

ABSTRACT

ADSORPTION OF MONOCOMPONENT AND BICOMPONENT METHYL ORANGE AND PHENOL BY ACTIVE CARBON RUBBER FRUIT SHELL (*Hevea Brasiliensis*)

By

Muhammad Rois Abdillah

In this research, the manufacture and characterization of activated carbon adsorption from rubber fruit shells has been carried out. The manufacturing stage is through physical activation, followed by chemical activation and the characterization process. Physical activation was carried out at a temperature of 700°C, physico-chemical activation was carried out by drying in an oven at a temperature of 100°C. The synthesized activated carbon was analyzed proximately and characterized using a Scanning Electron Microscope (SEM) to determine its surface morphology. Fourier Transform Infrared Spectroscopy (FTIR) to determine the functional groups on the surface of activated carbon. The final result of the adsorbate was characterized and analyzed using a UV-Vis Spectrophotometer to determine changes in functional groups. The adsorption test on activated carbon against methyl orange and phenol was carried out by testing the pH and optimum contact time to determine the kinetics model and the optimum adsorbate concentration to determine the pattern of adsorption isotherms. The results of the proximate analysis showed that the value of water

content and volatile matter content in CAF was less than in CAFK. While the value of ash content and carbon content bound to CAF is more than CAFK. The FTIR characterization of the adsorption results of CAF and CAFK produced a hydroxy group (O-H), an aromatic C=C bond, a methyl group (CH₃), and a C=O carboxylic acid group. CAF Potential of Zero Charge (PZC) values at pH 6 and CAFK pH 8. Optimum methyl orange adsorption at CAF pH 6 and CAFK pH 8, while the optimum phenol adsorption at CAF pH 8 and CAFK pH 6. The optimum contact time was 60 minutes with percent adsorption of phenol (CAF 94% ; CAFK 91%) and Methyl Orange (92% CAF; CAFK 94%). The optimum concentrations were 0.4 and 0.6 grams of adsorbent. The adsorption kinetics data tended to follow the pseudo second-order kinetic model and the adsorption isotherm tended to follow the Freundlich isotherm pattern.

Key Words : Rubber fruit shells, activated carbon, characterization, adsorption test, methyl orange, phenol

ABSTRAK

ADSORPSI MONOKOMPONEN DAN BIKOMPONEN ZAT PEWARNA METIL JINGGA DAN FENOL OLEH KARBON AKTIF CANGKANG BUAH KARET (*Hevea Brasiliensis*)

Oleh

Muhammad Rois Abdillah

Pada penelitian ini telah dilakukan pembuatan dan karakterisasi adsorpsi karbon aktif dari cangkang buah karet. Tahap pembuatan melalui aktivasi fisika yang dilanjutkan pada aktivasi kimia dan proses karakterisasi. Aktivasi fisika dilakukan dengan suhu 700°C, aktivasi fisika-kimia dilakukan pengeringan dalam oven pada suhu 100°C. Karbon aktif hasil sintesis dilakukan analisis proksimat dan dikarakterisasi menggunakan *Scanning Electron Microscope* (SEM) untuk mengetahui morfologi permukaannya. *Fourier Transform Infrared Spectroscopy* (FTIR) untuk mengetahui gugus fungsi pada permukaan karbon aktif. Hasil akhir adsorbat dikarakterisasi dan dianalisis menggunakan Spektrofotometer *UV-Vis* untuk mengetahui perubahan gugus-gugus fungsi. Uji adsorpsi pada karbon aktif terhadap metil jingga dan fenol dilakukan dengan pengujian pH dan waktu kontak optimum untuk mengetahui model kinetika dan konsentrasi adsorbat optimum untuk mengetahui pola isoterm adsorpsi. Hasil analisis proksimat menunjukkan nilai kadar air dan kadar zat menguap pada CAF lebih sedikit daripada CAFK. Sedangkan nilai kadar abu dan kadar karbon terikat pada CAF lebih banyak daripada CAFK. Karakterisasi FTIR pada hasil adsorpsi CAF dan CAFK

menghasilkan gugus hidroksi (O-H), ikatan C=C aromatic, gugus metil (CH₃), dan gugus asam karboksilat C=O. Nilai Potential of Zero Charge (PZC) CAF pada pH 6 dan CAFK pH 8. Adsorpsi metil jingga optimum pada CAF pH 6 dan CAFK pH 8, sedangkan adsorpsi fenol optimum pada CAF pH 8 dan CAFK pH 6. Waktu kontak optimum adalah 60 menit dengan persen adsorpsi fenol (CAF 94% ; CAFK 91%) dan Metil Jingga (CAF 92% ; CAFK 94%). Konsentrasi optimum adalah 0,4 dan 0,6 gram adsorben. Data kinetika adsorpsi cenderung mengikuti model kinetika pseudo orde dua dan isoterm adsorpsi cenderung mengikuti pola isoterm Freundlich.

Kata Kunci : Cangkang buah karet, karbon aktif, karakterisasi, uji adsorpsi, metil jingga, fenol