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Statics and kinetics of sorption of Co-60 with composite sorbent T35 in the presence of humic acids

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To elucidate the impact of humic acids (HA) on chemical affinity of Co(II) to inorganic sorbents experiments on statics of sorption Co (II) by the Thermoxide T35 (composition ZrO2-K2Ni [Fe (CN)6]) in the chloride-acetate solution are carried out. The dependance of the Co (II) sorption (S) as a function of contacting time, the dependance of distribution coefficient (Kd) on the pH, the concentration of humic acids (HA) and temperature was established. Within the framework of the surface complexation model, the model of distribution of Co2+, CoAc+, CoCl+, Co(OH)+, Co(OH)20, Co(OH)3- complexes between the solution and the sorbent was analyzed. The found stability constants of the Co(OH)+, Co(OH)20 complexes coincide with thermodynamic quantities. In the presence of HA (10.0 mg/ l), the best coincidence of the model dependence Kd - pH with the experimental data corresponds to the sorption of the complex of the composition Co (OH)A0, A - is an anion of humic acid. Kinetic analysis of sorption isotherms performed by the batch sorption with solution recirculation showed that the transfer of Co(II) ions to the sorbent corresponds to the mixed-diffusion model. It includes at least two stages of film and gel diffusion in macro-micropores of the sorbent grain. The velocity coefficients of film (*b*, m/s) and gel diffusion (*Dg*, m2/s) do not depend on the pH of the solution, and the concentration of HA. The average value of *Dg* is (6.0±4.5)·10-10, m2/s, the activation energy of gel diffusion (20.7±10.0) kJ/mol at a pH of 7.5. The values found are close to the parameters of Co2+ self-diffusion in ultra-dilute aqueous solutions. The results showed the possibility of effective extraction of Co(II) from natural aqueous solutions by the sorbent Thermoxide 35 in the presence of HA.

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