ACCUMULATION OF IRRADIATION-PRODUCED DEFECTS IN IONIC CRYSTALS LIMITED BY RECOMBINATION

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S u m m a r y

Irradiation-produced defects in ionic crystals (e.g., vacancies and interstitials) usually bear a charge that manifests itself in optical and luminescence properties even at very low concentrations of defects. On the other hand, the Coulomb interaction of charged defects essentially accelerates their recombination, thus diminishing the limiting (stationary) density of defects accumulated under irradiation. The complicated problem of the accumulation of charged defects limited by their recombination has been solved in the present work via numerical statistical modeling. The limiting level of the defect density was obtained as a function of the irradiation intensity. The theoretical results are compared with the traditional idea of the quadratic recombination. It was found that the latter is valid only for a very low concentration of defects (i.e. for a low irradiation intensity) and essentially overestimates the limiting value of the concentration under a strong irradiation. The kinetics of approaching the stationary regime obtained via the numerical statistical modeling is described in a broad dose-rate range in terms of an independent variable comprising the irradiation duration and the dose.