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Synthesis and characterization of P-doped TiO₂ thin-films for photocatalytic degradation of butyl benzyl phthalate under visible-light irradiation

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Abstract

P-doped TiO₂ (PTIO) thin-films with different P contents were prepared using a sol-gel method. The thin-film samples were characterized using various techniques. The photocatalytic activity was evaluated by decomposing butyl benzyl phthalate under visible-light irradiation. The results showed that the transformation of anatase to the rutile phase was inhibited and grain growth of TiO₂ was prevented by P doping. The results confirm that the doped P atoms existed in two chemical forms, and those incorporated in the TiO₂ lattice may play a positive role in photocatalysis. The high photocatalytic activities of the PTIO thin-films may be the result of extrinsic absorption through the creation of oxygen vacancies, rather than excitation of the intrinsic absorption band of bulk TiO₂. The PTIO can be recycled with little depression of the photocatalytic activity. After six cycles, the photocatalytic activity of the PTIO film was still higher than 98%. (c) 2013, Dalian Institute of Chemical Physics, Chinese Academy of Sciences. Published by Elsevier B.V. All rights reserved.

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