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A Novel Single-Mode Microwave Assisted Synthesis of Metal Oxide as Visible-light Photocatalyst

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Abstract

Visible-light photocatalyst titanium dioxide (TiO₂) was successfully prepared via a novel and facile single-mode microwave assisted synthesis process. In this one-step synthesis, Ti as target material selectively oxidizes in magnetic field throughout rapid heating, whose process requires less energy consumption and short time. In obtained TiO₂, self-doping of Ti³⁺ was confirmed, which makes TiO₂ perform sufficient light absorption in visible region with wavelength above 400 nm. Such Ti³⁺ self-doped TiO₂ exhibits much narrower optical bandgap (2.14 eV) with compared stoichiometric TiO₂ (3.0-3.2 eV). The synthesized TiO₂ also shows superior photocatalytic activity to commercially available TiO₂ towards the degradation of Rhodamine B under visible light irradiation.

Keywords: Single-mode microwave, TiO₂, Ti³⁺, visible light photocatalyst

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