

Spectroscopic Studies on NiO Supported on ZrO₂ Modified with MoO₃ for Ethylene Dimerization

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NiO supported on zirconia modified with MoO₃ for ethylene dimerization was prepared by drying powdered Ni(OH)₂-Zr(OH)₄ with [(NH₄)₆(Mo₇O₂₄)•4H₂O] solution, followed by calcining in air at high temperature. The characterization of prepared catalysts was performed using FTIR, Raman, XRD, and DSC. MoO₃ equal to or less than 15 wt% was dispersed on the surface of catalyst as two-dimensional polymolybdate or monomolybdate, while for MoO₃ above 15 wt%, crystalline orthorhombic phase of MoO₃ was formed, showing that the critical dispersion capacity of MoO₃ on the surface of catalyst is 0.18 g/g NiO-ZrO₂ on the basis of XRD analysis. From 600 °C of calcination temperature, zirconium molybdenum oxide, Zr(MoO₄)₂ was formed due to the reaction between ZrO₂ and MoO₃; its amount increased with the calcination temperature. Acidity and catalytic activity of catalyst increased with the amount of dispersed MoO₃. The high acid strength and acidity was responsible for the Mo=O bond nature of the complex formed by the interaction between MoO₃ and ZrO₂. The catalytic activity for ethylene dimerization was correlated with the acidity of the catalysts measured by the ammonia chemisorption method.