CONVERSION OF XYLENES IN THE PRESENCE OF ZEOLITES WITH A HIGH 
S\text{\textsubscript{1}}\text{O}_{2}/\text{Al}_{2}\text{O}_{3} RATIO

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During a study of the conversion of C\textsubscript{3}-C\textsubscript{8} olefins and 1-octene on ultrahigh-silica zeolites (USZ) it was shown [1, 2] that the ratio of the concentrations of the C\textsubscript{8} aromatic hydrocarbons in the reaction products was substantially dependent on the conditions under which the process is carried out and the composition of the catalyst.

In connection with this, we have investigated the conversion of o- and m-xylene (o-X and m-X) in the presence of the initial and decationized forms of USZ in the present work. For purposes of comparison, the conversion of these same hydrocarbons was studied on decationized mordenite (HM) and on a dealuminated mordenite which had been prepared from it (DM).

EXPERIMENTAL

Ultrahigh-silica zeolites (USZ) in the initial and decationized forms (Table 1) [3, 4] were employed in the work. A sample of decationized mordenite (HM) with a 95% degree of exchange was prepared by decationization of the Na-form of mordenite, while the dealuminated zeolite was prepared according to the technique described in [5].
TABLE 1. Some Characteristics of the Zeolite Catalysts

<table>
<thead>
<tr>
<th>Catalyst</th>
<th>Conventional symbol</th>
<th>SiO₂</th>
<th>Amount of Na₂O, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial form of the ultrahigh-silica zeolite</td>
<td>Na-USZ</td>
<td>70,5</td>
<td>0,7</td>
</tr>
<tr>
<td>Decationized ultrahigh-silica zeolite</td>
<td>H-USZ</td>
<td>60,3</td>
<td>0,1</td>
</tr>
<tr>
<td>Decationized mordenite</td>
<td>HM</td>
<td>10,0</td>
<td>0,45</td>
</tr>
<tr>
<td>Dealuminated mordenite</td>
<td>DM</td>
<td>68,0</td>
<td>0,03</td>
</tr>
</tbody>
</table>

The conversions of o- and m-xylene were studied in a flow system at 150-550°C and atmospheric pressure. Before the experiments, the catalysts were activated with air (500°C, 3 h). The initial xylenes were fed into the reactor by means of a microdosimeter. The experiments were carried out in a current of He at a He:hydrocarbon ratio of 5:1 and a hydrocarbon feedstock space velocity of 180 h⁻¹. The duration of the experiments was usually 20 min. The stability of the catalyst was checked in experiments lasting 120 min. The reaction products were analyzed by means of GLC at 70°C using a capillary column (50 m) with squalane (5%).

The purity of the initial m-xylene was 98,4% and the amount of impurities in the o-xylene did not exceed 0,1%.

DISCUSSION OF RESULTS

It follows from a comparison of the data on the change in the overall conversion of o-xylene as a function of temperature (Fig. 1) that the Na-USZ catalyst is the least active and the DM zeolite is the most active. A value for the overall conversion of o-xylene equal, for example, to 50% is achieved on Na-USZ at 440°C, on H-USZ at 240°C, and on DM and HM at 195 and 200°C, respectively. The Na- and H-USZ catalysts, as well as DM, possess satisfactory stability. The yield of products remained constant over a period of 120 min. Unlike this, the stability of HM, which is similar to DM with respect to its activity, was found to be low. After 70 min, its activity was lowered by a factor of two. The data for this catalyst shown in Fig. 1 therefore corresponds to the first 20 min of the experiment.

The conversion of the xylenes on the catalysts which were studied took place along two pathways: 1) isomerization with the formation of the corresponding isomers and 2) disproportionation of the initial xylene and the products of its isomerization into toluene and

![Graph](image1)

**Fig. 1.** The temperature dependence for the conversion of o-xylene on various zeolite catalysts: 1) DM; 2) HM; 3) H-USZ; 4) Na-USZ.

![Graph](image2)

**Fig. 2.** The change in the ratio of the concentrations of the disproportionation products of o-xylene and its isomerization products (D/I) on various zeolites as a function of temperature: 1) DM; 2) HM; 3) H-USZ; 4) Na-USZ.