A novel approach for rice straw agricultural waste utilization: Synthesis of solid aluminosilicate matrices for cesium immobilization

Автор: Panasenko, A. E. (Panasenko, A. E.) ; Shichalin, O. O. (Shichalin, O. O.) ; Yarusova, S. B. (Yarusova, S. B.) ; Ivanets, A. I. (Ivanets, A. I.) ; Belov, A. A. (Belov, A. A.) ; Dran'kov, A. N. (Dran'kov, A. N.) ; Azon, S. A. (Azon, S. A.) ; Fedorets, A. N. (Fedorets, A. N.) ; Buravlev, I. Yu (Buravlev, I. Yu) ; Shlyk, D. Kh (Shlyk, D. Kh) ; ...Больше

Показать номер Web of Science ResearcherID и ORCID (предоставлено Clarivate)

NUCLEAR ENGINEERING AND TECHNOLOGY

Том: 54 **Выпуск:** 9 **Страница:** 3250-3259

DOI: 10.1016/j.net.2022.04.005

Опубликовано: SEP 2022

Дата индексации: 2022-10-16

Тип документа: Article

Аннотация

A new approach to the use of rice straw as a difficult-to-recycle agricultural waste was proposed. Potassium aluminosilicate was obtained by spark plasma sintering as an effective material for subsequent immobilization of 137Cs into a solid-state matrix. The sorption properties of potassium aluminosilicate to 137Cs from aqueous solutions were studied. The effect of the synthesis temperature on the phase composition, microstructure, and rate of cesium leaching from samples obtained at 800-1000 degrees C and a pressure of 25 MPa was investigated. It was shown that the positive dynamics of compaction was characteristic of glass ceramics throughout the sintering. Glass ceramics RS-(K,Cs)AlSi3O8 obtained by the SPS method at 1000 degrees C for 5 min was characterized by a high density of -2.62 g/cm3, Vickers hardness - 2.1 GPa, compressive strength -231.3 MPa and the rate of cesium ions leaching of -1.37 x 10-7 g cm-2$day-1. The proposed approach makes it possible to safe dispose of rice straw and reduce emissions into the atmosphere of microdisperse amorphous silica, which is formed during its combustion and causes respiratory

diseases, including cancer. In addition, the obtained is perspective to solve the problem of recycling long-lived 137Cs radionuclides formed during the operation of nuclear power plants into solid-state matrices.

Ключевые слова

Ключевые слова автора: Rice straw; Agriculture waste utilization; Glass -ceramic matrices; Radionuclide immobilization; Potassium aluminosilicate

Keywords Plus: FLY-ASH; ZEOLITE; GEOPOLYMER; POLLUCITE; REMOVAL; RELEASE

Адреса:

1 Russian Acad Sci, Inst Chem, Far Eastern Branch, 159 Prosp 100 Letiya Vladivostoka, Vladivostok 690022, Russia

2 Far Eastern Fed Univ, 10 Ajax Bay, Vladivostok 690922, Russky Isl, Russia

3 Vladivostok State Univ Econ & Serv, Gogolya St 41, Vladivostok 690014, Russia

4 Natl Acad Sci Belarus, Inst Gen & Inorgan Chem, Surganova St 9-1, Minsk 220072, BELARUS

5 Far East Geol Inst, Far Eastern Branch Russian Acad Sci, 159 Prosp 100 Letiya Vladivostoka,, Vladivostok 690022, Russia

Категории/классификация

Области исследования: Nuclear Science & Technology

Темы цитирования : 2 Chemistry › 2.78 Photoluminescence › 2.78.1729 Pyrochlore

+ Показать ещё поля данных

Web of Science Core Collection

- Science Citation Index Expanded (SCI-EXPANDED)

Предложить поправку

Если вам хотелось бы улучшить качество данных этой записи, выберите Предложить поправку