TiO_2-based nanostructured photocatalysts for high photocatalytic degradation of organic dyes

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Nanostructured TiO_2 would have large surface area with high pore volumes, which is adequate for adsorbing plenty amount of organic dyes (or pollutants) in water and air. Also, TiO_2 is well-known as a highly reactive photocatalyst under UV light irradiation. For faster photocatalysis process, TiO_2 should be improved its light-harvesting ability, and charge transfer ability to generate reactive oxygen species. Here, other metal oxide (WO_x and FeO_x)-incorporated mesoporous TiO_2 were prepared via hard-template method using (1) titanium glycolate spheres and (2) KIT-6 (Ia3d mesostructure). (1) WO_x-incorporated mesoporous TiO_2 showed faster photocatalytic degradation rate than mesoporous TiO_2 exhibited. This phenomenon would be explained its larger surface area, and higher crystallinity of anatase phase. (2) Ordered mesoporous Fe_2O_3-TiO_2 nanocomposites decomposed organic dyes effectively under both UV and visible lights. The heterojunctions between Fe_2O_3 and TiO_2 nanoparticles would help excitons easily separated into the conduction and valence band, thus, reactive oxygen species could be generated without difficulty.