

DEGRADASI ZAT WARNA LIMBAH BATIK LENDAH KULONPROGO DENGAN ELEKTRODA PbO₂ TERDOPING NIKEL

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INTISARI

Pada penelitian ini elektroda PbO₂ dimodifikasi dengan metode elektrolisis. PbO₂ didoping dengan enam ion logam yang berbeda yaitu Mg²⁺, Co²⁺, Cu²⁺, Ni²⁺, Ag²⁺, Zn²⁺ serta diujikan pada elektrodegradasi zat warna metilen biru. Keenam elektroda PbO₂ yang telah didoping tersebut kemudian dikarakterisasi dengan XRD dan FTIR dan diujikan ke zat warna metilen biru untuk melihat logam yang paling baik dalam mendegradasi zat warna tersebut. Anoda yang terbaik kemudian digunakan untuk mendegradasi sampel limbah batik pada waktu, konsentrasi NaCl, dan kerapatan arus listrik yang telah dioptimasi.

Hasil penelitian menunjukkan bahwa anoda PbO₂-Ni paling efektif dalam mendegradasi zat warna metilen biru daripada anoda lainnya. Keberadaan nikel di permukaan elektroda membantu meningkatkan kinerja PbO₂ sebagai anoda. Elektrolisis menggunakan anoda PbO₂-Ni selama 30 menit dengan pH 8, konsentrasi NaCl 0,075 M, serta kerapatan arus listrik 20 mA/cm² memberikan persen degradasi limbah A sebesar 24,95% dan limbah B sebesar 43,81%.

Kata Kunci : degradasi elektrokimia, PbO₂, PbO₂-Ni, limbah batik

DEGRADATION OF LENDAH KULONPROGO BATIK DYE WASTE USING NICKEL DOPED PbO₂ ELECTRODE

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ABSTRACT

In this study, PbO₂ electrodes were modified by the electrolysis method. PbO₂ was doped with six different metal ions that were Mg²⁺, Co²⁺, Cu²⁺, Ni²⁺, Ag⁺, and Zn²⁺ and were tested on electrochemical degradation of methylene blue. The six PbO₂ electrodes that have been doped were characterized by XRD and FTIR and tested on methylene blue degradation to understand the best metal for degrading the dye. The best anode was used to degrade samples of batik waste at the optimized time, NaCl concentration, and current density.

The results showed that the PbO₂-Ni electrode is the most effective in degrading methylene blue than other electrodes. The presence of nickel on the surface of the electrodes helps improve the performance of PbO₂ as an anode. Electrolysis using PbO₂-Ni anode for 30 minutes in pH 8, NaCl concentration of 0.075 M, and electric current density of 20 mA/cm² give percent degradation of waste A of 24.95% and waste B of 43.81%, respectively.

Keywords: electrochemical degradation, PbO₂, PbO₂-Ni, batik waste