Sorption of radionuclides from aqueous solutions using titania based nanomaterial

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Radionuclides are used in a wide range of the applications, from medicine to the energy industry. Among them, long lived radionuclides of ^{137}Cs (half-life-time of 30 years), ^{90}Sr (half-life-time of 28 years), ^{60}Co (half-life-time of 5.27 years), and minor actinides (^{241,243}Am, ^{245}Cm, ^{237}Np) are considered as the most dangerous to human health and environment.

In this study, new nanomaterial (TSM) based on titania, has been developed and tested for sorption of ^{134}Cs, ^{85}Sr, ^{60}Co, and $^{152-154}$Eu (surrogate of trivalent lanthanides and actinides) from aqueous solutions. The morphology and structure of TSM were characterized by XRD, BET and SEM techniques. The particle shape of TSM samples is determined by the atomic structure of titanyl sulfate (the starting material) and TSM occurs as isometric crystals [1].

The sorption of radionuclides onto TSM nanomaterial was found to be pH dependent with the uptake increasing with pH. The efficient removal (more than 99%) of Sr(II), Co(II) and Eu(III) was achieved from neutral and base solutions. In case of Cs(I), the uptake was less efficient (83%). The evaluation of equilibrium sorption data for all studied ions indicated that the sorption processes onto TSM sorbent agreed better with Langmuir isotherm model suggested that sorptions are monolayer.

[1]. Klementová M. *et al* (2017) *Cryst. Growth Des.*, **17** (12), 6762–6769

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