

ABSTRACT

Metal oxides can be utilized in various applications, one of which is in environmental fields as catalysts for wastewater treatment. Typically, the synthesis of metal oxides involves conventional chemical methods that are toxic and not environmentally friendly. Green synthesis approaches have been developed as an alternative by utilizing natural compounds from plants, such as jackfruit peel extract (*Artocarpus heterophyllus*), which contains flavonoids, phenols, and tannins that function as stabilizing agents (*capping agents*). This study aims to synthesize lead oxide (PbO) through a green synthesis method using jackfruit peel extract and to evaluate its effectiveness in the decolorization of methylene blue (MB) using a Fenton-like process. This method was chosen because it avoids the formation of sludge commonly produced in conventional Fe²⁺-based Fenton reactions and does not require external energy such as irradiation. PbO powder was employed to generate Pb²⁺ ions in the decolorization of 5 ppm MB solution, with variations in H₂O₂ concentration (3–18%) and volume (4–24 mL). Characterization was carried out using SEM-EDX, XRD, and FTIR. The decolorization efficiency was analyzed based on decolorization percentage, UV-Vis absorbance measurements, and supporting parameters such as COD, Pb content via AAS, and hydroxyl radical intensity using a spectrofluorometer. The results showed successful synthesis of PbO with litharge (tetragonal) as the main phase, an average crystallite size of 26.94 nm, and a crystallinity of 89.7%. The Pb content from EDX analysis was 76.44%, and FTIR confirmed the presence of Pb–O bonds and residual organic compounds. The decolorization efficiency reached 67.12%, COD decreased by 60 mg/L, Pb concentration increased by 2.1 mg/L, and hydroxyl radical intensity was 18.18.

Keywords: decolorization, green synthesis, hydrogen peroxide, lead oxide, methylene blue.