

## **SINTESIS SELULOSA ASETAT DARI TANDAN KOSONG KELAPA SAWIT MELALUI REAKSI ESTERIFIKASI DAN APLIKASINYA SEBAGAI ADSORBEN LOGAM BERAT DALAM FRAKSI BERAT MINYAK BUMI**

Sulthan Dzaky Pratama Putra  
19/439192/PA/19015

### **INTISARI**

Telah dilakukan sintesis selulosa asetat dari tandan kosong kelapa sawit melalui reaksi esterifikasi dan kajian aplikasinya sebagai adsorben logam berat pada minyak bumi. Penelitian ini bertujuan untuk melakukan isolasi  $\alpha$ -selulosa dari tandan kosong kelapa sawit dan mensintesis selulosa asetat menggunakan asetat anhidrida melalui reaksi esterifikasi. Selain itu, penelitian ini juga bertujuan untuk membandingkan aktivitas  $\alpha$ -selulosa dengan selulosa asetat sebagai adsorben logam berat pada sampel minyak bumi.

Penelitian ini diawali dengan delignifikasi tandan kosong kelapa sawit menggunakan natrium hidroksida melalui proses refluks yang diikuti dengan proses isolasi  $\alpha$ -selulosa. Material  $\alpha$ -selulosa dimodifikasi dengan asetat anhidrida melalui reaksi esterifikasi. Material  $\alpha$ -selulosa dan selulosa asetat dianalisis dengan spektrofotometer FT-IR dan SEM-EDX. Material  $\alpha$ -selulosa dan selulosa asetat digunakan sebagai adsorben logam berat yang terkandung dalam minyak bumi umpan *Residual Fluid Catalytic Cracking* (RFCC).

Rendemen hasil sintesis selulosa asetat dengan rasio massa 1 dan 5 kali dari massa  $\alpha$ -selulosa berturut-turut adalah 97,0% dan 90,5%. Material  $\alpha$ -selulosa, selulosa asetat 1:1, dan selulosa asetat 1:5 digunakan sebagai adsorben untuk adsorpsi logam Ni(II), Fe(III), dan VO(II) dalam sampel minyak bumi umpan RFCC. Hasil adsorpsi logam Ni(II), Fe(III), dan VO(II) dengan adsorben  $\alpha$ -selulosa dan selulosa asetat mengalami fluktuasi pada setiap massa adsorben terhadap logam berat dalam minyak bumi. Hubungan antara massa adsorben dengan kapasitas adsorpsi adalah berbanding terbalik, sedangkan massa adsorben dengan persentase adsorpsi berbanding lurus.

Kata kunci: adsorpsi, asetat anhidrida, minyak bumi, tandan kosong kelapa sawit

## **SYNTHESIS OF CELLULOSE ACETATE FROM EMPTY PALM OIL BUNCHES THROUGH ESTERIFICATION REACTION AND ITS APPLICATION AS AN ADSORBENT FOR HEAVY METALS IN HEAVY OIL FRACTION**

Sulthan Dzaky Pratama Putra  
19/439192/PA/19015

### **ABSTRACT**

Synthesis of cellulose acetate from empty palm oil bunches through esterification reaction and its application as an adsorbent for heavy metals in heavy fraction oils have been carried out. This research aimed to isolate  $\alpha$ -cellulose from empty palm oil bunches and synthesize cellulose acetate using acetic anhydride through an esterification reaction. In addition, this study also aimed to compare the activity of  $\alpha$ -cellulose and cellulose acetate as an adsorbent for heavy metals in heavy fraction oil samples.

This research began with the delignification of empty palm oil bunches using sodium hydroxide through a reflux process and then followed by the isolation process of  $\alpha$ -cellulose. The  $\alpha$ -cellulose material was modified with acetic anhydride through an esterification reaction. The  $\alpha$ -cellulose and cellulose acetate were analyzed by FT-IR spectrophotometer and SEM-EDX. The  $\alpha$ -cellulose and cellulose acetate were used as adsorbents for heavy metals contained in heavy oil fraction from the Residual Fluid Catalytic Cracking (RFCC) unit.

The yield of synthesized cellulose acetate with a mass ratio of 1 and 5 times the mass of  $\alpha$ -cellulose was 97.0% and 90.5%, respectively. The  $\alpha$ -cellulose, 1:1 cellulose acetate, and 1:5 cellulose acetate materials were used as adsorbents for the adsorption of Ni(II), Fe(III), and VO(II) metals in the RFCC feed oil. The results of the adsorption of Ni(II), Fe(III), and VO(II) metals with  $\alpha$ -cellulose and cellulose acetate adsorbents fluctuated at each mass of the adsorbent against heavy metals in RFCC feed oil. The relationship between the mass of the adsorbent and the adsorption capacity is inversely proportional, while the mass of the adsorbent and the adsorption percentage is directly proportional.

**Keywords:** adsorption, cellulose acetate, crude oil, empty oil palm bunches, esterification