



Ionic Liquid-Mediated TiO₂/Ag/CA Photocatalyst for Enhanced Water Remediation

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Abstract

The effect of an environmentally friendly green solvent template, ionic liquid (IL) - 1-butylimidazolium acetate on the surface area of TiO₂ and its further combination with silver (Ag) dopant and cellulose acetate (CA) support were evaluated together. In this study, the TiO₂/Ag/CA photocatalyst was synthesized and systematically investigated for the degradation of dyes. The incorporation of IL during synthesis led to a notable increase in the surface area of TiO₂ (174.8 m²/g) and TiO₂/Ag/CA (186.5 m²/g) photocatalyst, as evidenced by Brunauer Emmett Teller (BET) surface analysis. The findings revealed that TiO₂/Ag/CA photocatalyst (IL: 3 mL, Ag: 2wt%, CA: 0.5%) exhibited great efficiency in removing both individual and mixed dyes (MB, MO and RhB) under UV irradiation ($\lambda = 365$ nm) and visible light ($\lambda = 440$ nm) after 120 min. The antibacterial activity of TiO₂-1/Ag 2%/CA 0.5% investigated via disc diffusion method against *Escherichia coli* (*E. coli*) and *Staphylococcus aureus* (*S. aureus*) bacteria demonstrated inhibition zones, indicating the antibacterial effectiveness of the photocatalyst. With the imperative goal of eliminating chemical pollutants and undesired biological constituents from wastewater, the TiO₂/Ag/CA photocatalyst investigated in this study exhibits the capability to effectively tackle both challenges with a high degree of efficiency.

Keywords

green solvent; surface area; silver; photocatalysis; wastewater; antibacterial