

# Pharmaceutical Wastewater Treatment using Advanced Oxidation Processes (AOPs)

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**Abstract:** *The treatment of pharmaceutical wastewater containing recalcitrant organic pollutants is a significant challenge in modern wastewater management. Conventional treatment methods often fall short in removing stable chemical compounds. Advanced Oxidation Processes (AOPs), which generate powerful radicals such as hydroxyl ( $\bullet\text{OH}$ ) and sulfate radicals ( $\text{SO}_4\bullet^-$ ), offer an effective alternative. In this study, oxidants including Oxone, Sodium Persulfate, Thiosulfate, and Air ( $\text{O}_2$ ) were employed to enhance the degradation of pharmaceutical pollutants. This paper discusses the properties of each oxidant, their effects on wastewater treatment, experimental observations, and comparative analysis. AOPs demonstrated promising results and high potential for sustainable wastewater treatment.*

**Keywords:** Advanced Oxidation Process, Pharmaceutical Wastewater, Hydroxyl Radical, Sulfate Radical, COD Reduction, Oxone, Sodium Persulfate, Sodium Thiosulfate

