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## **Electronic and optical properties of $\text{HgIn}_2\text{S}_4$ thiospinels**

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### **Abstract**

Photoluminescence (**PL**), transmission (**T**), reflection (**R**), wavelength modulated transmission ( $\Delta T / \Delta \lambda$ ) and reflection ( $\Delta R / \Delta \lambda$ ) spectra of thiospinel  $\text{HgIn}_2\text{S}_4$  crystals were investigated in temperature interval from 10 to 300 K. The band gap 1.64 eV (300 K) and 1.666 eV (10 K) are formed by electron transitions from L to  $\Gamma$  points of Brillouin zone. The edge temperature shift coefficient  $\beta$  ( $\Delta E_g / \Delta T$ ) is equal to  $4.3 \cdot 10^{-3} \text{ eV K}^{-1}$ . The direct energy gap in  $\Gamma$  point ( **$E_g$  dir**) corresponds to 1.748 eV. The top valence bands in  $\mathbf{k} = 0$  are split by the crystal field on 25 meV. Direct electron transitions  $a_1$ – $a_7$ , observed in energy range 1–6 eV, were interpreted conform the theoretically calculated band structure. The optical functions (**n**, **k**,  $\epsilon_1$  and  $\epsilon_2$ ) were determined by Kramers-Kronig analysis.