

Excitonic spectra in HgGa_2Se_4 crystals

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<https://doi.org/10.1016/j.optmat.2018.01.002>

Abstract

Ground and excited states of four excitonic series (A, B, C and D) were discovered in HgGa_2Se_4 crystals at 10 K. Parameters of excitons and bands were determined. An effective mass of electrons m_c is equal to $0.26m_0$ and masses of holes m_{v_1} , m_{v_2} and m_{v_3} are equal to $2.48m_0$, $2.68m_0$ and $1.6m_0$ respectively in Γ point of Brillouin zone. Valence bands splitting by crystal field ($\Delta_{cf} = 70$ meV) and spin-orbital interaction ($\Delta_{so} = 250$ meV) were estimated in Brillouin zone center. Optical functions (n , ε_1 and ε_2) for polarizations $E \perp c$ and $E \parallel c$ in electron transitions region (2–6 eV) were calculated by Kramers-Kronig method. The discovered features were discussed on a base of the existing theoretical energetical band structure calculations and excitonic bands symmetries in $k = 0$ Brillouin zone for chalcopyrite crystals. The resonance Raman scattering was investigated.