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Development of the production of immobilized cesium-containing closed sources

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With the rising of the global terrorist threat the improvement of the production technology of closed sources potentially able to be used for dirty bomb production becomes more and more important. The risk of radioactive species getting out into the environment can be decreased by embedding those species into insoluble matrices. In this work we would like to report about our research on Cs-137 sources. Our goal is development the production of immobilized cesium-containing closed sources by recycling used sources.

We would like to apply nano-porous systems (e. g. zeolite, titano silicate, and ceramics) in which selective transport occurs. In these systems the ions are bound selectively, and become difficult to mobilize. We prove these allegations with leaching tests.

Titano silicates are versatile materials, their ion exchange capacity is good, the kinetics of the sorption is fast, they resist big exposure doses and already at 800 °C there are changes in the structure of the titano silicates, glass phase is formed, thus making insoluble the bound materials. Other possible binders is the ceramic, we tested three type of pre-selected ceramics samples (stoneware, red tile, light tile). These ceramic type have a good properties making insoluble the bound materials, too.

From the materials were made test samples by adding inactive cesium, and the samples were fired at different temperatures (800, 900, 1000, 1100, 1200 °C). After the firing, leaching tests were performed and the activity concentration of the leached cesium was measured with ICP. The leaching tests were accelerated tests, it was made for four days (six samplings), we used three types of solvent and shaker. The results allow the development of a new effective protocol, which can be applied for the recycling of closed sources, and making them safer.

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