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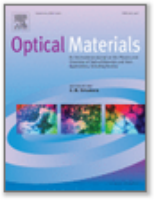

Frenkel excitons and band structure in Sb_2S_3 single crystals

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Abstract

Anisotropy of optical properties of Sb_2S_3 single crystals was investigated at 11 and 300 K. Ground and excited states of four excitonic states (A, B, C and D) were found out. Parameters of observed excitons and bands V_1 – V_4 were determined. In Γ point of Brillouin zone the effective masses of electrons in the bottom conduction band ($mc^* = 1.08m_0$) and of holes in four top valence bands (m_{v1}^*, $m_{v2}^* = 2.91m_0$ and m_{v3}^*, $m_{v4}^* = 3.12m_0$) were estimated. The splitting magnitudes of valence bands V_1 – V_2 in the Brillouin zone center by crystal field ($\Delta_{cf} = 20$ meV) and by spin-orbital interaction ($\Delta_{so} = 375$ meV) were calculated. V_3 and V_4 bands have splitting of 198 meV. The observed features were interpreted on the base of existing theoretically calculated band structure and symmetries of excitons in Γ point of Brillouin zone for single crystals of orthorhombic symmetry (Pnma).