Desalination and Water Treatment
www.deswater.com

doi: 10.5004/dwt.2017.20945

84 (2017) 40–47
July

Highly efficient decomposition of rhodamine B in wastewater with graphene/silver-based nanocomposite catalyst: process optimization and kinetics

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Received 15 December 2016; Accepted 10 May 2017

ABSTRACT

The carcinogenicity and reproductive ability of rhodamine B (RhB) towards humans and animals have been proved. Current techniques to treat RhB are non-destructive, high cost and low efficient. Therefore, it has practical significance to establish a reasonable method for effective degradation of RhB. Here, the silica gel (SG)/reduced graphene oxide (RGO)/Ag nanoparticles (Ag NPs) composite as the catalyst for degradation of RhB was facilely prepared. Effect of various parameters on the degradation efficiency of the composite was discussed in detail. Interestingly, the degradation efficiency of RhB can be dramatically improved in the presence of the SG/RGO/Ag composite. Moreover, the degradation efficiency was sensitive to the parameters such as the content of Ag in the composite, $NaBH_4$ dosage, pH value of the solution, the amount of the composite, initial concentration of RhB, temperature and inorganic salts. Under optimal conditions, the degradation efficiency for RhB could reach 100% within 50 s even the content of Ag was only 0.78%, instead of the traditional catalyst with high loading of Ag and low catalytic efficiency. Also, the composite was of low cost, highly stable performance and facile recovery, which is a potential candidate for the catalytic degradation of organic dyes in wastewater treatment.

Keywords: Reduced graphene oxide; Nanocomposite; Structure and performance; Catalysis; Wastewater treatment

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