2006, Volume 39_Number 8, pag. 1515-1520

Optical properties of $CuGa_3Se_5$ single crystals

S. Levcenko, N. N. Syrbu, A. Nateprov, E. Arushanov, J. M. Merino, M León

https://doi.org/10.1088/0022-3727/39/8/010

Abstract

Single crystals of $CuGa_3Se_5$ have been grown by chemical vapour transport. Optical properties of $CuGa_3Se_5$ have been investigated in the temperature range between 10 K and room temperature 300 K. The temperature dependence of the energy gap was studied using the Einstein and Pässler models. The values of the band gap at T = 0 K, the Einstein temperature and the Debye temperature, a dimensionless constant related to the electron–phonon coupling as well as an effective and a cut-off phonon energy have been estimated. It was found that the major contribution of phonons to the shift of E_g versus T in $CuGa_3Se_5$ is mainly from optical phonons. The optical absorption coefficient just below the absorption edge varies exponentially with photon energy indicating the presence of Urbach's tail. It was shown that the static structural disorders contribute mainly to the absorption below the direct band gap.