HDS Activity of NiMo Catalysts over Ce/Al Mixed Oxides Prepared Mechanochemically

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ITONITE – SUPPORTED NANOSCALE AMORPHOUS Fe –Ti HYDROUS OXIDES FOR OXIDATIVE/ADSORTIVE REMOVAL OF ARSENITE AND ARSENATE FROM WATER

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oxic levels of anionic arsenic species can significantly affect drinking water ty in many areas all over the word (more than 150 million people). The World h Organization (WHO) has recommended maximum contaminant levels of arsenic 0 μg/L[1]. Therefore, developing economical, effective and reliable treatment iques for arsenic removal from groundwater is critical and has gained considerable tion in recent years. It has been demonstrated that the mixed oxides are more active single oxides thanks to the synergistic effects between the metals in heterogeneous d oxides[2]. Therefore, the incorporation of iron, titanium (FT) into adsorbent ficantly improved their adsorption capacity toward arsenic because they have a ic selectivity for polyoxy anions. However, separation of As-bearing fine particles treated water presented a challenge. In this research, a natural bentonite (B) was orted with Fe-Ti hydrous oxides (BFT) to enhance its arsenic removal capacity and ation property. The results indicated that the BFT adsorbent performed excellently moving both As(III) and As(V) from water. The maximum adsorption capacities As(III) and As(V) calculated from Langmuir model are 79.2 and 54.3 mg/g, ctively. In addition, arsenite is partially converted to arsenate in the adsorption ss. The amorphous hydrous oxide is thus a promising adsorbent for both As(III) As(V) removal because of its excellent performance and simple low-cost synthesis ss.

References

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HDS ACTIVITY OF NiMo CATALYSTS OVER Ce/Al MIXED OXIDES PREPARED MECHANOCHEMICALLY

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The necessity of the development of hydrotreating catalysts with significantly better properties exists in the view of the strongest regulations on the contents of sulfur compounds in the transport fuels. New, so called deep hydrodesulfurization processes are necessary to achieve sulfur content in petrol close to zero. The choice of suitable, more effective support becomes other important alternative how to increase activity of HDS catalysts [1]. In this study, NiMo catalysts were synthesized by impregnation of the Al_2O_3-CeO_2 supports (with the quantities of CeO_2 in the range of 1-10 wt. %) prepared mechanochemically by milling of Al and/or Ce nitrates with NH_4HCO_3. Heteropolymolybdate $(NH_4)_4NiMo_6O_{24}$ was applied as the precursor of active components Ni and Mo in catalysts for hydrodesulfurization of 1-benzothiophene (BT). Chemical analysis, BET, IR and Raman spectra, XPS were used for physicochemical characterization of the catalysts. Activity of catalysts exceeds significantly that of the reference $NiMo/Al_2O_3$ catalyst prepared by impregnation of classical alumina using the same precursor and having the same composition (Table 1).
The highest Ni synergetic effect was observed at the Ni/Mo ratio about 0.20 on the $NiMo/Al_2O_3$ catalyst surface.

Table 1
HDS activity at 360 °C and 1.6 MPa

Catalyst	Ce_{cat}	k_{ED}	k_{ED}''
	wt. %	$mmol_{ED}\ g_{cat}^{-1}\ h^{-1}$	$mmol_{ED}\ m^{-2}\ h^{-1}$
$NiMo_6/Al_2O_3$	0.01	768	2.9
$NiMo_6/Al_2O_3$-1Ce	0.72	678	3.1
$NiMo_6/Al_2O_3$-2Ce	1.90	614	2.6
$NiMo_6/Al_2O_3$-4Ce	3.90	607	3.4
$NiMo_6/Al_2O_3$-10Ce	9.50	566	3.6
$NiMo_6/CeO_2$	67.5	15	0.3
Ref. NiMo catalyst	0	434	-

Presence of cerium increased Mo content on the surface of NiMo catalysts significantly, whereas Ni content does not change practically. Specific catalyst activity was increasing with increasing Ce content in the mixed $NiMo/Al_2O_3$-Ce catalysts.

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