Electrochemical Photocatalytic degradation of Brilliant Blue FCF as food dye by CuO–TiO₂ nanocomposite under visible and UV-light irradiations

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In this work, a simple deposition technique was used to synthesize CuO/TiO₂ nanocomposites and their application as photocatalysts for the photodegradation of Brilliant Blue FCF (BBF) under visible and UV-light irradiations were studied. The prepared nanocomposites and their components were investigated in terms of structural, morphological, electrochemical, optical, and photocatalytic degradation properties. When UV–Vis absorbance spectra were used to characterize photocatalysts, it was revealed that the bandgap reduced as the CuO concentration increased. TiO₂, CuO–TiO₂-0.5, CuO–TiO₂-1.5, CuO–TiO₂-4 and CuO–TiO₂-8 had bandgap values of 3.36, 3.33, 3.31, 3.27, and 3.25 eV, respectively, indicating that the band gap narrows with increasing CuO concentration. CuO supplied more electro-active on the surface of TiO₂ nanocomposites with greater conductivity, which can function as a catalyst in absorption and electrochemical processes, according to electrochemical tests. Photodegradation tests indicated that 100 mg/l of BBF was completely degraded in the presence of CuO/TiO₂ nanocomposites after 60 and 50 min of UV and visible-light irradiation, respectively. These findings suggest that the CuO–TiO₂ nanocomposites can be used to degrade BBF with great efficiency when exposed to visible and UV-light irradiation.

Keywords: Photocatalytic degradation; Brilliant Blue FCF; CuO–TiO₂ nanocomposite; UV–Vis absorbance; Cyclic voltammetry

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