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L. S. Djumabaeva[2], N. A. Zakarina[1], G. J. Eligbaeva[2]

[1]Institute of Fuel, Catalysis and Electrochemistry named after D. V. Sokolsky, Almaty, Kazakhstan,
[2]Kazakh National Technical University named after K. I. Satpaev, Almaty, Kazakhstan.
E-mail: djumabaevals@mail.ru nelly_zakarina@rambler.ru gulzhakh@yandex.ru
n.zakarina@ifce.kz

ISOMERIZATION OF H-HEXANE ON Pd CATALYSTS INFLICTED TO ACID-ACTIVATED MONTMORILLONITE IN Ca-FORM

Abstract. Pd/CaHMM catalysts have got and tested in the isomerization reaction of n-hexane. According to the results, in the palladium content decreased from 0.35% to 0.1% leads to a decrease in activity, but the selectivity of C_{4+} remains stable and high enough 99.6-100%. The maximum conversion of n-hexane by 0.35% Pd-catalyst is 45.1% at a temperature of 400°C, and 0.1% Pd-catalyst is 32.4% at the same temperature. One of the most important isomerization products is dimethyl butane; the maximum yield of 0.35% Pd contact is 21.3% at 350^{0}C. At a 0.1% Pd catalyst, the yield of dimethyl butane decreases and is 16.5% at 400°C. The introduction of mordenite significantly increases the activity and selectivity even on a low-percentage catalyst. At 0.35% Pd/CaHMM + HM catalyst, the conversion of n-hexane increases to 54.1% at 400°C, and the yield of 2.2-dimethylbutane is 25.8%. On a 0.1% Pd + HM catalyst, the conversion of n-hexane is 54.3%, and the maximum yield of dimethylbutane is 26.0% at 400^{0}C, which is slightly higher compared to 25.8% for 0.35% Pd.

The maximum yield of iso-hexanes on the non-zeolitic 0.35 and 0.1% Pd catalysts is 37.8 and 27.8%, respectively. Mordenite containing 0.35% Pd/CaHMM +HM catalyst reached 46.4%, at a low-percentage 0.1% Pd + HM catalyst 45.8%.

The increase in the octane number increases with increasing process temperature, as well as on catalysts modified with mordenite. The maximum increase was observed at 0.35% Pd/CaHMM + HM.

Keywords: isomerization, n-hexane, activated montmorillonite, catalyst, palladium.

Introduction. Natural layered silicates (clays) have the ability to ion exchange, high cation exchange capacity, micro-, meso and nanoporous structure, have surface active centers of various types that are widely used as high-performance components for the preparation of catalysts [1-3]. Montmorillonite (MM) is one of the most interesting representatives of layered silicates, the structural features and properties of which determine the wide possibilities of its use as a catalyst carrier are different processes. A characteristic property of montmorillonite clays is a high cation exchange capacity – from 60 to 150 meq / 100 g [4, 5].

It is known that acid treatment of clay minerals leads to a sharp increase in their catalytic and adsorption capacity [6-9]. The results of the study of samples by the method of low-temperature adsorption of nitrogen showed an increase in the specific surface area and a slight increase in the pore diameter. According to the data of the X-ray diffraction study, the crystal structure of the samples activated by solutions of mineral acids of low and medium concentration is preserved, and the results of the chemical analysis of natural clays after acid activation showed complete washing out of sodium ions from the structure of the samples and dissolution of a significant part of the octahedral magnesium, iron and aluminum cations, as a result of which the SiO2 content in the samples increases [10, 11]. In the case of MM, acid treatment often also causes a rather strong decrease in the first basal reflexes [12].

The determining factor in increasing the adsorption capacity of natural clay minerals after their acid treatment is the non-changing porous characteristics of MM, and the growth of the specific surface and the dissolution and removal of all possible impurity phases leading to the production of a monomineralic