



## Application of Photo-Fenton-like oxidation for the degradation and detoxification of commercial naphthalene sulfonates a case study with H-acid model pollutant

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### ABSTRACT

In this experimental study, the treatability of the commercially most important naphthalene sulfonate H-acid that is frequently being used as a raw material for the production of textile azo dyes with the Photo-Fenton-like ( $\text{Fe}^{3+}/\text{H}_2\text{O}_2/\text{UV-A}$ ) advanced oxidation process was investigated. In the first part of the study, the above-mentioned model pollutant was subjected to Photo-Fenton treatment under different working conditions, e.g., different pH,  $\text{Fe}^{3+}$  catalyst and  $\text{H}_2\text{O}_2$  oxidant concentrations. The treatment performance of the photocatalytic treatment process was examined on the basis of chemical oxygen demand and total organic carbon removal efficiencies. In the second part of the experimental work, untreated and Photo-Fenton-treated H-acid solutions were subjected to an activated sludge inhibition (toxicity) test using heterotrophic biomass to determine changes brought about in the acute toxicity of the naphthalene sulfonate during advanced oxidation treatment. For synthetic wastewater containing H-acid with an initial COD of 450 mg/l 82% COD and 51% TOC removals were obtained (optimized experimental conditionals: pH = 5.0;  $\text{Fe}^{3+}$  = 1.5 mM;  $\text{H}_2\text{O}_2$  = 35 mM; reaction time = 24 min). In the case when only partial oxidation was targeted (experimental conditions: pH = 5.0;  $\text{Fe}^{3+}$  = 1.0 mM;  $\text{H}_2\text{O}_2$  = 40 mM; reaction time = 12 min), for the same initial COD of 450 mg/l, COD and TOC abatements were obtained as 67% and 44%, respectively. Activated sludge inhibition experiments have demonstrated that no toxic advanced oxidation products were formed during Photo-Fenton oxidation.

*Keywords:* Advanced oxidation processes; H-acid; Naphthalene sulfonates; Photo-Fenton-like process; Activated sludge inhibition

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