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Facile Synthesis of Sulfur Doped TiO2 Nanoparticles with Enhanced Photocatalytic Activity

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Abstract : An effectual technology for wastewater treatment is a great demand now in order to encounter the water pollution caused by organic pollutants. Photocatalytic oxidation technology is widely used in removal of such unsafe contaminants. Among the semi-conducting metal oxides, robust and thermally stable TiO2 has emerged as a fascinating material for photocatalysis. Enhanced catalytic activity was observed for nanostructured TiO2 due to its higher surface, chemical stability and higher oxidation ability. However, higher charge carrier recombination and wide band gap of TiO2 limits its use as a photocatalyst in the UV region. It is desirable to develop a photocatalyst that can efficiently absorb the visible light, which occupies the main part of the solar spectrum. Hence, in order to extend its photocatalytic efficiency under visible light, TiO2 nanoparticles are often doped with metallic or non-metallic elements. Non-metallic doping of TiO2 has attracted much attention due to the low thermal stability and enhanced recombination of charge carriers endowed by metallic doping of TiO2. Amongst, sulfur doped TiO2 is most widely used photocatalyst in environmental purification. However, the most of S-TiO2 synthesis technique uses toxic chemicals and complex procedures. Hence, a facile, scalable and environmentally benign preparation process for S-TiO2 is highly desirable. In present work, we have demonstrated new and facile solid-state reaction method for S-TiO2 synthesis that uses abundant elemental sulfur as S source and moderate temperatures. The resulting nano-sized S-TiO2 has been successfully employed as visible light photocatalyst in methylene blue dye removal from aqueous media.

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