

Characterization of Nickel Metal Distribution in Ni/Y-Zeolite

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The nickel metal distribution in the reduced Ni/Y-zeolite was investigated. Nickel cation in the zeolite was reduced into nickel metal through the following reaction: $\text{Ni}^{2+} + \text{H}_2 \rightarrow \text{Ni}^0 + 2\text{H}^+$. The studies using TPR/TPO, TEM, XRD and FMR have shown the existence of a bidispersion of nickel metal particles; i.e., small particles were restricted inside the zeolite pores, and large particles were formed outside the zeolite crystal. Both the degree of reduction and the fraction of nickel metal outside the zeolite increased with increasing reduction temperature and time. The primarily reduced nickel metal inside the zeolite migrated out of the zeolite pores and agglomerates as large particles at the exterior surface of the zeolite. In this research Ni/Y-zeolite catalysts having different nickel metal distribution were prepared, and the nickel metal distribution in the reduced Ni/Y-zeolites was investigated.