

## Fundamental absorption edge in $\text{CuIn}_5\text{Se}_8$ and $\text{CuGa}_3\text{Se}_5$ single crystals

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### Abstract

Optical absorption spectra of  $\text{CuIn}_5\text{Se}_8$  and  $\text{CuGa}_3\text{Se}_5$  single crystals have been investigated. The energy gap  $E_g$  for  $\text{CuIn}_5\text{Se}_8$  ( $\text{CuGa}_3\text{Se}_5$ ) was found to be varied from 1.27 (1.79) to 1.21 (1.71) eV in the temperature range between 10 and 300 K. The temperature dependence of  $E_g$  was studied by means of the Einstein model and the Pässler model. The Einstein temperature {222 (267) K}, the Debye temperature {310 (380) K}, a dimensionless constant related to the electron–phonon coupling {1.62 (2.65)} as well as an effective energy {20 (24) meV} and a cut-off phonon energy {35 (39) meV} have been estimated for  $\text{CuIn}_5\text{Se}_8$  ( $\text{CuGa}_3\text{Se}_5$ ). It was also found that the major contribution of phonons to the shift of  $E_g$  versus temperature in  $\text{CuIn}_5\text{Se}_8$  ( $\text{CuGa}_3\text{Se}_5$ ) is mainly from optical phonons.