ABSTRACT

The use of synthetic dyes, such as Malachite Green, has been increasing along with the development and advancement of the textile industry. Malachite Green is a synthetic dye belonging to the triphenylmethane group, which has reactive properties and can potentially pollute the environment if its waste is discharged directly without prior treatment. Various methods such as coagulation, adsorption, sedimentation, photocatalysis, chlorination, and biodegradation have been studied, but their effectiveness is still limited. One of the most effective and promising methods is electrolysis or electrochemical degradation. The objective of this study is to analyze the effectiveness of Pb–PbO_2 electrodes in the electrodecolorization process of malachite green dye using NaCl as the electrolyte, to evaluate the reduction in Chemical Oxygen Demand (COD), to determine the percentage of decolorization, and to assess the values of Atomic Absorption Spectroscopy (AAS), Total Dissolved Solids (TDS), and Total Suspended Solids (TSS) in the solution after electrolysis.

The research stages include preparing 500 mL of 100 ppm Malachite Green solution, determining the maximum wavelength, creating a calibration curve, characterizing the Pb-PbO_2 electrode before and after electrolysis using SEM-EDX, optimizing potential, pH, and decolorization time, analyzing Pb content with AAS, determining COD values, as well as testing TDS and TSS.

The research results showed that the optimum decolorization condition for a 10 mL solution of 10 ppm in the potential of 4 Volts, pH 5, and a duration of 270 minutes. Electrolysis at the 270 minute resulted in a COD reduction to 39 mg/L. UV-Vis analysis indicated a decrease in the absorption peak intensity in the UV and visible regions as electrolysis time increased. In addition, water quality analysis showed a TDS value of 13,270 mg/L and a TSS value of 43.6 mg/L, indicating a change in the solution composition after the electrolysis process.

Keywords : Malachite Green, electrodecolorization, Pb–PbO_2 electrode.