

Influence of Co-ions and Water Matrices on the Removal of Tetracycline in Wastewater using Eosin Y Sensitized g-C₃N₄/ZnFe₂O₄

This study investigated the removal of tetracycline from wastewater using solar photocatalysis in a parabolic trough reactor. The Eosin-Y sensitized photocatalyst was fabricated using a three-step procedure involving direct annealing of melamine to yield g-C₃N₄, which was thermally exfoliated, hydrothermal precipitation reaction between g-C₃N₄, zinc chloride and iron chloride and a final dye sensitization step of the resultant composite using the mixing-adsorption method. The degradation performance of the photocatalyst was GCN < ZF < 25%ZF/GCN < EY-25%ZF/GCN. Faster degradation kinetics were observed in experiments conducted in synthetic wastewater compared to real wastewater. This was attributed to the interference of aromatic groups, competing ions and water turbidity. The effect of coexisting ions such as (Cl⁻, NO₃⁻ and SO₄²⁻) was also assessed at 100, 300, and 500mg/l concentrations of NaCl, Na₂SO₄, and NaNO₃, respectively in real wastewater. The low doses (100mg/l) of Cl⁻ and NO₃⁻ had a promoting effect of 0.75% and 5.26%, respectively, on the degradation constant, while higher doses inhibited degradation. Total Organic Carbon (TOC) studies carried out at 100mg/l salt concentrations showed that co-ions of SO₄²⁻ had the lowest TOC removal (37.02%) while Cl⁻ ions had the highest. Similarly, the SO₄²⁻ ions had the highest inhibition effect on tetracycline degradation, while Cl⁻ ions had the lowest. These findings confirm that high concentrations of anions decrease the photocatalytic performance of photocatalysts in wastewater, hence the need for adequate pre-treatment before applying photocatalytic treatment of real wastewater.

Author: MUTUMA, Humphrey (The Nairobi National Polytechnic)

Co-authors: Prof. ACHISA, Cleophas (The University of Arizona); Prof. M'ARIMI, Milton (Moi University)

Presenter: MUTUMA, Humphrey (The Nairobi National Polytechnic)

Track Classification: Pollution and waste management: Heavy metals pollution: bioremediation of heavy metals in water bodies and aquatic systems