Modifikasi serat kardus bekas dengan nanokitosan sebagai adsorben ion logam Pb(II) dan Cd(II) = Modification of waste corrugated board fiber with nanochitosan as heavy metal ion Pb(II) and Cd(II) adsorbent.

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Abstrak

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Studi pemanfaatan limbah untuk adsorpsi logam berat banyak menarik perhatian. Pada penelitian ini, selulosa yang berasal dari serat kardus bekas (WCF) dimodifikasi dengan nanokitosan (WCF/NCH) untuk meningkatkan kemampuan adsorpsi ion logam berat. WCF disiapkan dengan penambahan NaOH untuk memisahkan serat dengan material non selulosa. Hasil karakterisasi spektrofotometer FTIR menunjukkan modifikasi WCF dengan nanokitosan berhasil dilakukan dengan kondisi optimum pada 1 kali pencelupan nanokitosan. Hasil modifikasi WCF/NCH mampu mengadsorpsi larutan ion logam Pb(II) dan Cd(II). Kondisi optimum adsorpsi ion logam Pb(II) didapatkan pada pH awal 6,5, dosis adsorben 0,025 g, waktu kontak selama 10 menit, temperatur reaksi 30 ºC serta kapasitas adsorpsi maksimum sebesar 167,19 mg/g. Hasil optimasi ion logam Cd(II) menunjukkan proses adsorpsi berlangsung optimum pada pH awal 7,0, dosis adsorben 0,025 g, waktu kontak 15 menit, temperatur reaksi 30 ºC serta kapasitas adsorpsi maksimum sebesar 15,86 mg/g. Proses adsorpsi pada WCF/NCH untuk ion logam Pb(II) dan Cd(II) mengikuti model isoterm adsorpsi Langmuir. Studi termodinamika pada adsorpsi ion logam Pb(II) menunjukkan nilai energi bebas Gibbs (ΔGo) negatif pada semua temperatur yang diamati mengindikasikan proses adsorpsi berlangsung secara spontan, sedangkan pada adsorpsi ion logam Cd(II) menunjukkan nilai positif yang mengindikasikan proses adsorpsi berlangsung tidak spontan.
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ABSTRACT
Recent Study of the utilization of wastes as low-cost adsorbent have become attention. In this work, cellulose from waste corrugated board fiber (WCF) was modified with nanochitosan (WCF/NCH) to enhance its ability to adsorb heavy metal ion. WCF was prepared by the addition of NaOH to separate the cellulose fiber with non-cellulose material. Modification of WCF/NCH was characterized by FTIR. Optimum modification process was obtained at 1 layer of nanochitosan. WCF / NCH can be used for adsorption Pb (II) and Cd (II) ion. Optimum condition for adsorption of Pb(II) ion takes place at the initial pH 6.5, 0.025 g adsorbent dose, 10 minutes of contact time, temperature 30 ºC, and the maximum adsorption capacity was 167.19 mg/g. Optimum condition for adsorption of Cd(II) ion occur at initial pH 7, 0.025 g of adsorbent dose, 15 minutes of contact time, temperature 30 oC, and the maximum adsorption capacity was 15.86 mg/g. The process of adsorption for Pb(II) and Cd(II) ion on WCF/NCH follow Langmuir adsorption isotherm model. Thermodynamics studies for adsorption of Pb(II) shows that the adsorption have negative value at any temperatures indicating adsorption process takes place spontaneously, whereas adsorption of Cd(II) ion have positive value indicating adsorption process takes place non-spontaneously., Recent Study of the utilization of wastes as low-cost adsorbent have become attention. In this work, cellulose from waste corrugated board fiber (WCF) was modified with nanochitosan (WCF/NCH) to enhance its ability to adsorb

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