

## ABSTRAK

### Karakterisasi Adsorpsi Logam Fe(III) Menggunakan Karbon Aktif Tandan Kosong Kelapa Sawit

Tandan kosong kelapa sawit (TKKS) merupakan salah satu limbah padat yang berasal dari proses pengolahan industri kelapa sawit yang dapat dimanfaatkan sebagai prekursor pembuatan karbon aktif dikarenakan mengandung ligniselulosa dan gugus-gugus fungsional seperti  $-OH$  dan  $-COOH$  sehingga memiliki kemampuan untuk menyerap logam berat. Pada penelitian ini karbon aktif TKKS disintesis menggunakan metode aktivasi secara kimia fisika. Aktivasi secara kimia menggunakan bahan pengaktif  $H_3PO_4$  dan aktivasi secara fisika dilakukan dengan pemanasan menggunakan *furnace* pada suhu  $400^\circ C$  selama 1 jam. Selanjutnya, kemampuan adsorpsi Fe(III) menggunakan karbon aktif dari tandan kosong kelapa sawit ditentukan menggunakan metode spektroskopi *Atomic Adsorption Spectrometer* (AAS). Karakterisasi fisikokimiawi karbon aktif TKKS dilakukan menggunakan analisis proksimat, metode spektroskopi *Fourier Transform Infra Red* (FTIR) dan *Scanning Electron Microscopy* (SEM). Berdasarkan hasil analisis spektroskopi FTIR menunjukkan bahwa karbon aktif dari TKKS memiliki gugus-gugus fungsional diantaranya hidroksil ( $-OH$ ), karbonil ( $C=O$ ) dan aromatis yang berasal dari lignin dan selulosa. Analisis morfologi permukaan dengan SEM memperlihatkan karbon aktif dari TKKS memiliki ukuran pori yang relatif lebih terbuka dibandingkan dengan karbon dari TKKS dan TKKS. Hasil pengujian adsorpsi Fe(III) menggunakan karbon aktif menunjukkan Adsorpsi ion Fe(III) menggunakan karbon aktif TKKS terjadi pada pH optimum 5, waktu kontak optimum 30 menit, dan kapasitas adsorpsi maksimum sebesar  $0,00031$  mg/g. Pola adsorpsi ion Fe(III) menggunakan karbon aktif TKKS mengikuti isotherm adsorpsi Freundlich dengan nilai koefisien korelasi ( $R^2$ ) sebesar 0.984.

Kata kunci : Adsorpsi, Tandan Kosong Kelapa Sawit, Logam Fe(III), Karbon Aktif

# CHARACTERIZATION OF FE(III) ADSORPTION USING ACTIVATED CARBON FROM OIL PALM EMPTY FRUIT BUNCHES

**Dinny Kartika**  
**NIM. 150604001**

Komisi pembimbing :  
**PujiWahyuningsih, S.Si., M.Sc**  
**Ulil Anna, S.Si., M.Sc**

## ABSTRACT

Oil palm empty fruit bunches are one of the solid wastes that come from the processing of the oil palm industry which can be used as precursor of activated carbon because of contains lignocelluloses and functional groups such as -OH and -COOH which are known to have the ability to absorb heavy metals. In this study, synthesis of activated carbon from oil palm empty fruit bunches was carried out with chemical and physical methods. Chemical activation was using  $H_3PO_4$  and physical activation was carried out by heating with furnace at  $400^\circ C$  for 1 hour. Furthermore, the adsorption ability of Fe (III) using activated carbon from oil palm empty fruit bunch was determined using Atomic Adsorption Spectrophotometer (AAS) spectroscopic methods. The physicochemical characterization of activated carbon from oil palm empty fruit bunch was performed using proximate analysis, *Fourier Transform Infra Red* (FTIR) spectroscopy and Scanning Electron Microscopy (SEM). Based on the FTIR spectroscopy analysis results showed that the activated carbon from oil palm empty fruit bunches has functional groups such as hydroxyl (-OH), carbonyl (C=O) and aromatics derived from lignin and cellulose. Surface morphology analysis with SEM showed that the activated carbon from oil palm empty fruit bunches has more opened pore size compared to oil palm empty fruit bunches and carbon from oil palm empty fruit bunches relatively. The result of Fe (III) adsorption using activated carbon from oil palm empty fruit bunches showed that the adsorption of Fe (III) ion was occur at optimum pH of 5, optimum contact time of 30 minutes, and maximum adsorption capacity of 0,000031 mg/g. The adsorption pattern of Fe (III) ion using activated carbon from oil palm empty fruit bunches was followed by the Freundlich isotherm adsorption with correlation coefficient ( $R^2$ ) of 0.984.

Keyword : Adsorption, From Oil Palm Empty Fruit Bunches, Metal Fe (III),  
Activated Carbon