

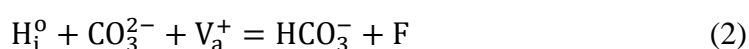
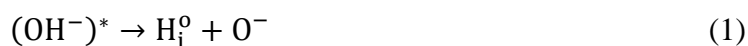
FORMATION OF RADIATION-INDUCED DEFECTS IN CsI CRYSTALS CONTAINING HYDROXYL AND CARBONATE IONS

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It is known that the presence of both carbonate- and hydroxyl-ions in CsI crystals significantly decrease their radiation hardness. The stock-produced crystals often contain CO_3^{2-} - and OH^- - ions at the same time. The double doping of CsI crystals by the admixtures mentioned above can lead to specific radiation-stimulated processes with their participation which occurred to be the subject of the given work. It was defined that under the ionizing radiation effect in the spectra of IR-absorption of CsI (OH , CO_3) crystals one can observe OH^- -band destruction and bands intensity decrease which are characteristic of CO_3^{2-} -ions. And a number of new bands appears, such as 593; 663; 745; 830; 947; 1223; 1315; 1679; 3318 cm^{-1} . The position and intensities relationship of the mentioned bands allow to describe them to bicarbonate-ions absorption. Analogous radiation-chemical conversions take place in irradiated CsI (CO_3) crystals too. Despite the fact that OH^- -ions absorption does not occur in IR-spectra of these crystals, the formation of HCO_3^- -ions at the expense of carbonate ions concentration decrease is always observed. The effect under study is volumetric. Unlike the crystals containing bicarbonate ions primarily, HCO_3^- -ions formed in radiation-chemical way are not stable and decompose when kept in the darkness.

Possible is the following mechanism of bicarbonate formation:



Reaction (2) supposed to explain the observed effect is quite possible because of high diffusion ability of hydrogen atoms. The formed products are spaciouly divided, since excess charge compensation of CO_3^{2-} -ions by anion vacancy take place mainly non-locally in CsI at the room temperature. The formation of bicarbonate-ions at additive colouring in halide vapors but not in metal vapors confirms proposed mechanism. HCO_3^- -ions destruction in the scheme under consideration is not limited by electron but ion processes (F-center diffusion).