

**KAJIAN GABUNGAN PROSES ELEKTROFLOTASI DAN ADSORPSI
MENGUNAKAN SERAT ALAMI UNTUK PENGOLAHAN LIMBAH
LABORATORIUM**

INTISARI

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Telah dilakukan kajian pengolahan limbah laboratorium dengan gabungan proses elektroflotasi dan adsorpsi menggunakan serat kelapa (*Cocos nucifera*) dan nanas (*Ananas comosus*). Optimasi proses elektroflotasi dilakukan dengan tegangan 10, 20 dan 30 V yang menggunakan distribusi ukuran gelembung dengan perangkat lunak DinoCapture 2.0. Karakterisasi serat alami dilakukan dengan mikroskop elektron (SEM) dan FTIR. Evaluasi kinerja adsorben ditentukan dengan penentuan kapasitas adsorpsi isothermal Langmuir dan Freudlich. Parameter keberhasilan proses meliputi pH, TDS, turbiditas, intensitas cahaya dan konsentrasi logam Pb dengan massa 2, 4, 6, 8 dan 10 g. Hasil penelitian menunjukkan, karakteristik serat alami dengan SEM menunjukkan permukaan serat halus dengan tonjolan (*tyloses*) setelah proses delignifikasi dengan 0,5 M NaOH dan spektra FTIR menunjukkan gugus OH sebagai tanda selulosa telah berada pada permukaan serat. Proses penyerapan logam Pb oleh serat kelapa dan nanas mengikuti persamaan Langmuir dengan $R^2 = 0,997$ dan $0,999$. Kapasitas adsorpsi maksimum dari serat kelapa sebesar 27,7 dan nanas 29,8 mg/g. Proses elektroflotasi berlangsung pada tegangan optimum 20 V, sehingga mampu menurunkan turbiditas dan konsentrasi logam Pb masing-masing sebesar 99,6% dan 94,6%. Sedangkan peningkatan proses elektroflotasi dengan adsorpsi mampu menurunkan parameter turbiditas, TDS dan logam berat masing-masing sebesar 99,6%, 48,1% dan 96,02% serta meningkatkan pH 6,9 dan intensitas cahaya +319% dengan dosis serat kelapa sebesar 4 g. Berdasarkan hasil penelitian menunjukkan bahwa gabungan proses elektroflotasi dan adsorpsi dengan serat alami mampu mengolah limbah laboratorium.

Kata kunci: Adsorpsi, Elektroflotasi, Limbah laboratorium, Serat kelapa, Serat nanas

**STUDY OF COMBINATION OF ELECTROFLOTATION AND
ADSORPTION PROCESS USING NATURAL FIBERS ON THE
TREATMENT OF LABORATORY WASTEWATER**

ABSTRACT

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A study on the treatment of laboratory waste has been carried out by the combination of electroflotation and adsorption processes using coconut (*Cocos nucifera*) and pineapple (*Ananas comosus*) fibers. Voltage optimization of electroflotation process was carried out by 10, 20 and 30 V using a bubble size distribution with the DinoCapture 2.0 software. The characterization of natural fibers was carried out by electron microscopy (SEM) and Fourier Transform InfraRed (FTIR). The evaluation of adsorbent performance was determined by isothermal adsorption capacity of Langmuir and Freundlich model. The effectiveness of treatment process was evaluated by the parameters are as follow: pH, TDS, turbidity, light intensity and metal concentration of Pb concentration in terms of adsorbent mass (2, 4, 6, 8 and 10 g). The results of SEM showed that the surface morphology of natural fibers was smooth with tyloses after the delignification with 0,5 M NaOH and the FTIR spectra shows the OH groups representing the cellulose had been appeared on the fiber surface. The adsorption of lead ions by coconut and pineapple fibers followed the Langmuir model which revealed the R^2 was 0.997 and 0,999. The optimum adsorption capacity of coconut fiber was 27.7 and pineapple was 29.8 mg/g. The electroflotation process was proceeded at optimum voltage of 20 V which able to, reduce the turbidity and Pb concentration by 99.6% and 94.6%. Meanwhile, the additional of adsorption process with 4 g coconut fiber in the electroflotation process was able to reduce the turbidity, TDS and Pb concentration by 99.6%, 48.1% and 96.02% respectively and increased the pH 6.9 and light intensity +319%. Based on these results, it was shown that the combination of electroflotation and adsorption processes by natural fibers could be used on the laboratory wastewater treatment.

Keywords: Adsorbtion, Coconut fibers, Electroflotation, Laboratory wastewater, Pineapple fibers