

Mo nanoparticle-incorporated zeolite catalysts for direct conversion of methane to aromatics

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Direct catalytic conversion of methane to aromatics (MTA) is a fascinating route for upgrading natural gas. Zeolite can serve as a support and catalyst for MTA reaction due to their acid sites and molybdenum (Mo) is widely known as active metal for this reaction. This study deals with the comparison of MTA reaction performance using various kinds of Mo nanoparticle-incorporated zeolite catalysts such as Mo/H-ZSM-5, Mo/HY, Mo/HA, Mo/MCM-22. All the zeolite supported catalysts except Mo/MCM-22 were prepared by impregnation using Mo precursor. But in the case of MCM-22 support, pre-synthesized Mo nanoparticles were infiltrated into MCM-22 support. The MCM-22 has a unique hierarchical structure unlike the conventional zeolites such as H-ZSM-5, HY and HA. Brunauer-Emmett-Teller (BET), wide-angle X-ray scattering (WAXS), scanning electron microscopy (SEM) and temperature programmed desorption (NH₃-TPD) were conducted for investigating characteristics of zeolite supports. And transmission electron microscopy (TEM) was conducted for investigating morphology of incorporated Mo nanoparticles. The product mixture was analyzed by gas chromatography (GC).