ABU DASAR BATUBARA TERAKTIVASI DENGAN METODE SINTERING DAN PEMANFAATANNYA SEBAGAI ADSORBEN ION LOGAM NI(II)

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INTISARI

Penelitian mengenai aktivasi abu dasar batubara menggunakan metode sintering sebagai adsorben ion logam Ni(II) telah berhasil dilakukan. Penelitian ini dilakukan secara 2 tahap. Tahap pertama yaitu preparasi abu dasar batubara dengan melakukan proses degassing dan sintering pada abu dasar batubara dengan suhu 900 °C selama 2 jam. Abu dasar batubara sebelum dan setelah aktivasi kemudian dikarakterisasi menggunakan instrumentasi FTIR, XRD, dan SEM. Tahap selanjutnya dilakukan kajian adsorpsi meliputi pengaruh massa adsorben, waktu kontak, konsentrasi, dan pH larutan.

Hasil karakterisasi FTIR dan XRD menunjukkan bahwa abu dasar batubara menggunakan proses sintering tidak merubah gugus fungsi dan mineral pada abu dasar serta terjadi peningkatan intensitas kuarsa (SiO_2). Karakterisasi SEM menunjukkan peningkatan porositas abu dasar batubara. Hasil optimasi kondisi adsorpsi menunjukkan bahwa adsorpsi ion logam Ni(II) optimum pada massa adsorben 1,25 gram dengan konsentrasi 50 ppm dan pH 5 selama waktu adsorpsi 60 menit. Parameter kinetika adsorpsi ion logam Ni(II) untuk abu dasar batubara teraktivasi mengikuti kinetika reaksi orde dua semu dengan konstanta laju reaksi 0,12 g mg^{-1} $menit^{-1}$. Adsorpsi ion logam Ni(II) oleh abu dasar batubara teraktivasi mengikuti model isoterm adsorpsi Langmuir dengan kapasitas adsorpsi 2,28 mg g^{-1} yang melibatkan energi adsorpsi sebesar 31,58 kJ mol^{-1} sehingga adsorpsi termasuk dalam jenis kemisorpsi.

Kata kunci: abu dasar batubara, adsorpsi, karakterisasi, nikel

BOTTOM ASH ACTIVATED BY SINTERING METHOD AND ITS UTILIZATION AS AN ADSORBENT FOR N NI(II) METAL ION

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ABSTRACT

Research on the activation of bottom ash using the sintering process as an adsorbent for nickel metal ion has been successfully carried out. This research was carried out in 2 stages. The first stage is the preparation of coal bottom ash by carrying out a degassing and sintering process on coal bottom ash at a temperature of 900 ℃ for 2 hours. Coal bottom ash before and after activation was then characterized using FTIR, XRD, and SEM instrumentation. The next stage was an adsorption study, including the influence of adsorbent mass, contact time, concentration, and pH of the solution.

The results of FTIR and XRD characterization show that coal bottom ash using a sintering process does not change the functional groups and minerals in the bottom ash, and there is an increase in quartz (SiO_2) intensity. SEM characterization shows an increase in coal bottom ash porosity. Optimizing the adsorption conditions showed that the adsorption of Ni(II) metal ions was optimum at an adsorbent mass of 1.25 grams with a concentration of 50 ppm and a pH of 5 with an adsorption time of 60 minutes. The adsorption kinetic parameters of Ni(II) metal ions for activated coal bottom ash follow pseudo-second-order reaction kinetics with reaction rate constant 0.12 g mg^{-1} min^{-1}. Adsorption of Ni(II) metal ions by activated coal bottom ash follows the Langmuir adsorption isotherm model with an adsorption capacity of 2.28 mg $g^{-1,}$ which involves an adsorption energy of 31.58 kJ mol^{-1} so that adsorption is chemisorption.

Keywords: adsorption, bottom ash, characterization, nickel