

## **ADSORPSI Au(III) PADA SELULOSA KULIT KELENGKENG DENGAN DAN TANPA PERLAKUAN ASAM SULFAT**

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### **INTISARI**

Telah dilakukan penelitian adsorpsi Au(III) pada selulosa dari kulit kelengkeng (*dimocarpus longan lour*) hasil perlakuan dengan asam sulfat dan tanpa asam sulfat. Tujuan penelitian ini untuk mempelajari isoterm adsorpsi Au(III) dan membandingkan kemampuan adsorpsi Au(III) oleh kedua adsorben.

Penelitian ini diawali dengan preparasi kulit kelengkeng melalui metode asam sulfat dan tanpa asam sulfat. Adsorben yang sudah terbentuk ditentukan isoterm adsorpsi pada variasi konsentrasi 0, 1, 2, 4, 6, 8 dan 10 mM dalam HCl 0,5 M dan dengan variasi temperatur 28, 40, 50 dan 60 °C. Konsentrasi Au(III) dalam proses adsorpsi dianalisis dengan menggunakan AAS. Adsorben selulosa asam sulfat dikarakterisasi dengan FTIR, XRD dan foto mikroskop. Adsorben tanpa asam sulfat kulit kelengkeng dikarakterisasi dengan FTIR dan foto mikroskop.

Hasil analisis menggunakan FTIR menunjukkan bahwa adsorben memiliki beberapa gugus fungsional diantaranya -O-H, C-O-C, -C=O dan -C-H. Karakteristik adsorben selulosa dengan asam sulfat dari kulit kelengkeng dengan XRD menunjukkan sifat amorf dan difraktogram adsorben selulosa dengan asam sulfat dari kulit kelengkeng setelah interaksi dengan Au(III) menunjukkan beberapa puncak karakteristik dengan tipe *face centered cubic* (fcc). Berdasarkan perhitungan dari hasil penelitian untuk adsorben selulosa dengan asam sulfat dari kulit kelengkeng diperoleh kapasitas adsorpsi maksimum ( $Q_{maks}$ ), energi bebas Gibbs ( $\Delta G^\circ$ ), entalpi adsorpsi ( $\Delta H^\circ$ ) dan entropi ( $\Delta S^\circ$ ) sebesar 3,919 mmol g<sup>-1</sup>; -23,01 kJ mol<sup>-1</sup>; 33,02 kJ mol<sup>-1</sup> dan 169,3 J mol<sup>-1</sup> K<sup>-1</sup> dengan model isoterm Langmuir. Adsorben dengan tanpa asam sulfat kulit kelengkeng diperoleh kapasitas adsorpsi maksimum ( $Q_{maks}$ ), energi bebas Gibbs ( $\Delta G^\circ$ ), entalpi adsorpsi ( $\Delta H^\circ$ ) dan entropi ( $\Delta S^\circ$ ) sebesar 1,648 mmol g<sup>-1</sup>; -24,00 kJ mol<sup>-1</sup>; 22,39 kJ mol<sup>-1</sup> dan 138,1 J mol<sup>-1</sup> K<sup>-1</sup>. Hasil parameter termodinamika membuktikan adsorben selulosa dengan asam sulfat dari kulit kelengkeng lebih baik mengadsorpsi Au(III) daripada tanpa asam sulfat kulit kelengkeng.

Kata kunci: adsorben, adsorpsi Au(III), isoterm adsorpsi dan parameter termodinamika

## Au(III) ADSORPTION ON THE CELLULOSE OF THE LONGAN PEEL WITH AND WITHOUT THE TREATMENT OF SULFURIC ACID

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### ABSTRACT

Au(III) adsorption of biomass from longan peel (*dimocarpus longan lour*) treatment with cross-linked and extraction have been studied. The purpose of this research was to study adsorption isotherm Au(III) and compare the capability of Au(III) adsorption by two adsorbents.

This research was started with the preparation of longan peel with cross-linked and extraction method. Adsorbents were determined adsorption isotherm at various concentrations of 0, 1, 2, 4, 6, 8 and 10 mM in HCl 0,5 M and with various temperatures of 28, 40, 50 and 60 °C. The concentration of Au(III) in the adsorption process was analyzed using AAS. Cellulose cross-linked from longan peel adsorbent were characterized using FTIR, XRD and photomicroscope. Longan peel extract adsorbent was characterized using FTIR and photomicroscope.

FTIR analysis result showed that the adsorbents have several functional groups including -O-H, C-O-C, -C=O dan -C-H. XRD of cellulose cross-linked from longan peel adsorbent was amorphous and diffractogram adsorbent after interaction with Au(III) shows some characteristic peaks with typical *face centered cubic* (fcc). Some parameters were obtain from the calculations for cross-linked cellulose adsorbent from longan peel are maximum adsorption capacity ( $Q_{max}$ ), free energy Gibbs ( $\Delta G^\circ$ ), enthalpy adsorption ( $\Delta H^\circ$ ) and entropy ( $\Delta S^\circ$ ) were 3.919 mmol g<sup>-1</sup>, -23.01 kJ mol<sup>-1</sup>, 33.02 kJ mol<sup>-1</sup> and 169.3 J mol<sup>-1</sup> K<sup>-1</sup> with the Langmuir isotherm model. Adsorbent with extraction from longan peel are maximum adsorption capacity ( $Q_{max}$ ), free energy Gibbs ( $\Delta G^\circ$ ), enthalpy adsorption ( $\Delta H^\circ$ ) and entropy ( $\Delta S^\circ$ ) were 1.648 mmol g<sup>-1</sup>, -24.00 kJ mol<sup>-1</sup>, 22.39 kJ mol<sup>-1</sup> and 138.1 J mol<sup>-1</sup> K<sup>-1</sup>. From the result of thermodynamic parameter showed cellulose cross-linked adsorbent from longan peel was better to Au(III) adsorption than longan extract adsorbent.

Keywords: adsorbent, Au(III) adsorption, adsorption isotherm and thermodynamic parameter