ISOMERIZATION OF 1-METHYLNAPHTHALENE ON MAGNESIUM MODIFIED NaY ZEOLITES

Chr. Dimitrov, Z. Popova and Mai Tuyën

Faculty of Chemistry, University of Sofia, Sofia, Bulgaria

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The conversions of 1-methylnaphthalene on NaY zeolite and its magnesium modifications with different degrees of ion exchange and various Si/Al ratios have been studied at 310 and 350 °C. The investigated catalysts are highly active for positional isomerization. The observed changes in their catalytic activity are explained by the promotion of proton formation and by the absorption properties of magnesium cations as well as by their localization in cations as well as by their localization in the crystal lattice of the zeolite.

The activity of zeolite catalysts in the positional isomerization of 1-alkyl-naphthalenes was reported recently /1–2/. There is no published data however on the activity of magnesium modified NaY zeolites with respect to naphthalene hydrocarbons.

The isomerization of 1-methylnaphthalene on NaY zeolites with various Si/Al ratios and various degrees of ion exchange with magnesium cations are presented in this paper.
EXPERIMENTAL

The initial NaY contained 12 wt. % Na₂O. The dealumination of this zeolite was carried out by the method of Kerr /3/ using EDTA processing. The analysis of the dealuminated samples (Nos. 8–10) was made by complexometry. The NaX used for comparison contained 14.03 wt. % Na₂O. The magnesium modifications of NaY, the dealuminated forms and of NaX were obtained by ion exchange. The degree of ion exchange was determined by gravimetric analysis of magnesium cations in the filtrate. The X-ray diffraction pattern demonstrated that a partial amorphization is observed in the dealuminated samples Nos. 10 and 13. All the other zeolite samples retained their crystal structure. Amorphous silica-alumina, 90% HNaY and 10% fluorinated alumina were used for comparison as well. The 1-methylnaphthalene was a chromatographically pure commercial product.

The catalytic experiments were carried out in a semimicrocatalytic flow apparatus on a fresh, 2.5 ml catalyst sample (particle size 0.5–1.25 mm, a space velocity 1.12 h⁻¹ for 30 min). The catalysts were activated for 3 h at 500 °C. The catalytic experiment was performed without a carrier gas. A temperature of 310 °C was used for a part of catalysts. Comparable experiments were carried out with all catalysts at 350 °C. The products obtained were analyzed by means of a Tsvet-6 gas chromatograph.

The characteristics of the catalysts and the product composition are listed in Table 1.

RESULTS AND DISCUSSION

It is evident from Table 1 that 1-methylnaphthalene practically does not react on NaY zeolite. The magnesium modifications obtained from it is however highly effective for positional isomerization to 2-methylnaphthalene and, at higher degrees of conversion, for disproportionation as well.