SINTESIS KOMPOSIT BENTONIT-MAGNETIT-ALGINAT SEBAGAI ADSORBEN ZAT WARNA BIRU METILEN

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INTISARI

Modifikasi bentonit-magnetit (BM) dengan alginat sebagai adsorben zat warna biru metilen telah dilakukan. Penelitian ini diawali dengan sintesis BM dengan metode kopresipitasi menggunakan $FeCl_3 \cdot 6H_2O$ dan $FeCl_2 \cdot 4H_2O$ dengan rasio mol 2:1 serta penambahan NaOH 3 M. BM kemudian dimodifikasi dengan alginat menggunakan penaut silang $CaCl_2$ 5 M sehingga didapat komposit bentonit-magnetit-alginat (BMA). Material hasil sintesis dikarakterisasi dengan FTIR, XRD, dan SEM-EDX. Kajian adsorpsi biru metilen dipelajari pada variasi pH, massa adsorben, waktu kontak, dan konsentrasi awal adsorbat. Penentuan konsentrasi biru metilen dianalisis menggunakan spektrofotometer UV-Vis.

Komposit BMA yang diperoleh berwujud serbuk kasar berwarna hitam yang dapat ditarik oleh magnet eksternal. Proses adsorpsi biru metilen berjalan optimum pada pH 8, massa adsorben 30 mg, waktu kontak adsorpsi selama 120 menit, dan konsentrasi awal adsorbat 500 ppm. Adsorpsi biru metilen oleh komposit BMA mengikuti model kinetika orde kedua semu Ho-McKay dengan nilai konstanta laju sebesar 0,00164 g mg^{-1} $menit^{-1}$ dan model isoterm Temkin dengan nilai konstanta Temkin sebesar 7,74 L mol^{-1}.

Kata kunci: adsorpsi, alginat, bentonit, biru metilen, magnetit

SYNTHESIS OF BENTONITE-MAGNETITE-ALGINATE COMPOSITES AS ADSORBENT FOR METHYLENE BLUE DYE

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ABSTRACT

Modification of bentonite-magnetite (BM) with alginate as an adsorbent for methylene blue dye has been carried out. This research started with the synthesis of BM using the coprecipitation method of $FeCl_3 \cdot 6H_2O$ and $FeCl_2 \cdot 4H_2O$ with a mole ratio of 2:1 and the addition of NaOH 3 M. Then, BM was modified with alginate using a $CaCl_2$ 5 M crosslinker to obtain a bentonite-magnetite-alginate (BMA) composite. The synthesized materials were characterized by FTIR, XRD, and SEM-EDX, respectively. Methylene blue adsorption was studied at variations in pH, adsorbent mass, contact time, and initial adsorbate concentration. Determination of methylene blue concentration was explained using a UV-Vis spectrophotometer.

BMA composites that obtained were a black coarse powders that could be attracted by an external magnet. The methylene blue adsorption process runs optimally at pH 8, adsorbent mass of 30 mg, adsorption contact time of 120 min, and initial adsorbate concentration of 500 ppm. The adsorption of methylene blue by the BMA composite followed the Ho-McKay pseudo second order kinetic model with a rate constant value of 0.00164 g mg^{-1} min^{-1} and the Temkin isotherm model with a Temkin constant value of 7,74 L mol^{-1}.

Keywords: adsorption, alginate, bentonite, magnetite, methylene blue