Excitonic polaritons of zinc diarsenide single crystals

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Abstract

Excitonic polaritons of $ZnAs_2$ single crystals had been investigated. Parameters of singlet excitons with $\Gamma_2^-(z)$ symmetry and orthoexcitons $2\Gamma_1^-(y)+\Gamma_2^-(x)$ had been determined. Spectral dependencies of ordinary and extraordinary dispersion of refractive index had been calculated using interferential reflection and transmittance spectra. It was shown, that A excitonic series were due to hole (V_1) and electron (C_1) bands. The values of effective masses of electrons $(mc^*=0.10m_0)$ and holes $(mv1^*=0.89m_0)$ had been estimated. It was revealed that the hole mass $mv1^*$ changes from $1.03m_0$ to $0.55m_0$ at temperature increasing from 10K up to 230K and that the electron mass mc^* does not depend on temperature. The integral absorption A $(eVcm^{-1})$ of the states n=1, 2 and 3 of $\Gamma_2^-(z)$ excitons depends on the $A_n\approx n^{-3}$ equality, which it is characteristic for S-type excitonic functions. Temperature dependences of the integral absorption of ground states for $\Gamma_2^-(z)$ and $\Gamma_2^-(x)$ excitons differ. The ground states of B and C excitons formed by $V_3 - C_1$ and $V_4 - C_1$ bands and its parameters had been determined.