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REMOVAL OF DICLOFENAC FROM SECONDARY WASTEWATER EFFLUENTS BY FENTON BASED PROCESSES

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Abstract

This study considers the removal of diclofenac (an important representative of pharmaceuticals and personal care products - PPCPs) from the secondary effluents of Iasi municipal wastewater treatment plant by means of different advanced oxidation processes (homogeneous Fenton, photo-Fenton and photolysis), carried out in a laboratory scale reaction system. The influence of three qualitative or quantitative factors (Fe^{3+} concentration, the absence/presence of UV-A radiation and H_2O_2) was studied in 4 h oxidation tests, at both acidic and neutral pH conditions. A 2^3 full factorial plan was designed to check the influence of the main parameters affecting the process. The removal efficiencies of several process variants were determined by measuring the DCF concentration in the influent and effluent, by gas chromatography - mass spectrometry analysis. Total organic carbon, specific UV absorption at 254 nm and the hydrogen peroxide concentration were determined for each experiment. At acidic pH, the main effects plots showed that both use UV-A radiation and H_2O_2 addition improve the DCF removal efficiency, Fe concentration having a much smaller effect. DCF removal efficiencies of up to 98% were obtained depending on the operational conditions. At neutral pH, UV-A radiation is the most important factor that contributes to the removal of DCF and the interaction plots demonstrated this fact. The Pareto chart shows that all factors, with the exception of Fe concentration and H_2O_2 interactions, are influential. DCF removal efficiencies of up to 70% were obtained depending on the operational conditions.

Key words: diclofenac, experimental design, Fenton, photolysis, wastewater

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