



# Up-conversion luminescence in GaSe nanocrystals

N. N. Syrbu, I. G. Stamov, A. V. Dorogan, V. V. Zalamai

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## Abstract

Optical properties of GaSe crystals have been investigated at wide temperature range from 10 to 300 K by help of reflection, absorption, and wavelength modulated reflection, and transmission spectra. Received data were compared with measured photoluminescence spectra. Three excitonic series were found out. The parameters of excitonic serie for  $C_1-V_1$  bnads were determined. The longitudinal-transversal splitting of excitonic polariton ground states were determined. The doublet character of the transversal excitonic polariton mode ( $\omega_T$ ) was found out. The ground ( $n = 1$ ) and excited ( $n = 2,3 \dots E_g$ ) states of two high-energy excitonic series caused by  $C_2-V_1$  and  $C_3-V_1$  bands had been recognized, and its parameters were determined. The up-conversion of luminescence from high-energy excitonic levels ( $E > 3$  eV) was studied. The electrons were excited from  $V_1$  ( $\Gamma_1$ ) to  $C_1$  ( $\Gamma_6$ ) and  $C_2$  ( $\Gamma_5$ ) bands with further transitions to higher energy levels  $C_3-C_6$ . So the luminescence from the excitonic levels of  $C_3-C_6$  bands towards valence bands takes place. The band model in the Brillouin zone center was constructed based on the obtained data.