Adsorption Behavior of Heavy Metals on NaP1 Zeolite Synthesized from Coal Bottom Ash

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ABSTRACT

This paper describes chemical characteristics of zeolite synthesized from coal bottom ash separated by specific gravity and its effectiveness on the adsorption of heavy metals. The coal bottom ash sample consists of SiO_2 43% and Al_2O_3 24%, showing high contents of Si and Al, main chemicals of natural zeolite. From physical separation based on specific gravity(S) difference, the bottom ash sample was separated into the following four kinds: <1.8S (18%), 1.8-2.2S (29%), 2.2-2.5S (30%), and 2.5S< (22%). More NaP1 zeolite was synthesized using the bottom ash in less than 1.8S, which contains more amorphous substances. Cation exchange capacity (CEC) of the synthetic NaP1 zeolite gradually increased depending on synthesis time (24 hr) and showed 140 meq/100g at the end of synthesis (cf. natural zeolite 54 meq/100g). The adsorbed amount of heavy metals on the synthetic zeolite sharply increased from the initial time to 5 min and then stayed in a steady state until the end of the reaction (60 min). The maximum amount of adsorbed Pb was much higher (11 mg Pb/g) than that of Cd (9 mg/g) and Cr(lll) (4 mg/g), showing the same adsorption sequence of heavy metals as that on natural zeolite: Pb > Cd > Cr.

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