



Effect of inorganic anions on Rhodamine B removal under visible light irradiation using Bi₂O₃/Ti rotating disk reactor

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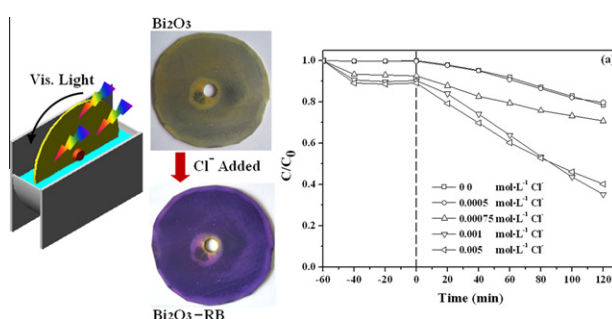
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HIGHLIGHTS

- ▶ RB was degraded using Bi₂O₃/Ti rotating disk reactor under visible light irradiation.
- ▶ Effects of different inorganic anions (F⁻, Cl⁻, S²⁻, CO₃²⁻, SO₄²⁻) were investigated.
- ▶ RB adsorption capacity could be enhanced in the presence of Cl⁻.
- ▶ RB removal efficiency was greatly enhanced due to indirect dye photosensitization.
- ▶ The large amount of Cl⁻ in tap water could also be utilized to degrade RB.

GRAPHICAL ABSTRACT



ARTICLE INFO

Article history:

Received 5 June 2012

Received in revised form 16 September 2012

Accepted 17 September 2012

Available online 5 October 2012

Keywords:

Bi₂O₃

Rotating disk reactor

Visible light

Cl⁻

Rhodamine B

ABSTRACT

In this study, Bi₂O₃ with band gap energy of 2.6 eV was coated on a Ti disk and used in a rotating disk reactor to treat 10 mg L⁻¹ Rhodamine B (RB) solution under UV and visible light irradiation. The effects of different inorganic anions (including CO₃²⁻, S²⁻, SO₄²⁻, F⁻ and Cl⁻) were investigated and the results shown that the color removal efficiency could be greatly improved in the presence of Cl⁻. RB adsorption capacity could be enhanced when Cl⁻ was added and RB could further be degraded due to indirect dye self-photosensitization under visible light irradiation. The radicals generated during the reaction were detected by adding radical trapping agents and other experimental conditions like Cl⁻ concentration, rotating speed and pH of the process were investigated and optimized.

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1. Introduction

Photocatalytic (PC) oxidation technology has drawn great attention in wastewater treatment in recent years because the use of stable, non-toxic photocatalysts and the direct utilization of solar light [1–3]. However there are two main factors that limit the practical application of this technique. One is the development of effective PC reactor to improve the light utilization efficiency for high

concentration wastewater treatment, the other is that the traditional TiO₂ photocatalyst can only be excited by ultraviolet radiation that only occupies less than 5% of the solar light due to its wide band gap (3.2 eV).

For the first factor, many new reactors have been developed and most of them are with immobilized photocatalyst because the traditional powder catalyst is hard to separate and recover [4–6]. Meanwhile the development of thin-film PC reactor is also a great improvement for the application of PC technology because the solution adsorption of irradiation light is also a very serious problem [7]. The rotating disk reactor, first developed by

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