

Ga Supported on Mesoporous TiO₂ as Catalyst for Ethane Dehydrogenation: Effect of Metal Doping

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Mesoporous TiO₂ was fabricated by hydrothermal method and used as support of the Ga-based catalyst (Ga/meso-TiO₂) for C₂H₆ dehydrogenation reaction (EDH). Ga/meso-TiO₂ with high specific surface area showed higher C₂H₆ conversion than Ga/bulk-TiO₂ with non-porous structure and low surface area. The mesoporous structure of TiO₂ support facilitates the dispersion of active sites and the diffusion of reactants during the EDH reaction, resulting in the enhancement of the catalytic activity. However, the Ga/meso-TiO₂ catalyst rapidly deactivated at high temperature which may be due to the coke deposition. To suppress the coke formation, various type of metal additives consisting of K, Mg, Ca, Sr, and Ba were introduced to Ga/meso-TiO₂ catalyst. Mg (Ca, Sr, and Ba) doping in Ga/meso-TiO₂ can increase the C₂H₆ conversion and C₂H₄ selectivity but the coke deposition still presence on these catalysts. Whereas, K-Ga/meso-TiO₂ catalyst can inhibit the formation of coke but the conversion is lower than Ga/meso-TiO₂. The catalytic activity of the Ga/meso-TiO₂ catalysts drastically changed depending on the metal additives.