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LEAD(II) REMOVAL FROM AQUEOUS SOLUTIONS BY SERBIAN ZEOLITIC TUFF

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Abstract

The present study was aimed at examining the ability of the natural zeolitic tuff from the Zlatokop deposit in Serbia to remove Pb(II) ions from aqueous solutions under various conditions. It has been found that the adsorption proceeds *via* an ion-exchange reaction in which the Na^+ ions from the clinoptilolite phase of the tuff are replaced to a high degree by aqueous Pb(II) ions. The removal capacity of the clinoptilolite at 298 K varies from 78 mg Pb g^{-1} (for C_0 = 100 mg Pb dm^{-3}) to 92.5 mg Pb g^{-1} (for C_0 = 400 mg Pb dm^{-3}), the capacity markedly increasing with temperature. The adsorption isotherm is in accord with the Langmuir model. The ion-exchange kinetics can be best described by the pseudo-second-order model. Intra-particle diffusion of Pb^{2+} is present in the process, but it is not the rate-limiting step and that can be explained by a modification of the Pb(II) hydration sphere during the ion-exchange. From the adsorption of Pb(II) on the studied zeolitic tuff, it is revealed that the ion-exchange process is spontaneous and endothermic, and that the standard free energy decreases with temperature.

Key words: lead, kinetics, thermodynamics, clinoptilolite, natural zeolite, heavy metal

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