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Birefringence and band structure of CdP2 crystals

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Abstract

The spatial dispersion in CdP2 crystals was investigated. The dispersion is positive ($n^{k||c} > n^{k||y}$) at $\lambda > \lambda_o$ and negative ($n^{k||c} < n^{k||y}$) at $\lambda < \lambda_o$. CdP2 crystals are isotropic for wavelength λ_o=896nm. Indirect transitions in excitonic region Egx are nonpolarized due to one pair of bands. Minimal direct energy intervals correspond to transitions Γ1→Γ1 for $E||c$ and Γ2→Γ1 for $E \perp c$. The temperature coefficient of energy gap sifting in the case of temperature changing between 2 and 4.2K equals to 10.6meV/K and 3.2mev/K for Γ1→Γ1 and Γ2→Γ1 band gap correspondingly. Reflectivity spectra were measured for energy interval 1.5–10eV and optical functions (n, k, ε_1, ε_2, $d^2\varepsilon_1/dE^2$ and $d^2\varepsilon_2/dE^2$) were calculated by using Kramers–Kronig analyses. All features were interpreted as optical transitions on the basis of both theoretical calculations of band structure.