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Effect of Synthesis Conditions on the Photocatalytic Activity of TiO_2 and Ordered Mesoporous Carbon Nanocomposite

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Titanium dioxide (TiO_2) materials are very well-known photoactive materials and can be widely applied to the photoactive energy production and photocatalytic degradation for environmentally friendly catalysts. The TiO_2 have common 3 phases such as anatase, brukite, and rutile phase, and the anatase phase is frequently used as active photocatalyst because of higher activity than other phases. In many cases, TiO_2 materials are supported on other inorganic materials such as activated carbon (AC) to enhance the photocatalytic efficiency owing to the large surface area for adsorption of organics and characteristics of AC－TiO_2 surface. However, the non-uniform pore structure of AC materials make it difficult to characterize the TiO_2 and AC nanocomposite often. Here, we used ordered mesoporous carbon materials CMK-3 as a carbon support for TiO_2 which are synthesized by template synthesis of ordered mesoporous silica SBA-15 as a template with furfuryl alcohol as a carbon precursor. The CMK-3 exhibits unique characteristics of periodic pore structure, large pore volume, high specific surface area, and tuneable pore structure by reproducible replication of SBA-15 silica templates. TiO_2 supported on CMK-3 (TiO_2/CMK-3) are synthesized by post-introduction of titanium *i*-propoxide precursor into CMK-3 and calcined at elevated temperature of 500-1100 ℃ in nitrogen environment. In addition to the synthesis temperature, other synthesis conditions such as the content of hydrofluoric acid were varied and the photocatalytic activity of these TiO_2/CMK-3 photocatalysts in the photodegradation of aqueous Rhodamin 6G were measured in this work.