

**SPECTRAL CHARACTERISTICS OF CALCIUM IODIDE CRYSTALS,
ACTIVATED BY OXYGEN- AND HYDROGEN-CONTAINING IMPURITIES**

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As shown earlier [1, 2], the crystals on the base of calcium iodide can be used to produce scintillators with high lightyield. It is known that the presence of oxygen- and hydrogen-containing anion impurities leads to the formation of additional emission centers and traps in ionic crystals, produces considerable changes in their radiation resistance, and has a significant effect on the mechanisms of energy migration and their scintillation characteristics. Such impurities in CaI_2 -based scintillators may originate from starting materials because of the high hygroscopicity of CaI_2 .

For this investigation we used CaI_2 , $\text{CaI}_2:\text{Ca}$, $\text{CaI}_2:\text{Ca}(\text{OH})_2$ crystals, and also $\text{CaI}_2:\text{H}_2$ and $\text{CaI}_2:\text{Ca}$, H_2 crystals, prepared from starting mixtures heat-treated in a hydrogen atmosphere below the melting points of CaI_2 and $\text{CaI}_2:\text{Ca}$. From investigation results of the influence of growth conditions, temperature and ionizing radiation on the X-ray luminescence, thermo- and photostimulated luminescence follows that at low temperature the spectra of recombination emission of researched crystals are presented by superposition of individual bands with maxima near 345, 395, 430, 460 and 520 nm [3]. Doping with oxygen- and hydrogen-containing impurities of calcium iodide crystals leads to increasing of emission intensity of individual centers. The shape of thermostimulated luminescence curves also is considerably depended from the presence of defects, connected with these impurities, in CaI_2 crystals. The emission with maximum 395 nm is assumed to be due to radiative decay excitons, localized on the uncontrolled impurity of hydrogen. The luminescence with maximum 520 nm is caused by anion excitons, localized on the iodine vacancies. The thermostimulated luminescence peaks observed in the temperature range 90–150 K are had the hole nature. At 90 K the photostimulated luminescence of CaI_2 -based crystals is excited in the electronic stage of the recombination process.

References

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