INFLUENCE OF NEUTRON IRRADIATION ON THE ELEMENTAL CONTENT AND OPTICAL PROPERTIES OF THE CAF_2 AND BAF_2 CRYSTALS

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The alkaline-earth fluorides represent an important class of relatively simple ionic crystals that are crystallised in the cubic structure and due to their optical and lattice-dynamical properties have theoretical and experimental interest. These alkaline-earth fluorides crystals can be doped with rare earth elements (RE, RE=La, Er, Yb, etc.) and exhibit good optical properties [1-4] that have been studied for various applications [5]. Pure and Er^{3+} barium fluoride crystals are the fastest known scintillator. Also, the optical and luminescence behaviour of Er^{3+}:BaF_2 crystals isvery promising [6-8]. Crystals of pure and Er^{3+} high-doped BaF_2 were grown at the West University of Timisoara, Romania. Neutron irradiation of samples and further elemental composition studies were conducted at the Joint Institute for Nuclear Research. Elemental content was studied by Particle-induced X-ray emission (PIXE) and Rutherford backscattering spectrometry (RBS) was applied to study elemental depth profile before and after irradiation with fast neutrons (2.5 MeV, dose D = 10^{12} particles / cm^2).
It found out that neutron irradiation changed elements distribution in depth of the samples. Thus, light atoms of Ba are transferred inside samples while heavier atoms of Er are coming close to the surface. Moreover, at the depth of 100 nm surface deformation was observed. Studies of the optical characteristics of different crystals showed slight difference between non-irradiated and irradiated samples.
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