Influence of Nanosize Clusters on the Optical Absorption near the Fundamental Egde in Indium Arsenide Crystals

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In crystals of InAs, as well as in many other semiconductors, there has been revealed the abnormal frequency (*hv*) dependence with energy deficiency of the optical absorption coefficient (*K*) $K=f(hv)$ near the fundamental edge in the long-wavelength region. The frequency dependence of the absorption coefficient $K=f(hv)$ is described by exponential function. The common mechanism was formulated in work by N.Kekelidze,G.Kekelidze (*Phys.Letters*, 42,29,1972). In given paper we present new experimental and calculated data for the crystals of indium arsenide, before and after irradiation by fast neutrons and high-energy electrons. It has been shown, that mechanism proposed by J.R.Dixonand and M.Ellis (*Phys.Rev*., 123, 1560, 1961) is confirmed. It has been revealed, that nanoscale clusters, which arise in crystals under radiation by fast neutrons, have the strongest impact on this phenomenon. The frequency dependence of the absorption coefficient undergoes a qualitative and quantitative change and is not described by simple exponential function. We have revealed the empirical law of $K = f (hv)$.

Current Carriers Scattering on Nanosize Clusters in III–V Semiconductor Materials

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In this paper we have investigated temperature dependence of current carriers mobility $\mu (T)$ in the compounds of III-V type and their alloys before and after high-energy electrons and fast neutrons irradiation by fluxes of Φ=2 10^{18}n/ cm^2. It has been shown, that $\mu(T)$ dependence may be described quantitatively in a wide temperature range on the base of theory of scattering of charge carriers on optical vibrations of lattice, ionized and neutral impurities and alloy disordered areas both before and after irradiation. However, as a result of a large flux irradiation of crystals nanosize clusters are born, which dramatically reduce the value of mobility and change the character of the $\mu (T)$ dependence. It is no longer possible to be described this dependence on the base of theory of scattering of charge carriers on point type defects. Calculations were made taking into account the scattering of charge carriers on the nanoscale clusters. It has been reached agreement with experimental data and determined the size of nanoscale clusters.