



## Removal of acid 4092 dye from aqueous solution by zinc oxide nanoparticles and ultraviolet irradiation

Mohammad Hadi Dehghani<sup>a,b,\*</sup>, Parvin Mahdavi<sup>a</sup>

<sup>a</sup>Department of Environmental Health Engineering, School of Public Health, Tehran University of Medical Sciences, Tehran, I.R. Iran, Tel. +98 21 66954914; Fax: +98 21 66915233; email: [hdehghani@tums.ac.ir](mailto:hdehghani@tums.ac.ir)

<sup>b</sup>Center for Solid Waste Research, Institute for Environmental Research, Tehran University of Medical Sciences, Tehran, I.R. Iran

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### ABSTRACT

One of the most important environmental concerns is that of water contamination from industrial effluent and dyes used in the textile industry are a primary cause of such contamination. Most conventional methods of wastewater treatment are insufficient to remove these pollutants, so tests were done on a method of removing acid red 4092 dye from wastewater. Tests investigated advanced oxidation processes, based on hydroxyl radical production, were used as an effective method to remove this type of pollutant. The purpose of this study was to investigate the removal of acid red 4092 dye by zinc oxide nanoparticles and ultraviolet radiation (UV-150 W). Dye concentration was measured before and after treatment using a spectrophotometer (Perkin–Elmer Lambda 25–UV/vis). Experiments were performed in a batch photo-reactor on synthetic wastewater with concentrations of 0.5, 1.0, 1.5, and 2 mg/L. The study investigated the effects of factors such as initial dye concentration, irradiation time, dose of catalyst, and pH on the removal efficiency of acid red 4092 dye by the photocatalytic process in the presence of zinc oxide nanoparticles. The dye samples were irradiated by ultraviolet radiation for 2–12 min. Experiments showed that the best result was obtained in the treatment with concentration of dye = 0.5 mg/L, radiation time = 12 min, pH 5, and dosage of catalyst = 0.2 g/L. Results of the study showed that with increasing concentration of acid red 4092 dye (2 mg/L), removal percentage was decreased and with increasing radiation time (12–14 min), removal percentage was increased (100%). This research determined that the photocatalytic process of zinc oxide nanoparticles in the UV reactor effectively removed the acid red 4092 dye from an aqueous solution.

*Keywords:* Acid red 4092 dye; Zinc oxide nanoparticles; Ultraviolet irradiation; Aqueous solution

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\*Corresponding author.