

INTERFERENCE OF RESONANCE LUMINESCENCE OF EXCITON POLARITONS IN CuGaS₂ CRYSTALS

N.N. Syrbu^a, L.L. Nemerenco^a, I.G. Stamov^a, V.N. Bejan^a, V.E. Tezlevan^b

^a*Technical University of Moldova, 168, Stefan cel Mare str., MD-2004, Chisinau, Republic of Moldova*

^b*Institute of Applied Physics, Academy of Sciences of Moldova, 5, Academiei str., MD-2028, Chisinau, Republic of Moldova*

(Received 12 October 2006)

Abstract

The nonmodulated and wavelength-modulated reflection spectra of CuGaS₂ crystals for the polarization E||c of 10 K are studied. The states $n = 1, 2$ and 3 of the excitons Γ_4 (A-excitons) and $n = 1, n = 2$ of B- and C-excitons are found. The nonmodulated absorption spectra for the polarization E⊥c at 10 K have been studied. The states $n=1, 2$ and 3 of Γ_5 excitons are found. The main parameters of the A (Γ_4, Γ_5) and B, C exciton series at the energies of the longitudinal and transverse excitons Γ_4 for the states $n = 1$ and $n = 2$, the effective masses of electrons (m_{e1}^*) and holes ($m_{v1}^*, m_{v2}^*, m_{v3}^*$) are determined.

Introduction

Up to the present moment polariton spectra, problems of space dispersion and many other extremely important peculiarities of behaviour of exciton polaritons have been studied mainly for A^{II}B^{VI} crystals (e.g., [1-3] and references there). In order to confirm universality of the polariton luminescence phenomenon, elastic scattering of polaritons, optic orientation of exciton spins, it is important to study these effects in crystals of multicomponent materials, CuGaS₂ compound belongs to them. In these crystals polariton luminescence [4] and resonance Raman scattering of exciton polaritons [5-7] are found.

In the present work new information on parameters of long-wave exciton polaritons is obtained. Reflection spectra in the polarization E||c are studied, the states $n = 1, 2$ and 3 are found and parameters of the excitons Γ_4 are determined. In the polarization E⊥c the transmission spectra are studied, where ground and excited states ($n = 1, 2$ and 3) of the excitons Γ_5 are found. Resonance luminescence and its interference in the region of excited states of the excitons Γ_4 and Γ_5 are found. Polariton branches of the exciton polaritons Γ_5 are restored.

Experiment methods

The investigations were carried out in CuGaS₂ samples obtained by the method of gas transport reactions. The optic spectra of reflection and luminescence were registered with the help of an installation mounted on the basis of double Raman spectrometer ДФC-32. The samples were fixed to the cold conduit of the cryostat LTS-22C330 of the Workhorse type and were kept at the temperature of 9 ± 0.5 K. The luminescence spectra were excited by the radiation lines $\lambda = 4880$ and 4765 \AA of Ar⁺-laser.