THE EFFECT OF GAMMA-IRRADIATION ON VAC OF GaS MONOCRYSTAL DOPED WITH Yb

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GaS monocrystals belonging to layered A^3B^6 compounds are semiconductors with a partially irregular structure. GaS monocrystal has strong anisotropy. The structural feature is due to the presence of covalent bonds between atoms in layered semiconductors, and Van der Waals forces within the layers. The volt-ampere characteristics of GaS and GaS (Yb) monocrystals, as well as the effect of gamma irradiation on their electrical properties. VAC of GaS and GaS (Yb) monocrystals, parameters of local levels in their restricted zone, for example, energy location of local levels in the forbidden zone, price of activation energies of charge carriers at local levels, etc. After studying the VAC of the initial sample to study the effect of gamma radiation on the VAC, the sample was irradiated with gamma rays irradiated by ^{60}Co isotope source at a temperature of 290 K.

Figure 1 shows the volt-ampere characteristics of GaS and GaS (Yb) single crystals at different doses at room temperature, and the results before irradiation are given in curves 1 and 2 to compare the graphs. A comparative analysis of the curves shown in Figure 1 shows that when the GaS single crystal is alloyed with the Yb atom, the current decreases, the ohmic region shifts toward the high voltage region, and at the same time, the transition voltage in the non-trap quadratic region shifts toward the high voltage region.

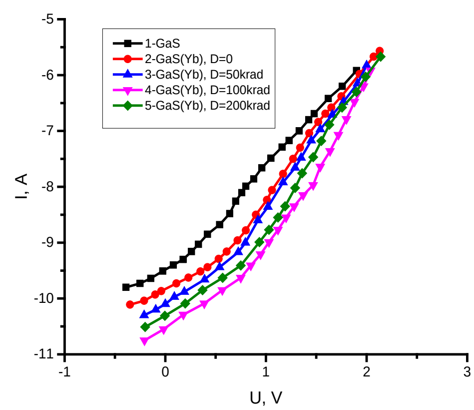

Figure 1. Volt-ampere characteristics of GaS and GaS(Yb) single crystals at different doses (T=300K).

Figure 1 shows that as can be seen from the graph, the VAC of the GaS(Yb) crystal irradiated with γ-quanta is observed with the regularity before irradiation, but the value of the voltage corresponding to ohmic, quadratic ($J\text{-}V^2$), a sharp increase in current ($J\text{-}V^3$) and finally, non-trap regions corresponding to ≥60V shift to the high voltage region. When the GaS (Yb) crystal is irradiated with a dose of D = 50krad (curve 3), the value of the current passing through the sample decreases compared to the non-irradiated sample, but the nature of the curve does not change. In this case, the value of the transition voltage from the ohmic region to the quadratic region increases. A comparison of the parameters shows that the decrease in current in the irradiated GaS (Yb) crystal at a dose of 50 krad is due to a decrease in the concentration of free charge carriers. Curve 4 shows that when irradiating GaS(Yb) single crystal with a dose of D=100 krad, the value of the current passing through the sample decreases again, and non-trap quadratic region is not observed in the subsequent increase in voltage (U≥100V). Such a change in current may be due to the formation of deep levels that collect the charge carriers involved in the conduction. When irradiating a GaS(Yb) crystal with a dose of D=200 krad, the value of current increases in the whole voltage region ($U=8*10^{-1}\div10^2$), and after U≥60V, a non-trap quadratic region is observed. As a result of dissociation of the [V_{Ga} I_{Yb}] complex at radiation doses Φ>100 krad, an increase in the concentration of free charge carriers (relative to the pre-irradiation concentration) is observed, the VAC of the crystal shifts to a low voltage region.