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OPTIMIZATION OF ADVANCED OXIDATION PROCESSES FOR THE REMOVAL OF ACETAMIPRID FROM WASTEWATER

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Abstract

Advanced oxidation process is getting tremendous importance in the treatment techniques for the removal of nonbiodegradable organics from wastewater due to its ability to completely mineralize the pollutants. It uses different methods to produce hydroxyl radicals which are responsible for oxidation of pollutants. In this work, studies on Fenton, ultraviolet radiation (UV) and UV-hydrogen peroxide processes for removing acetamiprid, a neonicotinoid insecticide from aqueous solution are carried out. Acetamiprid is now finding wide use as a substitute for organophosphates. The effects of pH for UV, H_2O_2 concentration and Fe^{2+} concentration for Fenton process and pH and H_2O_2 concentration for UV-H_2O_2 process are studied for a simulated wastewater containing acetamiprid. The efficiency of the processes was evaluated by measuring acetamiprid concentration and total organic carbon concentration. The processes are optimized using central composite design of response surface methodology. A second order model has been suggested for the processes and the model is validated using statistical tools. The H_2O_2 and Fe^{2+} concentrations showed a positive effect on the removal of pesticide by Fenton process and the optimum conditions obtained are pH-3, H_2O_2- 190 mg/L and Fe^{2+} -19 mg/L. For UV-H_2O_2 process, the optimum pH is found to be 6 at a H_2O_2 concentration of 110 mg/l. Kinetic studies were conducted for Fenton, UV and UV-H_2O_2 processes at the optimized conditions, which show the applicability of first order kinetics.

Key words: acetamiprid, advanced oxidation process, optimization, response surface methodology, wastewater treatment

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