

PEMANFAATAN SENYAWA HIDROKSIAPATIT DARI CANGKANG TELUR BEBEK SEBAGAI ADSORBEN ION Ni(II)

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INTISARI

Telah dipelajari pemanfaatan hidroksiapatit dari cangkang telur bebek sebagai adsorben ion Ni(II). Tujuan dari penelitian ini adalah menentukan pH optimum adsorpsi, isothermal adsorpsi, dan model kinetika adsorpsi ion Ni(II) oleh hidroksiapatit dari cangkang telur bebek.

Sintesis hidroksiapatit dilakukan dengan melarutkan bubuk cangkang telur bebek ke dalam larutan HNO₃ 65% dan diikuti dengan penambahan larutan H₃PO₄ 85%. Larutan dibuat menjadi pH 10 menggunakan larutan NH₄OH 37%. Suspensi didiamkan pada suhu ruang selama 24 jam. Suspensi disaring, dikeringkan, dan dihaluskan menjadi bubuk. Bubuk hidroksiapatit dipanaskan pada temperatur 600 °C selama 3 jam. Pengaruh pH terhadap adsorpsi ion Ni(II) oleh hidroksiapatit dilakukan pada variasi nilai pH dari rentang 2-7. Isothermal adsorpsi ditentukan menggunakan model Langmuir dan Freundlich dengan memvariasikan konsentrasi awal adsorbat. Model kinetika adsorpsi ditentukan menggunakan model Langmuir-Hinshelwood, orde pertama semu Lagergren, dan orde kedua semu Ho-McKay.

Penelitian ini menunjukkan bahwa pH optimum adsorpsi ion Ni(II) oleh hidroksiapatit dicapai pada pH 6,0. Adsorpsi ion Ni(II) oleh hidroksiapatit mengikuti model isothermal Langmuir dengan kapasitas adsorpsi sebesar $4,35 \times 10^{-4}$ mol g⁻¹. Selanjutnya, adsorpsi Ni(II) oleh hidroksiapatit dapat digambarkan melalui model kinetika orde kedua semu Ho-McKay dengan konstanta laju adsorpsi sebesar 477,68 g menit⁻¹ mol⁻¹.

Kata kunci: cangkang telur bebek, hidroksiapatit, ion nikel(II), isothermal adsorpsi, dan studi kinetika

APPLICATION OF HIDROXYAPATITE FROM THE DUCK EGG SHELL AS ADSORBENT FOR Ni(II) ION

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ABSTRACT

Application of hydroxyapatite from the duck egg shell as adsorbent for Ni(II) ion had been conducted. The purposes of this research were to determine the optimum pH, the adsorption isotherm, the kinetic adsorption model of Ni(II) adsorption on the hydroxyapatite from the duck egg shell.

The preparation of hydroxyapatite was conducted by dissolving the duck egg shell powder in 65% of HNO₃ solution and followed by the addition of 85% of H₃PO₄ solution. The solution was adjusted to pH 10 using 37% of NH₄OH solution. The suspension was maintained at room temperature for 24 h. The suspension was filtered, dried, and ground into a powder. The hydroxyapatite powder was heated at 600 °C for 3 h. The effect of pH on the adsorption of Ni(II) ion on the hydroxyapatite was carried out at different pH ranging from 2-7. The adsorption isotherm was evaluated using the Langmuir and Freundlich models at various initial concentration of adsorbate. Kinetic adsorption model was investigated using the Langmuir-Hinshelwood, the Lagergren pseudo first order, and the Ho-McKay pseudo second order models.

The results showed that the optimum pH for ion Ni(II) adsorption on the hydroxyapatite was obtained at 6.0. The adsorption of Ni(II) ion on the hydroxyapatite followed the Langmuir isotherm model with the adsorption capacity of $4.35 \times 10^{-4} \text{ mol g}^{-1}$. In addition, the adsorption can be described by Ho-McKay pseudo second order with the adsorption rate constant of $477.68 \text{ g min}^{-1} \text{ mol}^{-1}$.

Keywords: duck egg shell, hydroxyapatite, nickel (II) ion, adsorption isotherm, and kinetic study