

Shallow donor states induced in ZnSe:Au single crystals by lattice deformation

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<https://doi.org/10.1063/1.3050327>

Abstract

Photoluminescence (PL) spectra are investigated in n -ZnSe single crystals at different temperatures from 4.4 to 300 K immediately after doping with Au from melt of Se+Au or Zn+Au and after storage of the doped samples for 4 years in the dark under normal room conditions. Due to the formation of Au_i interstitial donors in the n -ZnSe:Se:Au crystals with time, the origin of the near band edge PL changes from acceptor-bound to donor-bound excitons. Taking into account the results of PL characterization, we proposed that the Au_i donors are generated by displacement of Au ions from regular lattice sites to interstitial sites with the help of lattice deformation forces. Transport measurements show dramatic increase in the electrical conductivity and the free electron concentration after storage of the n -ZnSe:Zn:Au crystals, thus confirming the proposed model.

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