

## ABSTRAK

Telah dilakukan penelitian dekolorisasi larutan zat warna *methylene blue* menggunakan metode elektrolisis sebagai salah satu pengolahan limbah tekstil dan batik. Tujuan penelitian ini untuk menentukan potensi efektivitas metode elektrolisis pada dekolorisasi larutan *methylene blue* menggunakan elektroda Pb (katoda) dan PbO<sub>2</sub> (anoda). Penelitian ini melibatkan beberapa tahapan, termasuk preparasi larutan sampel *methylene blue* 100 ppm sebanyak 500 mL, penentuan panjang gelombang maksimum, pembuatan kurva kalibrasi standar, karakterisasi elektroda Pb-PbO<sub>2</sub> menggunakan SEM-EDX sebelum dan setelah elektrolisis, penentuan potensial aplikasi, penentuan pH terbaik, penentuan waktu dekolorisasi, analisis kandungan logam Pb menggunakan AAS, analisis kadar COD serta demineralisasi dengan menguji kadar ion nitrat, kadar ion sulfat, TDS, dan TSS. Hasil penelitian menunjukkan bahwa kondisi optimum proses dekolorisasi larutan *methylene blue* konsentrasi 5 ppm sebanyak 100 mL dengan metode elektrolisis yaitu pada potensial 5 V, pH 3 dan waktu dekolorisasi 45 menit dengan presentase 99,53%. Keberhasilan proses dekolorisasi dapat dilihat dari penurunan absorbansi pada daerah ultraviolet dan tampak. Selain terjadi penghilangan warna, larutan *methylene blue* mengalami demineralasi yang ditunjukkan dengan kenaikan kadar ion nitrat <0,2-0,518 ppm. dan kadar ion sulfat <1,03-10,071 ppm. Hasil pengukuran COD menunjukkan kenaikan 54,63-328 ppm. Kadar logam Pb dalam larutan mengalami penurunan dari 0,2-0,1 ppm. Nilai TDS menunjukkan kenaikan 6,4-12,46 ppm, dan nilai TSS meningkat 3-347 ppm.

Kata kunci: Dekolorisasi, *methylene blue*, elektroda Pb-PbO<sub>2</sub>

## ABSTRACT

A study on the decolorization of methylene blue dye solution using the electrolysis method as a treatment for textile and batik waste has been conducted. The purpose of this research was to determine the potential effectiveness of the electrolysis method in decolorizing methylene blue solution using Pb (cathode) and PbO<sub>2</sub> (anode) electrodes. This study involved several stages, including the preparation of 100 ppm methylene blue sample solution (500 mL), determination of maximum wavelength, creation of a standard calibration curve, characterization of Pb-PbO<sub>2</sub> electrodes using SEM-EDX before and after electrolysis, determination of the application potential, determination of the optimal pH, decolorization time determination, analysis of Pb metal content using AAS, COD analysis, and demineralization by testing nitrate ion levels, sulfate ion levels, TDS, and TSS. The results showed that the optimal conditions for the decolorization process of a 5 ppm methylene blue solution (100 mL) using the electrolysis method were at 5 V potential, pH 3, and a decolorization time of 45 minutes with a decolorization percentage of 99.53%. The success of the decolorization process was observed from the decrease in absorbance in the ultraviolet and visible regions. In addition to the color removal, the methylene blue solution underwent demineralization, as indicated by an increase in nitrate ion levels from <0.2 to 0.518 ppm and sulfate ion levels from <1.03 to 10.071 ppm. COD measurements showed an increase from 54.63 to 328 ppm. The Pb metal content in the solution decreased from 0.2 to 0.1 ppm. The TDS value increased from 6.4 to 12.46 ppm, and the TSS value increased from 3 to 347 ppm.

Keywords: Decolorization, methylene blue, Pb-PbO<sub>2</sub> electrodes