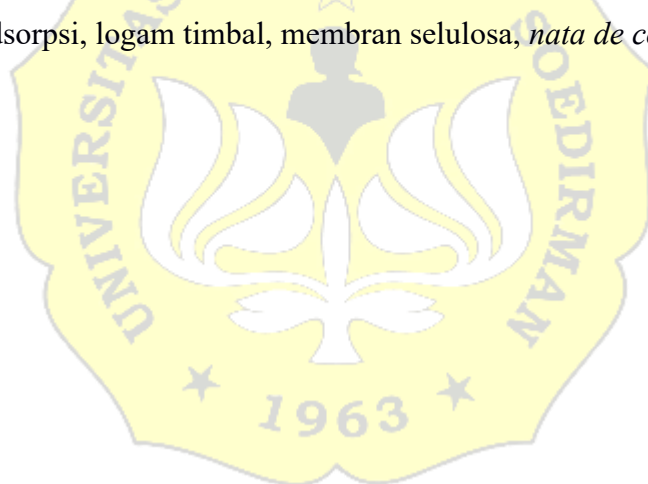


ABSTRAK

Pencemaran logam timbal (Pb) di perairan menjadi masalah serius yang dapat mengancam keseimbangan ekosistem. Penelitian ini bertujuan menganalisis efektivitas membran selulosa *nata de coco* termodifikasi Na₂EDTA sebagai adsorben logam Pb melalui pembentukan senyawa kompleks stabil. Karakterisasi membran dilakukan menggunakan *Fourier Transform Infrared Spectroscopy* (FTIR) dan analisis berat molekul relatif, sedangkan kinerja adsorpsi diuji dengan Spektrofotometer Serapan Atom (SSA) pada variasi pH (4, 7, 9), waktu kontak (30-120 menit), dan konsentrasi Pb (10-30 mg/L). Analisis data dilakukan dengan model kinetika adsorpsi dan isoterm. Hasil menunjukkan penyerapan tertinggi pada pH 7 (31,82%), waktu kontak 90 menit (6,38%), dan konsentrasi logam Pb 20 mg/L (64,45%) dengan konstanta laju kinetika orde satu (k_1) = $3,99 \times 10^{-4}$ menit⁻¹. Analisis isoterm sesuai dengan model Freundlich ($R^2 = 0,814$), mengindikasikan proses adsorpsi multilayer pada permukaan heterogen. Membran termodifikasi ini berpotensi sebagai material alternatif untuk remediasi limbah logam berat.

Kata kunci: adsorpsi, logam timbal, membran selulosa, *nata de coco*, Na₂EDTA



ABSTRACT

Lead metal (Pb) pollution in waters is a serious problem that can threaten the balance of the ecosystem. This study aimed to analyze the effectiveness of Na₂EDTA-modified nata de coco cellulose membrane as a Pb metal adsorbent through the formation of stable complex compounds. Membrane characterization was conducted using Fourier Transform Infrared Spectroscopy (FTIR) and relative molecular weight analysis. Meanwhile, adsorption performance was tested with an Atomic Absorption Spectrophotometer (SSA) at various pH (4, 7, 9), contact time (30-120 min), and Pb concentration (10-30 mg/L). Data analysis was performed with adsorption kinetics and isotherm models. The results showed the highest adsorption at pH 7 (31,82%), a contact time of 90 minutes (6,38%), and a Pb metal concentration of 20 mg/L (64,45%), with a first-order kinetics rate constant (k_1) of $3,99 \times 10^{-4} \text{ min}^{-1}$. The isotherm analysis fitted the Freundlich model ($R^2 = 0,814$), indicating a multilayer adsorption process on the heterogeneous surface. This modified membrane had potential as an alternative material for heavy metal waste remediation.

Keywords: *adsorption, cellulose membrane, lead metal , nata de coco, Na₂EDTA*

