



## Photocatalytic degradation of Congo red by using the $\text{Cu}_2\text{O}/\alpha\text{-Fe}_2\text{O}_3$ composite catalyst

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### ABSTRACT

The  $\text{Cu}_2\text{O}/\alpha\text{-Fe}_2\text{O}_3$  photocatalytic composites were synthesized by precipitation method. The synthesized  $\alpha\text{-Fe}_2\text{O}_3$  and  $\text{Cu}_2\text{O}/\alpha\text{-Fe}_2\text{O}_3$  were characterized by scanning electron microscopy, X-ray diffraction and X-ray photoelectron spectroscopy. The effects of the  $\alpha\text{-Fe}_2\text{O}_3$  synthesis method,  $\text{Cu}_2\text{O}$  mass ratio, initial concentration of Congo red, catalyst quality, reaction temperature and initial pH on the degradation rate of Congo red were investigated. The results showed that under the irradiation of a high-pressure mercury lamp, 12 mg  $\text{Cu}_2\text{O}/\alpha\text{-Fe}_2\text{O}_3$  as a photocatalyst, in which the mass fraction of  $\text{Cu}_2\text{O}$  is 5%, initial pH of 6.0, degradation of 100 mL and 25 mg  $\text{L}^{-1}$  Congo red solution for 60 min, the best degradation rate of Congo red can reach 95.57%. Under the optimized conditions, the chemical oxygen demand and total organic carbon removal rates of Congo red reached 85.36% and 72.57%, respectively. The reaction kinetic of Congo red degradation was according to the pseudo-first-order reaction kinetic model, and the possible mechanism of the photocatalytic reaction was also discussed.

**Keywords:** Photocatalysis; Congo red;  $\text{Cu}_2\text{O}$ ;  $\alpha\text{-Fe}_2\text{O}_3$

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