

ABSTRAK

**STUDI ADSORPSI KARBON KAYU JATI (*TECTONA GRANDIS*)
TERHADAP METIL JINGGA SEBAGAI SUMBER BELAJAR KOLOID**

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Metil jingga merupakan salah satu zat warna sintetis yang berpotensi mencemari lingkungan perairan sehingga diperlukan metode pengolahan yang efektif. Salah satu metode yang dapat digunakan adalah adsorpsi menggunakan karbon aktif berbasis biomassa. Penelitian ini bertujuan untuk mengetahui model isoterm, kinetika, dan efisiensi adsorpsi karbon aktif kayu jati (*Tectona grandis*) yang diaktivasi menggunakan asam fosfat (H_3PO_4) terhadap zat warna metil jingga serta mengkaji potensinya sebagai sumber belajar pada materi sistem koloid. Penelitian ini merupakan penelitian eksperimen. Karbon aktif dikarakterisasi menggunakan *Fourier Transform Infrared Spectroscopy* (FTIR) dan *Scanning Electron Microscopy* (SEM). Pengujian adsorpsi dilakukan melalui variasi waktu kontak, massa adsorben, dan konsentrasi adsorbat, kemudian dianalisis menggunakan model isoterm Langmuir, Freundlich, dan Dubinin–Radushkevich serta model kinetika *pseudo-first-order* (PFO) dan *pseudo-second-order* (PSO). Hasil penelitian menunjukkan bahwa proses adsorpsi mengikuti model isoterm Freundlich yang mengindikasikan adsorpsi berlangsung pada permukaan heterogen dengan pembentukan multilayer. Analisis Dubinin–Radushkevich menunjukkan bahwa mekanisme adsorpsi didominasi oleh fisisorpsi sedangkan model PSO memberikan kesesuaian terbaik dalam menggambarkan kinetika adsorpsi. Kondisi optimum adsorpsi diperoleh pada waktu kontak 20 menit, massa adsorben 0,10 g, dan konsentrasi adsorbat 10 ppm dengan efisiensi adsorpsi sebesar 44,89%. Hasil penelitian menunjukkan bahwa karbon aktif kayu jati berpotensi sebagai adsorben alternatif berbasis biomassa untuk pengolahan limbah zat warna metil jingga serta sebagai sumber belajar pada materi sistem koloid.

Kata Kunci: adsorpsi, isoterm, kayu jati, kinetika, metil jingga

ABSTRACT

***A STUDY OF THE ADSORPTION OF TEAK (TECTONA GRANDIS)
CHARCOAL ON METHYL ORANGE AS A COLLOIDAL LEARNING
RESOURCE***

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*Methyl orange is a synthetic dye that has the potential to pollute aquatic environments, making effective treatment methods necessary. One method that can be used is adsorption using biomass-based activated carbon. This study aims to determine the isotherm model, kinetics, and adsorption efficiency of teak (*Tectona grandis*) activated carbon treated with phosphoric acid (H_3PO_4) toward the methyl orange dye, as well as to assess its potential as a teaching resource for colloidal systems. This is an experimental study. The activated carbon was characterized using Fourier Transform Infrared Spectroscopy (FTIR) and Scanning Electron Microscopy (SEM). Adsorption tests were conducted by varying contact time, adsorbent mass, and adsorbate concentration, and the results were analyzed using the Langmuir, Freundlich, and Dubinin–Radushkevich isotherm models, as well as the pseudo-first-order (PFO) and pseudo-second-order (PSO) kinetic models. The results indicate that the adsorption process follows the Freundlich isotherm model, suggesting that adsorption occurs on a heterogeneous surface with multilayer formation. The Dubinin–Radushkevich analysis showed that the adsorption mechanism was dominated by physisorption, while the PSO model provided the best fit for describing the adsorption kinetics. Optimal adsorption conditions were achieved at a contact time of 20 minutes, an adsorbent mass of 0.10 g, and an adsorbate concentration of 10 ppm, with an adsorption efficiency of 44.89%. The results indicate that teak wood activated carbon has potential as an alternative biomass-based adsorbent for treating methyl orange dye wastewater and as a teaching resource for the topic of colloidal systems.*

Keywords: *adsorption, isotherm, kinetic, teak wood, methyl orange*