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Optical properties and electronic band structure of SnS single crystals

Abstract

Reflection and absorption spectra of SnS single crystals (*Pnma* (*D2h16*) space group) were investigated at low and room temperatures. Features attributed to three excitonic states were found out. Parameters of excitons and bands were determined. The first excitonic states are formed at Γ -Y direction of Brillouin zone and have hole effective mass $m_{V1}^* = 2.6m_0$ and electron effective mass $m_{C1}^* = 1.3m_0$. The second excitonic states near X point in direction Γ -X and the third excitonic states in U point of Brillouin zone are formed. Excitonic transitions in U point are allowed in both polarizations and effective mass of holes in U point ($m_{V1}^* = 3.46m_0$) is more than one at Γ -Y direction ($m_{V1}^* = 2.6m_0$). Polarized transitions in reflection spectra of E||b and E⊥b polarizations in wide energy range of 1–6 eV were revealed. Optical functions (n , k , ϵ_1 and ϵ_2) for polarizations E||b and E⊥b in the wide energy range by Kramers-Kronig relations were calculated.