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"Gheorghe Asachi" Technical University of Iasi, Romania

PHOTOCATALYTIC DEGRADATION OF ANILINE IN AQUEOUS SOLUTION USING ZnO NANOPARTICLES

Ahmad Jonidi Jafari[1], Emad Dehghanifard[2*], Roshanak Rezaei Kalantary[1], Mitra Gholami[1], Ali Esrafili[1], Ahmad Reza Yari[3], Mohammad Mehdi Baneshi[4]

[1]Environmental Health Engineering Department, School of Public Health, Iran University of Medical Sciences, Tehran, Iran
[2]Department of Environmental Health Engineering, Faculty of Health, Alborz University of Medical Sciences, Karaj, Iran
[3]Research Center for Environmental Pollutants, Qom University of Medical Sciences, Qom, Iran
[4]Social Determinant of Health Research Center, Yasuj University of Medical Science, Yasuj, Iran

Abstract

Aniline is a priority pollutant, which is known as a toxic organic pollutant released as effluent from several industries. Several physicochemical methods have been used for degradation of this pollutant. In this study, photocatalytic degradation of aniline from synthetic wastewater by ZnO nanoparticle was considered. The effects of different variables, such as irradiation time, the amount of photocatalyst, initial pH values and initial concentration of pollutant on the photodegradation of aniline were investigated to find the optimum condition. A laboratory-scale batch photocatalytic reactor with a low pressure UV lamp in the center was used. Results showed that the photocatalytic system was highly efficient for degrading aniline in a reasonable time. No statistically significant changes for photodegradation of aniline was observed in different concentrations of ZnO, pH and irradiation times ($P_{value}<0.05$). The maximum degradation efficiency of aniline was 93.9% in 500 mg/L of ZnO and alkaline pH. The degradation kinetic of aniline, based on Langmuir-Hinshelwood mechanism, illustrated a pseudo first-order kinetic model with a rate constant of surface reaction equal to 3.04 mg/L.min, and adsorption equilibrium constant of 0.31 L/mg. As a conclusion, the photocatalytic process by using ZnO has great potential for aniline degradation in wastewaters.

Key words: aniline, Langmuir-Hinshelwood mechanism, photocatalytic degradation, ZnO nanoparticles

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[*] Author to whom all correspondence should be addressed: e-mail: edehghanifard@gmail.com; Phone: +9821 88779118; Fax: +9821 8877948