Ni/Al2O3계 액체 연료 분해용 흡열 촉매 특성 연구

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Supercritical methylcyclohexane cracking of $NiAl_2O_4$ spinel-based catalysts with varying Ni/Al deficiencies was investigated. Thus, catalysts with Ni contents of 10–50 wt.% were prepared by typical co-precipitation methods. The performance and physicochemical properties of the reference stoichiometric Ni_3Al_7 catalyst differed significantly from those of the other catalysts. Indeed, the Ni-deficient Ni_1Al_9 catalyst led to the formation of large Ni particles (diameter: 20 nm) and abundant strong acid sites, without spinel structure formation, owing to the excess Al. These acted with sufficient environment and structure to form the coke precursor nickel carbide, resulting in a pressure drop within 17 min. On the other hand, the additional NiO linked to the $NiAl_2O_4$ spinel structure of the Al-deficient Ni_5Al_5 catalyst formed small crystals (10 nm), owing to the excess Ni, and displayed improved Ni dispersion. Thus, dehydrogenation proceeded effectively, thereby improving the resistance to coke formation. This catalytic behavior further demonstrated the remarkable activity and stability of this catalyst under mild conditions (450 °C and 4 Mpa).