International Multidisciplinary Scientific GeoConference Surveying Geology and Mining Ecology Management, SGEM 2018 vol.18 N1.4, pages 657-664

Ni-Al mixed oxides as catalysts in the reactions of conversion of the higher alkanes

Shinkarev A., Sitdikova L., Valieva G., Gorelysheva V., Petrov S.
Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia

Abstract

© SGEM2018. In this study, investigation of the composition, structure and catalytic activity of the catalyst support based on Ni-Al mixed oxides was carried out. The possibility of controlling structural and acid-base properties of the layered double hydroxides (LDH) by varying the ratio of M2+/M3+ metal cations determines its use as catalyst support. Besides varying of anions in the interlayer space allows to regulate catalytic system activity in the reaction medium. The Ni-Al LDH support was prepared by coprecipitation method followed by conversion to Ni-Al mixed oxide in the reaction medium. According to the X-ray diffraction analysis, it was shown that the Ni-Al-based mixed oxide obtained with a specific surface area of 158 m2/g contains nickel oxide with a reduced lattice parameter related with the replacement of part of Ni2+ cations with Al3+, phase of mixed oxides of variable composition and amorphous phase. The replacement of Ni2+ by Al3+ in nickel positions is 16%. The crystallite size of the obtained oxide phases is 4 nm. The catalytic activity of Ni-Al mixed oxide was determined in the reactions of the conversion of higher alkanes of the C11-C22 composition, taken in equal proportions, at a temperature of 500°C and a feed to catalyst ratio of 30. According to the chromatographic analysis, alkanes and isoalkanes of composition C7-C14 were formed as catalytic products. Unsaturated compounds in the reaction products were revealed by IR spectroscopy method; the iodine value was 0.172.

http://dx.doi.org/10.5593/sgem2018/1.4/S06.086

Keywords

Catalytic activity, Catalytic cracking, Layered double hydroxides, Mixed oxides, X-ray diffraction

References

[1] Kapustin A.Ye. Et al. Control of the structure and surface of layered double hydroxides// Scientific Herald.-2015. – № 4-1.

[2] Braterman P.S., Xu Z.P., Yarberry F. Layered double hydroxides (LDHs)// Handbook of layered materials. – 2004. – P. 373-474.

[3] Rives V. Layered double hydroxides: present and future. – Nova Publishers, 2001.

[4] Duan X., Evans D.G. (ed.). Layered double hydroxides. – Springer Science & Business Media, 2006. – T. 119.