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Synergistic effect of bifunctional Co-TiO_2 catalyst on degradation of Rhodamine B: Fenton-Photo hybrid process

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Abstract: The synergistic effect of two different advanced oxidation technologies, heterogeneous sulfate radical based Fenton and TiO_2 photocatalysis, was observed through a drastic enhancement of Rhodamine B removal in Co-TiO_2/Oxone/Photo process. Our catalysts were obtained by a citric acid-assisted sol-gel method and Rhodmine B was used as model organic pollutant. The cobalt species in Co-TiO_2 play a crucial role of integration Fenton with TiO_2 photocatalysis in one heterogeneous hybrid system that not only active Oxone to produce $SO_4^{\bullet -}$, but also enhance the photocatalytic activity of TiO_2 as well as extend its absorption spectrum to visible region, thus it can be defined as a type of bifunctional catalyst. The influence of the pH, [Oxone]/[RhB] molar ratio and catalyst concentration of the catalytic performance were investigated. The Rhodamine B can be eliminated 100% and TOC removal of solution can reach 68% at the optimum conditions by Photo/Co-TiO_2/Oxone process. Moreover, the catalyst was demonstrated to have good stability and reusability.

Key words: Synergistic effect, Co-TiO_2, Sulfate radical, Heterogeneous Fenton-Photo, Rhodamine B degradation

1. Introduction

Nowadays, the rapid development of society has been causing severe environmental problems, among which is the contamination of water by diverse organic pollutants such as pesticides, dyes, and toxic pharmaceuticals. Some of them, like DDT, Malachite Green and Diphenhydramine, are so highly resistant to biodegradation and chemical decomposition that traditional biological treatment is not a complete solution to these pollutants. To deal with the emergent issue with efficient ways for this sort

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