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LUMINESCENT PROTECTION AGAINST THE CREATION OF FRENKEL DEFECTS AT THE IRRADIATION OF NaCl AND MgO SINGLE CRYSTALS BY VUV RADIATION, ELECTRONS AND SWIFT IONS.

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The role of hot (nonrelaxed) electron-hole (*e-h*) pair recombination in Frenkel defect formation in wide-gap solids as well as the way to lower the probability of these recombination via energy transfer to luminescent impurity centers were considered in Ref. 1. The present study is a continuation of these investigations. The complex study of photo- and cathodoluminescense and optical absorption has been carried out for pure MgO and NaCl, as well as for NaCl:Tl^+ and MgO:Cr^+ single crystals grown in Tartu [2, 3]. The samples were irradiated by 5-20 eV photons and 5-15 keV electrons at 6-420 K or by 2.14-GeV uranium ions (GSI, Darmstadt) at 300 K.

In KCl crystals at 4.2 K, stable F centers and H interstitials are efficiently created at the decay of anion excitons or at the recombination of relaxed (cold) *e-h* pairs, while hot holes are mainly responsible for the formation of F_2 and F_n centers (see, e.g., [4]). On the other hand, the formation energy of a pair of Frenkel defects exceeds the energy gap in NaCl, $E_{FD} > E_g$. Our recent experiments have confirmed the extremely low efficiency of Frenkel defects creation in NaCl via anion decay or cold *e-h* recombination. At the same time, the efficiency of F-H pairs creation sharply increases at the crystal irradiation by 11-17 eV photons, when the energy of hot photoelectrons is not still sufficient for the formation of secondary *e-h* pairs. The analysis of the creation spectra of F-H pairs (measured by a luminescent method) and the excitation spectra of Tl^+-luminescence in NaCl:Tl^+ [2, 5] allowed to conclude that hot conduction electrons directly excite Tl^+ ions or form near-impurity-localized excitons, thus strongly decreasing the formation of Frenkel defects via hot *e-h* recombination.

Using the methods of synchrotron spectroscopy and low-temperature cathodoluminescence, the peculiarities of the creation of F and F^+ centers by hot *e-h* recombination have been investigated in MgO and MgO:Cr^{3+} single crystals previously exposed to uniaxial stress at 300 K − both directly plastically deformed or stressed due to the impact mechanism under the crystal irradiation by swift uranium ions (see also [2,4]).

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