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n-PENTANE CONVERSION OVER AlF₃-SUPPORTED NOBLE METAL CATALYSTS

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The progress in preparation of heterogeneous catalysts is based on search for new types of active phases and supports, which are characterized by high surface area, acidity and thermal and mechanical resistance. In this case, metal fluorides are very attractive supports. In this study aluminum fluoride with high surface area (HS-AlF₃) was chosen as a support of catalyst for isomerization reaction. This material was produced by non-aqueous sol-gel synthesis with adding palladium and platinum precursors during synthesis. This method was developed by the group of Kemnitz in Humboldt University [1] and permits to obtain high surface nanomaterials. The surface of the support was activated by chlorodifluoromethane (R-22) for increasing its acidity. Palladium and platinum precursors were reduced to metal phase by hydrogen flow.

Results from FT-IR/PAS (infrared spectroscopy-photoacoustic spectroscopy) analysis with pyridine adsorption showed the presence of high concentration of Lewis and Brønsted acid sites. Specific surface areas of catalysts, obtained from physical adsorption of nitrogen (BET), were found higher than 100 m²/g. All catalysts were investigated by method temperature programmed reduction (TPR), chemisorption by H₂ and CO, temperature programmed β-hydride decomposition (TPHD, only for palladium catalysts).

Catalytic activity of catalysts was investigated in the reaction of n-pentane hydroconversion in a flow system, with hydrogen flowing through a saturator filled with n-pentane. Then, the reaction mixture entered a tubular reactor with the catalyst. Reaction products were analyzed in a gas-chromatograph (HP-5890, FID detector).

High conversion (more than 50%) and significant selectivity to iso-pentane (near 80%) was obtained for platinum catalyst supported on aluminum fluoride. On the other hand, palladium catalyst is less active (overall conversion ca. 40%) but the selectivity to iso-pentane was higher than 90%.

[1] S. Rüdiger, U. Groß, E. Kemnitz, *J. of Fluorine Chem.* 128 (2007) 353–368

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