

ABSTRAK

Zat warna *methyl orange* merupakan zat warna anionik azo yang dapat menimbulkan dampak negatif terhadap lingkungan jika dibuang tanpa pengolahan yang benar. Pengolahan zat warna *methyl orange* dapat dilakukan dengan metode adsorpsi. Hidrotalsit adalah mineral yang terbentuk melalui proses hidrotermal. Hidrotalsit digunakan sebagai adsorben karena memiliki kemampuan menyerap zat warna secara efektif dan efisien. Penelitian ini bertujuan mensintesis hidrotalsit Ni/Al-*Polyoxometalate* dan mengetahui kondisi optimum adsorpsi *methyl orange* yang meliputi parameter pH, waktu kontak dan konsentrasi serta model kinetika dan isoterm adsorpsi dari zat warna *methyl orange* dengan hidrotalsit Ni/Al-*Polyoxometalate*. Hidrotalsit Ni/Al-*Polyoxometalate* berhasil disintesis dengan metode kopresipitasi secara hidrotermal selama 15 jam pada suhu 100 °C. Hasil sintesis dikarakterisasi menggunakan *Fourier Transform Infra Red* (FTIR), *X-Ray Diffraction* (XRD) dan *Scanning Electron Microscope-Energy Dispersive X-Ray* (SEM-EDX). Berdasarkan penelitian ini diperoleh kondisi optimum adsorpsi *methyl orange* oleh hidrotalsit Ni/Al-*Polyoxometalate* pada pH 4, waktu kontak 40 menit dan konsentrasi adsorbat 40 ppm dengan persentase adsorpsi sebesar 98,537% dan kapasitas adsorpsi sebesar 39,41 mg/g. Persamaan kinetika adsorpsi mengikuti model kinetika pseudo orde dua dengan nilai R^2 sebesar 0,9999, konstanta laju adsorpsi sebesar 0,1534 mg/g.menit dan nilai q_e sebesar 18,52 mg/g. Isoterm adsorpsi mengikuti model isoterm Temkin dengan nilai R^2 sebesar 0,9429; b_T sebesar 131,072 kJ/mol; K_T sebesar $1,48 \times 10^{22}$ L/g dan E sebesar 127,110 kJ/mol.

Kata kunci: hidrotalsit Ni/Al-*Polyoxometalate*, kinetika, isoterm

ABSTRACT

Methyl orange dye is an anionic azo dye that can have a negative impact on the environment if discharged without proper treatment. The treatment of methyl orange dye can be done by adsorption method. Hydrotalcite is a mineral formed through a hydrothermal process. Hydrotalcite is used as an adsorbent because it has the ability to effectively and efficiently absorb dyes. This study aimed to synthesize Ni/Al-Polyoxometalate hydrotalcite and to determine the optimum adsorption conditions of methyl orange, including parameters such as pH, contact time, and concentration, as well as the kinetic and isotherm models of methyl orange dye adsorption with Ni/Al-Polyoxometalate hydrotalcite. Ni/Al-Polyoxometalate hydrotalcite was successfully synthesized by the coprecipitation hydrothermal method for 15 hours at 100 °C. The synthesis results were characterized using Fourier Transform Infra Red (FTIR), X-Ray Diffraction (XRD), and Scanning Electron Microscope-Energy Dispersive X-Ray (SEM-EDX). Based on this study, the optimum adsorption conditions for methyl orange by Ni/Al-Polyoxometalate hydrotalcite were obtained at pH 4, a contact time of 40 minutes, and an adsorbate concentration of 40 ppm. The adsorption kinetic equation followed the pseudo second order kinetic model with an R^2 value of 0,9999, an adsorption rate constant of 0,1534 mg/g.minute, and a q_e value of 18,52 mg/g. The adsorption isotherm followed the Temkin isotherm model with an R^2 value of 0,9429; bT of 131,072 kJ/mol; KT of $1,48 \times 10^{22}$ L/g, and E of 127,110 kJ/mol.

Keywords: Ni/Al-Polyoxometalate hydrotalcite, kinetics, isotherm