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Hydrothermal synthesis and spark plasma sintering of NaY zeolite as solid-s...

Hydrothermal synthesis and spark plasma sintering of NaY zeolite as solid-state matrices for cesium-137 immobilization

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Аннотация

Hydrothermal synthesis of NaY-type zeolite was carried out and the effect of temperature on the phase composition, crystal structure, textural characteristics, particle size and morphology, as well as sorption properties to Cs⁺ ions was studied. Solid-state matrices based on NaY zeolite the Faujasite structure containing 26.1 wt% cesium were obtained by spark plasma sintering (SPS) with high values of compressive strength (to 132.9 MPa) and Vickers microhardness to HV similar to 698, Fracture toughness (K-1c) similar to 1.26 MPa m^{1/2}. The kinetics of ceramic matrices consolidation, phase composition and morphology using dilatometric studies, XRD, and SEM were studied. The thermogravimetric analysis shown the high thermal stability of the obtained samples up to 1300 degrees C. The high hydrolytic stability of CsAlSiO₄ ceramic was proven (leaching rate of 2.33 x 10⁻⁸ g.cm⁻².day⁻¹) and cesium diffusion coefficient De 1.41 x10⁻¹³), which exceeds the requirements of GOST R 50926-96 and ISO 6961:1982 for solid-state matrices.

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