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OXIDATION OF SULFUR-CONTAINING COMPOUNDS IN THE PRESENCE OF CATALYSTS BASED ON MESOPOROUS MATERIALS

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The task of treatment of petroleum and products of its processing from sulfur-containing compounds is one of the most urgent for today and is associated with both stricter environmental requirements for petroleum products and an increase of sulfur content in hydrocarbon feedstock [1,2].

A traditional method for treatment of fuels from organosulfur compounds is hydrodesulfurization, which requires high capital investment. In this connection, there is a lot of research devoted to alternative methods for removing sulfur compounds from hydrocarbon feedstock [3,4], among which the method of oxidative desulfurization has been most widely used [5]. The method of oxidative desulfurization is based on the oxidation of sulfur-containing compounds to corresponding sulfoxides and sulfones, followed by the recovery of oxidation products from petroleum processing products. Homogeneous systems containing transition metal salts are widely used for oxidative desulfurization, but loses of high cost catalyst limits this method.

Potentially interesting supports for catalysts of the oxidative desulfurization process are mesoporous materials whose pore size correlates with the size of molecules of organo-sulfur compounds present in hydrocardon feedstock, in particular, in light hydrocarbon fractions [6]. The most widely used are mesoporous materials SBA-15 and MCM-41. In the present work, catalysts based on mesoporous material (MCM-41) were used to oxidize sulfur-organic compounds with hydrogen peroxide. Transition metal oxides (molybdenum, tungsten, vanadium) that are capable of forming active peroxocomplexes in the presence of hydrogen peroxide or alkyl peroxides were applied to this material [7].

Transition metal oxides (molybdenum, tungsten, vanadium) were applied to MCM-41 in various amounts by the impregnation method (in molar ratios of metal: MCM-41 from 1: 320 to 1:20). The activity of the obtained catalysts was studied on a model mixture representing a solution of dibenzothiophene in decane: the most active of them containing the supported tungsten oxide allows completely removing dibenzothiophene at 60°C in one hour. Also, oxidation of organo-sulfur compounds present in straight-run gasoline and diesel fractions was carried out.

Based on the data obtained, the catalyst composition and oxidation conditions are proposed, which allow to oxidize with high conversion and selectivity different classes of organosulfur compounds, including inert heteroaromatic sulfur compounds.

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