PREPARATION AND POTENTIAL ENVIRONMENTAL APPLICATION OF Pt/TiO_2-NANOTUBE CATALYSTS

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Formation of titanium oxide (TiO_2) nanotubes was carried out by hydrothermal method, with TiO_2 powders immersed in concentrated NaOH solution in an autoclave at 110°C. Immobilization of nanosize Pt on TiO_2-nanotubes was performed by photochemical deposition method with UV irradiation of an aqueous solution containing TiO_2-nanotubes and hexachloroplatinic acid. The prepared samples exhibit high surface area (~ 200 m^2/g) with nanosize Pt crystallites (~ 2 nm) uniformly dispersed on TiO_2-nanotube-surfaces, which were characterized by transmission electron microscopy. The structural characteristics of the prepared samples were investigated by nitrogen adsorption isotherm, X-ray diffraction, Raman, infrared, UV-Visible, XANES, and electron paramagnetic resonance spectroscopy. In-situ FT-IR spectroscopic studies exhibited the formation of methane at temperature near 100°C while heating the preevacuated sample in hydrogen, that inferred the prepared TiO_2 nanotube-supported nanosize Pt is highly capable for CO_2 absorption and highly active for CO_2 hydrogenation. Besides, the catalyst is highly active for CO oxidation and NO reduction.