lewis acidity of the catalysts, especially during direct synthesis. Ce-Zr-SBA-15 catalyst prepared by direct synthesis was very active in the oxidation of dibenzothiophene, 4,6-dimethyl dibenzothiophene and benzothiophene using hydrogen peroxide (H_2O_2) as oxidant agent and acetonitrile as polar solvent. The effect of acidity in the catalyst, hydrogen peroxide concentration and temperature was studied. The deactivation test demonstrated that the catalyst is stable and adequate for the industrial process.

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