

## **MODIFIKASI KIMIA ABU DASAR BATUBARA UNTUK ADSORPSI METIL VIOLET**

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### **INTISARI**

Dalam penelitian ini telah dilakukan modifikasi kimia abu dasar batubara untuk adsorpsi zat warna metil violet. Penelitian ini diawali dengan karakterisasi abu dasar dan abu dasar hasil modifikasi kimia menggunakan FTIR, XRD, dan BET analyzer. Variasi kondisi meliputi variasi massa adsorben, waktu, konsentrasi adsorbat, suhu, dan pH.

Hasil penelitian menunjukkan kandungan utama abu dasar batubara adalah  $\text{SiO}_2$  dan  $\text{Al}_2\text{O}_3$ . Modifikasi kimia abu dasar batu bara dengan NaOH 5 M dapat memunculkan fasa zeolit seperti zeolit Y dan zeolit A yang menambah luas permukaan spesifik, rerata diameter pori dan volume pori. Luas permukaan spesifik adsorben meningkat dari 19,73 menjadi 48,03  $\text{m}^2/\text{g}$ , rerata diameter pori meningkat dari 40,90 menjadi 120,00 Å, dan volume pori meningkat dari  $2,021 \times 10^{-2}$  menjadi  $1,44 \times 10^{-1}$  cc/g.

Kondisi optimum adsorpsi metil violet 50 mg/L terjadi pada saat penambahan adsorben AD dan AD 5 M sebanyak 0,8 gram. Waktu optimum AD 5 M dan AD adalah 60 dan 90 menit, dan pH optimum adsorpsi terjadi pada pH 11. Kinetika adsorpsi metil violet pada kedua macam adsorben mengikuti kinetika pseudo orde dua ( $H_0$ ) dengan laju awal adsorpsi untuk AD dan AD 5 M adalah 1,19 dan 5,02 mg/g.menit. Isoterm adsorpsi AD dan AD 5 M masing-masing mengikuti model isoterm Langmuir dan Freundlich dengan kapasitas adsorpsi 5,65 dan 16,31 mg/g. Entalpi adsorpsi AD dan AD 5 M adalah 31,23 dan 14,3 kJ/mol.

Kata kunci : Abu dasar batubara, adsorpsi, zeolit.

## CHEMICAL MODIFICATION OF COAL BOTTOM ASH FOR THE ADSORPTION OF METHYL VIOLET

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### ABSTRACT

Coal bottom ash chemical modification has been studied to adsorb methyl violet. This research was started by coal bottom ash and modified-bottom ash characterization using FTIR, XRD and BET analyzer. Adsorption variables in this research were adsorbent mass, contact times, adsorbate concentration, temperature, and pH.

The result showed that the main components of coal bottom ash are  $\text{SiO}_2$  and  $\text{Al}_2\text{O}_3$ . Chemical modification of bottom ash using NaOH 5 M produced some zeolite phases such as zeolite Y and zeolite A that could increase the specific surface area, diameter pore average, and pore volume. The specific surface area of adsorbent was increased from 19.73 to 48.03  $\text{m}^2/\text{g}$ , pore diameter size from 40.90 to 120.00 Å, and pore volume from  $2.02 \times 10^{-2}$  to  $1.44 \times 10^{-1}$  cc/g.

The optimum adsorption condition of 50 mg/L methyl violet was achieved using 0.8 g adsorbent. The optimum time of adsorption using AD 5 M and AD were 60 and 90 minutes, respectively. The optimum adsorption pH for both adsorbent was 11. Pseudo second order ( $H_0$ ) was fit for methyl violet adsorption for both adsorbents and the initial sorption rate for AD and AD 5 M was 1.19 and 5.02 mg/g.min. AD and AD 5 M followed the Langmuir and Freundlich adsorption isotherm model, respectively, which their adsorption capacity was 5.65 and 16.31 mg/g, each. The enthalpy of adsorption for AD and AD 5 M was 31.23 and 14.3 kJ/mol.

Keywords : Coal bottom ash, adsorption, zeolite.