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Ludvíková, Jana
2012

Dostupný z <http://www.nusl.cz/ntk/nusl-135455>

Dílo je chráněno podle autorského zákona č. 121/2000 Sb.

Tento dokument byl stažen z Národního úložiště šedé literatury (NUŠL).

Datum stažení: 09.04.2024

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VOC TOTAL OXIDATION OVER MIXED OXIDE CATALYSTS PREPARED FROM LDH PRECURSORS MODIFIED WITH ORGANIC COMPONENTS

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Mesoporous materials like MCM-41 or SBA-15 synthesized in the presence of organic components¹ possess high surface area and large pore sizes which permit the anchoring of metals with tiny particle size and, therefore, performing catalytic reactions that were recently either not possible or possible but with substantially higher concentration of active components. The MCM-41 or SBA-15 mesoporous catalysts containing Co were tested in the total oxidation of toluene and showed reasonable catalytic activity². In this contribution the possible effect of organic components added to the reaction mixture during coprecipitation of Co-Mn-Al layered double hydroxide (LDH) precursors on the porous structure of the LDH-related mixed oxides and their activity in the total oxidation of ethanol was studied.

The LDH precursors were prepared by coprecipitation of Co, Mn, and Al nitrates with Co:Mn:Al molar ratio of 4:1:1. The polyethyleneglycole-type triblock copolymer Pluronic 123 was added to the nitrate solution; its amount was about 2 wt.% related to the precursor weight. The coprecipitation was carried out under vigorous stirring at pH 10 and 25 °C. The products were washed with distilled water, dried at 60 °C and then calcined at 500 °C in air. The obtained mixed oxide catalysts were characterized by chemical analysis, N₂ adsorption at -195 °C, XRD, TPR, NH₃-TPD and CO₂-TPD. The catalytic tests were carried out in a laboratory flow reactor using air as an oxidant at 80 l g⁻¹ h⁻¹ space velocity.

Mixed oxides with spinel structure were obtained after calcination of the LDH precursors; the presence of organic template in the precursors resulted in slight increase in the surface areas of the calcination products. TPR profiles of the samples modified with Pluronic 123 showed a shift of reduction maxima to lower temperatures. The catalyst obtained from the precursor prepared in the presence of Pluronic 123 was more active in the ethanol oxidation than the other catalysts. The ethanol conversion of 90 % was achieved at 141 °C; the corresponding temperatures of about 40 °C higher were measured with other catalysts, during which preparation no Pluronic 123 was applied.

In spite of the observed improvement of physical-chemical properties and catalytic activity in ethanol oxidation it is necessary to note that the changes evolved by the presence of Pluronic 123 used during coprecipitation of LDH precursors are rather small.

References:

- ¹ Kresge, C. T.; Leonowicz, M.E.; Roth, W.J.; Vartuli, J. C. and Beck, J.S. *Nature*, **1992**, 359, 710-712.
- ² Szegedi, A.; Popova, M.; Minchev, C. *J. Mater. Sci.* **2009**, 44, 6710-6716.

Acknowledgement: The authors thank the Czech Science Foundation for the financial support (project P106/10/1762).