



# Energy band structure and Frenkel excitons in $\text{PbGa}_2\text{S}_4$

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## Abstract

Optical reflection spectra are measured and calculated in  $\text{PbGa}_2\text{S}_4$  crystals in the region of resonances related to excitons with large oscillator strength and binding energy (Frenkel excitons). The splitting of the upper valence band in the center of the Brillouin zone due to crystal field ( $\Delta_{\text{cf}}$ ) and spin orbit ( $\Delta_{\text{so}}$ ) interaction are determined. Optical reflection spectra are measured and calculated according to Kramers–Kronig relations in the region of 3–6eV in  $E \perp c$  and  $E \parallel c$  polarizations, and the optical constants  $n$ ,  $k$ ,  $\epsilon_1$  and  $\epsilon_2$  are determined. The observed electronic transitions in  $\text{PbGa}_2\text{S}_4$  crystals are discussed in the frame of theoretical energy band structure calculation for thiogallate crystals.