Preparasi Zeolit Berpori Hierarki dari Klinoptilolit Kalianda Lampung dengan Metode Tandem Acid-Base Treatments sebagai Adsorben Ion Cu(II) = Preparation of Hierarchical Zeolite Using Kalianda Lampung Clinoptilolite by Tandem Acid-Base Treatments as Cu(II) Ions Adsorbent

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Abstrak

[Preparasi zeolit berpori hierarki dari klinoptilolit Kalianda Lampung berhasil dilakukan dengan metode tandem acid-base treatments. Material zeolit alam berpori mikro dimodifikasi dengan menyatukan dua metode yang biasa dilakukan untuk mengubah ukuran mikropori zeolit menjadi mesopori, yaitu perlakuan asam (dealuminasi) dan perlakuan basa (desilikasi). Perlakuan asam diharapkan dapat meningkatkan rasio Si/Al sebagai hasil dari penurunan kadar Al, kemudian dilakukan perlakuan basa yang bertujuan untuk melarutkan sebagian atau menyeimbangkan kadar Si dan mengarahkan pembentukan mesopori dalam kerangka zeolit. Karakterisasi terhadap klinoptilolit raw dan hasil perlakuan asam-basa digunakan instrumen AAS, XRD, FTIR, dan BET surface area. Berdasarkan penelitian, Z-A4B1 memiliki sisi aktif yang cukup besar yang dapat berperan menjadi adsorben ion logam berat Cu(II) yang lebih baik karena kapasitas adsorpsi Z-A4B1 ini 4 kali lipat lebih tinggi daripada kapasitas adsorpsi dari klinoptilolit raw pada waktu optimum dan konsentrasi awal Cu(II) 300 ppm. Nilai KTK Z-A4B1 adalah sebesar 33,27 mg/g yang setara dengan 104,78 meq/100 g zeolit, sedangkan nilai KTK klinoptilolit raw adalah sebesar 72,19 meq/100 g zeolit. Adapun isoterm adsorpsi yang paling sesuai untuk menjelaskan mekanisme adsorpsi Cu(II) pada klinoptilolit berpori hierarki Z-A4B1 adalah model isoterm adsorpsi Freundlich.
;Hierarchical zeolites are prepared from Kalianda Lampung clinoptilolite by tandem acid-base treatments. Natural zeolites that are micropore intrinsicly was modified with two familiar methods that mostly used to change micropore size zeolite into hierarchical zeolite; acid treatment (dealumination) and base teratment (desilication). Acid treatments can increase Si/Al ratio of clinoptilolite because of Al content decreasing, then base treatment can balance Si content and aim the mesopore formation in zeolite frameworks. Intensive characterizations of both raw and modified clinoptilolites are conducted using XRD, AAS, FTIR, and BET surface area measurement. In this research, Z-A4B1 has more active sites to adsorb Cu(II) ions because the adsorption capacity of Z-A4B1 is up to 4-fold higher than the adsorption capacity of raw clinoptilolite at its optimum contact time and initial Cu(II) concentration 300 ppm. The CEC of Z-A4B1 is 33.27 mg/g that equals to 104.78 meq/100 g zeolite, besides CEC of raw clinoptilolite is 72.19 meq/100 g zeolite. Therefore, adsorption isoterm that fit to explain the adsorption Cu(II) mechanism at hierarichal zeolite Z-A4B1 is Freundlich isoterm adsorption model.
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