



ADSORPSI ION LOGAM Cu(II) PADA MANIK ALGINAT-ASAM HUMAT-KARBON AKTIF

YUNITA AMALIA KHUSNA

15/378119/PA/16594

ABSTRAK

Adsorpsi ion logam Cu(II) pada manik Alginat-Asam Humat-Karbon Aktif (A-AH-KA) telah dilakukan. Manik disintesis dari alginat, asam humat dan karbon aktif secara langsung dalam akuades disertai pengadukan hingga homogen, dan dicetak dalam larutan CaCl_2 . Manik dikarakterisasi menggunakan FTIR, SAA dan SEM. Kajian adsorpsi yang dipelajari meliputi pengaruh perbandingan berat material penyusun, penentuan pH larutan, waktu kontak, konsentrasi awal adsorbat, kinetika dan isoterm adsorpsi. Kajian desorpsi dipelajari untuk mengetahui kemampuan regenerasi adsorben serta tipe interaksi yang terjadi antara logam dengan situs aktif manik dalam proses adsorpsi.

Spektra FTIR manik A-AH-KA menunjukkan munculnya beberapa puncak serapan yang teridentifikasi memiliki kemiripan dengan puncak serapan material penyusunnya. Analisis menggunakan SAA memberikan hasil distribusi pori dengan ukuran mesopori. Citra SEM manik A-AH-KA sesudah proses adsorpsi menunjukkan adanya sedikit perubahan terhadap permukaan adsorben sedangkan citra SEM sesudah proses desorpsi menunjukkan kemiripan permukaan terhadap adsorben sebelum dilakukan proses adsorpsi. Dari kajian adsorpsi ion Cu(II) pada manik A-AH-KA didapatkan kondisi optimum pada pH 5, waktu kontak 150 menit dan konsentrasi awal 200 mg L^{-1} . Dari hasil penelitian, didapatkan kinetika adsorpsi orde kedua semu dengan nilai konstanta laju adsorpsi (k) sebesar $1,285 \times 10^{-3} \text{ menit}^{-1}$ dan isoterm adsorpsi Freundlich dengan harga konstanta K_F sebesar 10,10. Kajian desorpsi dengan kapasitas tertinggi ditunjukkan oleh larutan HNO_3 1 M, hal tersebut menunjukkan interaksi yang terbentuk antara ion logam Cu(II) dengan situs aktif manik A-AH-KA didominasi oleh interaksi elektrostatik, sedangkan antar material penyusun berupa ikatan hidrogen. Pada larutan pendesorpsi HNO_3 menunjukkan tidak terjadi destabilisasi dari material penyusun adsorben, sehingga adsorben dapat diregenerasi.

Kata Kunci: adsorpsi, alginat, asam humat, Cu(II), karbon aktif,



ADSORPTION OF Cu(II) METAL ION ON ALGINATE-HUMIC ACID- ACTIVATED CARBON BEADS

YUNITA AMALIA KHUSNA

15/378119/PA/16594

ABSTRACT

Adsorption of metal ion Cu(II) on alginate-humic acid-activated carbon (A-AH-KA) was carried out. Beads were synthesized from alginate, humic acid and activated carbon that were mixed within distilled water with stirring until homogenous, and printed in CaCl₂ solution. Beads were characterized by using FTIR, SAA and SEM. The study of adsorption was included the effect of comparison weight material constituent, determination of the pH, contact time, initial concentration of adsorbate, kinetics and isotherm adsorption. The desorption study was to determine the ability of regeneration of the adsorbent and type of interaction that occurred between the metal and active site of beads.

FTIR spectra of A-AH-KA beads were shown that it had similarities with the adsorption peak of constituent materials. The analysis using SAA was resulted the pore size distribution of mesopore. The image of SEM beads A-AH-KA after adsorption process showed a slight change to the surface of the adsorbent while the SEM image after the desorption process showed a similarity of the surface to the adsorbent before the adsorption process was carried out. From the study of adsorption of Cu (II) ions in beads was found optimum at pH 5, contact time 150 minutes and initial concentration of 200 mg L⁻¹. Based on the result, it was obtained pseudo second order of adsorption kinetics with the rate constant value $1.285 \times 10^{-3} \text{ minutes}^{-1}$ and Freundlich adsorption isotherm with K_f value of 10.10. The desorption study with the highest capacity was shown by 1 M HNO₃ solution, which showed the bond between metal ion Cu(II) and active site of beads was dominated by electrostatic interaction and the bond between of constituent materials was dominated by hydrogen bonding. The HNO₃ desorps solution showed that there was no destabilization of the adsorbent constituent materials, so that the adsorbent can be regenerated.

Keywords: activated carbon, adsorption, alginate, Cu(II), humic acid