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

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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/\textit{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 Yazdabat 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