

## TREATMENT OF RADIOACTIVE AQUEOUS SOLUTIONS BY ADSORPTION ON FLY ASH AND SYNTHETIC ZEOLITES

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The sorption behaviour of fly ash and three synthetic zeolites (of the P1, X and A type, respectively) for cesium-137 ( $\text{Cs}^+$ ), strontium-85 ( $\text{Sr}^{2+}$ ), cobalt-60 ( $\text{Co}^{2+}$ ) and americium-241 ( $\text{Am}^{3+}$ ) cations has been studied to check the possibility of their application in the purification of radionuclide-containing aqueous solutions. We have also tested the possibility of using all the above-mentioned sorbents for the removal of technetium-99m (occurring as  $\text{TcO}_4^-$  anions) in aqueous solutions.

The batch method has been used for competitive sorption systems with metal concentrations in the solution at the *nca* level. The removal efficiency ( $E_M$ , %) and distribution coefficients ( $K_d$ ) were determined for the sorption system as a function of all the most important process parameters. Namely, the parameters studied were the sorbent dosage, acidity of the purified solution and contact time of sorbent with the purified water. In addition, the influence of solution salinity and the presence of metal complexing agents (always present in the decontamination liquids) was determined to affect the process yield.

The results show that both fly ash, and synthetic zeolites can be used to remove radioactive metal ions from aqueous solutions. Fly ash turns out to be particularly interesting, as this industrial waste is readily available in huge quantities and its price is negligible.

In separate sorption experiments, the radiation stability of the proposed sorbents was shown to be high.

From a theoretical viewpoint, it is interesting that in the fly ash case, sorption occurs mainly on the surface of the sorbent and in turn in the zeolite case - in pores. It means that the distribution coefficients ( $K_d$ ) depended on the metal ionic radii or on the ionic hydration energies for fly ash and zeolites, respectively.

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