

Decoloration of textile Acid Red 18 dye by hybrid UV/COP advanced oxidation process using ZnO as a catalyst immobilized on a stone surface

Mohammad Malakootian^{a,b}, Alfred Smith Jr.^c, Majid Amiri Gharaghani^d,
Hakimeh Mahdizadeh^{b,e,§}, Alireza Nasiri^a, Ghazal Yazdanpanah^{e,*}

^aEnvironmental Health Engineering Research Center, Kerman University of Medical Sciences, Kerman, Iran, emails: m.malakootian@yahoo.com (M. Malakootian), nasiri_a62@yahoo.com (A. Nasiri)

^bDepartment of Environmental Health, School of Public Health, Kerman University of Medical Sciences, Kerman, Iran ^cDepartment of Biology, Foothill–De Anza Community College District, Los Altos Hills, CA, USA, email: bonk@att.net (A. Smith Jr.)

^dDepartment of Environmental Health Engineering, Sirjan School of Medical Sciences, Sirjan, Iran, email: amiri.majid76@gmail.com (M. Amiri)

^eStudent Research Committee, Kerman University of Medical Sciences, Kerman, Iran, Tel. +98 343 132 5128, Fax: +98 343 132 5105; emails: ghazal.yazdanpanad@gmail.com (G. Yazdanpanah), H.Mahdizadeh2018@gmail.com (H. Mahdizadeh)

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ABSTRACT

Azo dyes are one of the most important groups of synthetic dyes. These dyes are compounds resistant against decomposition by biological processes and are used in textile industries. The aim of this study was to decoloration of textile Acid Red 18 dye by hybrid UV/catalytic ozonation process (COP) advanced oxidation process (AOP) using ZnO (synthesized by thermal method) as a catalyst, immobilized on a stone surface. The process efficiency was investigated using parameters of pH, contact time, catalyst concentration and initial concentration of dye in the hybrid process. Dye removal mechanisms were identified in the sole ozonation process, COP and photocatalytic process (UV/ZnO). X-ray diffraction, scanning electron microscopy and transmission electron microscopy analyses were used to study the structural properties, morphology, and size of the ZnO nanoparticles. 97% dye removal was obtained at a contact time of 40 min, pH: 5, catalyst concentration of 3 g/L and dye initial concentration of 25 mg/L. The Yazdbaf textile factory wastewater was selected as a real sample and its physicochemical quality was determined. Also, the Acid Red 18 dye removal efficiency was obtained 65% in the optimal conditions. Kinetic studies showed that the decomposition reaction follows pseudo-first-order kinetics. The UV/COP hybrid process as an AOP has high efficiency in removing resistant dye contaminants from textile wastewater.

Keywords: Azo dyes; ZnO; Wastewater; Textile industry; COP process

* Corresponding author.

§ Co-corresponding author.