PHOTOCHEMICAL OXIDATION OF CEFTRIAXONE BY MAGNETITE-ACTIVATED PERSULFATE

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The occurrence of micropollutants in the aquatic environment is a growing global environmental problem. These contaminants, even at low concentrations (ng/L to µg/L), can have serious consequences for the aquatic ecosystem, such as disruption of the endocrine system, acute and chronic toxicity, and resistance to antibiotics [1]. Ceftriaxone (CTA), a beta-lactam antibiotic, is one of these micropollutants [2].

The aim of this study was to investigate the photochemical oxidation of CTA in ultrapure water and groundwater using UV photolysis and UV-induced persulfate (PS) based processes. Among the systems studied were UVA, UVC, UVA/PS, UVC/PS, UVA/PS/Fe_3O_4, and UVC/PS/Fe_3O_4.

The obtained results showed that the most effective CTA degradation in both water matrices was achieved by UV/PS systems. However, the performance of CTA removal in UVA-induced systems was lower as compared to UVC-based processes. The results also indicated that the performance of heterogeneous activator, magnetite, in the studied systems was considerably dependent on solution pH. Thus, adjustment of pH value to 3 resulted in better utilization of PS due to higher iron leaching from the surface of Fe_3O_4 magnetite and, as a result, in higher CTA degradation and mineralization efficacy in UV/PS/Fe_3O_4 systems. Notably, the application of UVA-induced systems showed better treatment efficacy in groundwater, while the use of UVC-based technologies was more efficient in ultrapure water. The findings in this study strongly suggested that prudently adjusted UV/PS oxidation could be a reliable technology for CTA-contaminated water matrices treatment.

References

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