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OPTICAL ABSORPTION OF RADIATION DEFECTS IN ALKALI-HALIDE CRYSTALS IMPLANTED MAGNESIUM AND SILVER IONS*

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This work presents the results of a research of the properties, structure, and formation mechanisms of metallic magnesium and silver nanoparticles obtained by ion implantation in LiF, NaCl, KCl, and KBr crystals. The crystals were irradiated with a pulsed beam of accelerated Mg ions with an average energy of ~ 80 keV and an average current density of 4 μA/cm^2. Dose range was from 2.2×10^{16} to 7.5×10^{16} ion/cm^2.

Nanoparticles were formed in a thin crystalline layer (~60–100 nm) along with color centers. The relevance of this topic is confirmed by the fact that metal nanoparticles produce optical effects, such as, for example, giant Raman scattering of molecules and plasmon-enhanced luminescence [1], which are promising for the development of various nanotechnologies.

It was noted that the luminescence intensity of color centers with λ_{max}=640 nm in implanted layers was more than 10^3 times higher than that in heavily γ-irradiated LiF:Mg crystals [1, 2].

The absorption spectra of NaCl, KCl, and KBr alkali halide crystals implanted with magnesium ions are shown in Fig.1. The nature of the centers responsible for the band ~ 320 nm in the spectrum of NaCl, KCl, and KBr crystals can be finally established by experiments on thermal annealing and optical bleaching.

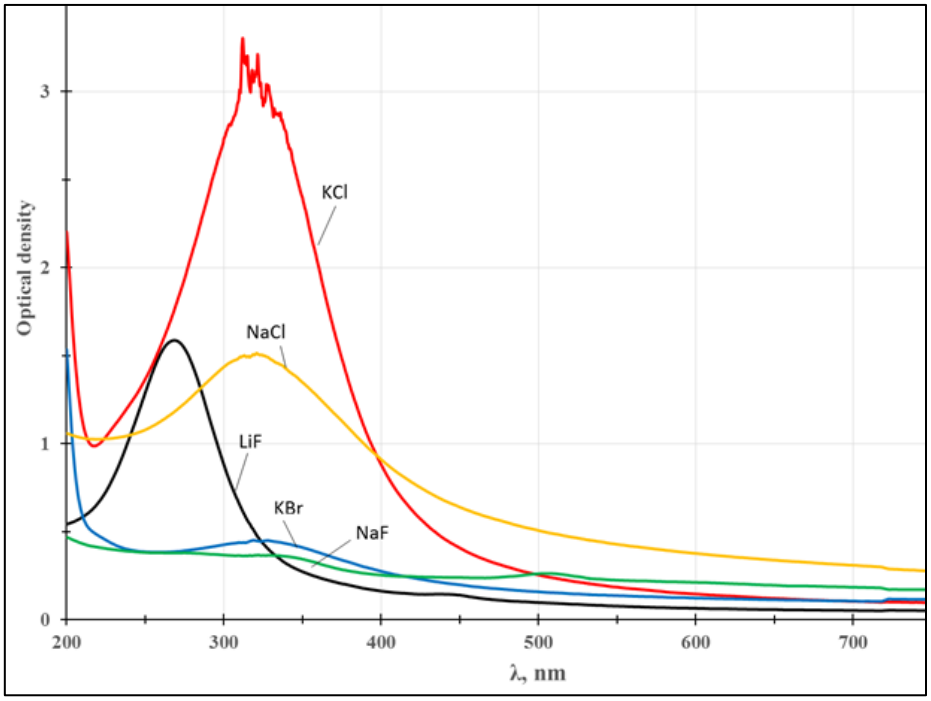

Fig.1. Absorbance spectra of alkali-halide crystals after magnesium ions implantation.

A comparison of the optical properties of crystals implanted with magnesium and silver ions shows a significant superiority of the optical characteristics in the case of implantation with magnesium ions.

REFERENCES

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