Efficiency optimization of a microwave-assisted Fenton-like process for the pretreatment of chemical synthetic pharmaceutical wastewater

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ABSTRACT

Chemical synthetic pharmaceutical wastewater was treated using a microwave-assisted Fenton-like (MW-Fenton-like) process with satisfactory efficiency. Firstly, based on the MW power chosen, three factors, namely ferric sulfate dose, hydrogen peroxide dose, and total organic carbon (TOC) concentration were used to investigate the improvement in the efficiency of the MW-Fenton-like process for pharmaceutical wastewater pretreatment. Ferric sulfate and hydrogen peroxide doses (ferric sulfate 1.5 mg/L and hydrogen peroxide 10 mL/L) were low, after mixing well, oxidation decomposition was explored without acidification, this time was short (6 min). Under optimal conditions, the removal rate of TOC was with satisfactory effects (57.5\%). Furthermore, the initial pH value was selected without adjustment when the MW radiation started. It was unnecessary to extend the radiation time because no hydrogen peroxide existed in system with the radiation time of 8 min. The influent was unnecessary to be diluted. Biodegradation of the wastewater could be elevated well (BOD\textsubscript{5}/COD arose from 0.23 to 0.40). Moreover, all of coloration from Riboflavin sodium phosphate dissolved (<15 mg/1 L wastewater) was completely removed in the sample. Finally, according to the TOC removal, the second step (flocculation precipitation) was as equally important as the first step (oxidation decomposition), though ferric sulfate dose was low. The effect of biological treatment was unsatisfactory compared with MW-Fenton-like process.

Keywords: Fenton-like; Microwave; Pharmaceutical; Wastewater

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