SINTESIS KOMPOSIT MAGNETIT/ZEOLIT DARI BAHAN ALAM SEBAGAI ADSORBEN *CRYSTAL VIOLET*

Alhadi Masyhur Ritonga
19/442499/PA/19248

INTISARI

Sintesis komposit magnetit/zeolit telah dilakukan dengan memanfaatkan bahan alam asal Yogyakarta dan Klaten. Bahan-bahan tersebut adalah pasir besi Pantai Glagah Kulon Progo sebagai bahan dasar magnetit dan zeolit alam Klaten sebagai bahan dasar zeolit. Komposit magnetit/zeolit digunakan sebagai adsorben *cyrstal violet*. Pasir besi dan zeolit alam berturut-turut dilakukan preparasi menggunakan larutan NaOH dan H_2SO_4. Sintesis komposit magnetit/zeolit dilakukan dengan menggunakan metode kopresipitasi yang dimana digunakan NH_4OH sebagai agen pengendap. material magnetit, zeolit, dan komposit magnetit/zeolit dikarakterisasi dengan *X-Ray Diffraction* (XRD), *Fourier Transform Infra-Red Spectroscopy* (FTIR), *Scanning Electron Microscope-Energy Dispersive X-Ray* (SEM-EDX), dan *Vibrating Sample Magnetometer* (VSM). Kajian adsorpsi *crystal violet* dengan komposit magnetit/zeolit dilakukan melalui penentuan pH_{pzc}, pH optimum, waktu optimum yang dilanjutkan dengan kajian kinetika adsorpsi, dan konsentrasi optimum yang dilanjutkan dengan kajian isoterm adsorpsi. Konsentrasi *crystal violet* dianalisis dengan spektrofometer UV-Visibel.

Hasil penelitian menunjukkan keberhasilan dalam memanfaatkan bahan alam untuk sintesis komposit magnetit/zeolit yang dibuktikan dengan komposit dapat ditarik magnet eksternal dan hasil karaktersisasi. Adsorpsi berjalan optimum pada kondisi pH 6, waktu kontak 60 menit, dan konsentrasi 50 ppm. Kinetika adsorpsi mengikuti model kinetika orde dua-semu (Ho dan McKay) dengan konstanta laju adsorpsi 0,0345 g mg^{-1} $menit^{-1}$. Isoterm adsorpsi *crystal violet* dengan magnetit/zeolit mengikuti model isoterm Langmuir dengan nilai konstanta kesetimbangan (K_L) 0,240 L mg^{-1}.

Kata kunci: adsorpsi, *crystal violet*, magnetit/zeolit

SYNTHESIS OF MAGNETITE/ZEOLITE FROM NATURAL MATERIALS AS CRYSTAL VIOLET ADSORBENT

Alhadi Masyhur Ritonga
19/442499/PA/19248

ABSTRACT

The synthesis of magnetite/zeolite composite has been conducted utilizing natural materials from Yogyakarta and Klaten. The materials used are Glagah Beach iron sand from Kulon Progo as the base material for magnetite, and natural zeolite from Klaten as the base material for zeolite. The magnetite/zeolite composite is employed as an adsorbent for crystal violet. The iron sand and natural zeolite are sequentially prepared using NaOH and H_2SO_4 solutions. The synthesis of magnetite/zeolite composite is performed through the coprecipitation method using NH_4OH as the precipitating agent. The magnetite, zeolite, and magnetite/zeolite composite materials are characterized using X-Ray Diffraction (XRD), Fourier Transform Infra-Red Spectroscopy (FTIR), Scanning Electron Microscope-Energy Dispersive X-Ray (SEM-EDX), and Vibrating Sample Magnetometer (VSM). The adsorption study of crystal violet using magnetite/zeolite composite is conducted by determining the pH_{pzc} (point of zero charge), optimum pH, and optimum time, followed by the investigation of adsorption kinetics, and optimum concentration followed by the investigation of adsorption isotherms. The concentration of crystal violet is analyzed using a UV-Visible spectrophotometer.

The research results demonstrate the successful utilization of natural materials for the synthesis of magnetite/zeolite composite, as evidenced by the composite's response to external magnetic force and characterization results. The optimum adsorption occurs at pH 6, a contact time of 60 minutes, and a concentration of 50 ppm. The adsorption kinetics follows the pseudo-second-order kinetic model (Ho and McKay) with an adsorption rate constant of 0.0345 g mg^{-1} min^{-1}. The adsorption isotherm of crystal violet on magnetite/zeolite follows the Langmuir isotherm model with an equilibrium constant (K_L) value of 0.240 L mg^{-1}.

Keyword: adsorption, crystal violet, magnetite/zeolite