

STUDI ADSORPSI-DESORPSI NANOPARTIKEL Fe₃O₄/SiO₂ TERMODIFIKASI KITOSAN TERHADAP ION [AuCl₄]⁻

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INTISARI

Studi adsorpsi-desorpsi nanopartikel Fe₃O₄/SiO₂ termodifikasi kitosan terhadap ion [AuCl₄]⁻ telah dilakukan. Studi ini diawali dengan menentukan adsorpsi optimum ion [AuCl₄]⁻ dimana variasi yang digunakan ialah variasi pH, massa, konsentrasi, serta waktu. Kajian karakteristik adsorpsi ion Au(III) pada Fe₃O₄/SiO₂/Kitosan yang dilakukan meliputi tetapan laju adsorpsi pada beberapa model kinetika, kapasitas adsorpsi, dan energi adsorpsi dengan menggunakan isoterm Langmuir dan Freundlich. Setelah itu, dilakukan kajian desorpsi menggunakan tiourea pada variasi waktu. Hasil kajian yang telah dilakukan digunakan untuk mempelajari adsorpsi-desorpsi ion [AuCl₄]⁻. Konsentrasi ion [AuCl₄]⁻ sebelum dan sesudah adsorpsi dianalisis menggunakan *Atomic Absorption Spectrophotometer* (AAS). Adsorben sebelum dan sesudah adsorpsi dianalisis menggunakan *Fourier Transform Infrared* (FT-IR) *Spectrophotometer* dan *X-Ray Diffractometer* (XRD). Hasil penelitian menunjukkan bahwa kondisi optimum adsorpsi ion [AuCl₄]⁻ tercapai pada pH 3 menggunakan massa adsorben 0,030 g dan konsentrasi ion [AuCl₄]⁻ 20 mg L⁻¹ dengan waktu kontak 300 menit. Adsorpsi menggunakan Fe₃O₄/SiO₂/Kitosan mengikuti model kinetika reaksi orde dua semu dan isoterm adsorpsi Langmuir dengan kapasitas adsorpsi Au(III) maksimum sebesar 50,8 mg g⁻¹. Larutan tiourea dapat mendesorpsi ion [AuCl₄]⁻ sebesar 55,31% dengan waktu reaksi selama 10 menit.

Kata kunci: adsorpsi-desorpsi, [AuCl₄]⁻, kitosan, Fe₃O₄/SiO₂/Kitosan

ADSORPTION-DESORPTION STUDY OF CHITOSAN MODIFIED Fe₃O₄/SiO₂ NANOPARTICLES ON ION [AuCl₄]⁻

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ABSTRACT

The adsorption-desorption study of chitosan modified Fe₃O₄/SiO₂ nanoparticles on [AuCl₄]⁻ ions have been carried out. The investigation started with determining optimum adsorption of [AuCl₄]⁻ ions, with the variation used in this study were pH, mass, concentration, and time. The Au(III) adsorption characteristics by Fe₃O₄/SiO₂/Chitosan, such as adsorption rate constant on several kinetic models, adsorption capacity, and adsorption energy using Langmuir and Freundlich isotherm, were tested. Afterward the optimum desorption by thiourea was investigated, where the variation used in this study was time. The concentration of [AuCl₄]⁻ before and after adsorption then was analyzed by Atomic Absorption Spectrophotometer (AAS). Meanwhile, Fourier Transform Infrared (FT-IR) Spectrophotometer and X-Ray Diffractometer (XRD) were applied to analyze the adsorbent before and after adsorption. The results showed that the optimum condition of [AuCl₄]⁻ ions adsorption could be accomplished at pH 3 using an adsorbent mass of 0.030 g and concentration of [AuCl₄]⁻ ions of 20 mg L⁻¹ with a contact time of 300 min. The adsorption of [AuCl₄]⁻ ions using Fe₃O₄/SiO₂/Chitosan followed the pseudo-second-order kinetic model and the Langmuir isotherm adsorption with the maximum adsorption capacity of Au(III) of 50.8 mg g⁻¹. The desorption by thiourea could desorb 55.31% of [AuCl₄]⁻ with a reaction time of 10 min.

Keyword: adsorption-desorption, [AuCl₄]⁻, chitosan, Fe₃O₄/SiO₂/Chitosan