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Excitons in PL spectra of Cu(In, Ga)Se₂ single crystal *

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A photoluminescence (PL) study of Cu(In,Ga)Se₂ (CIGSe) single crystals, (grown by the vertical Bridgman technique) with the [Ga]/[Ga + In] ratio of 7% and 12% and the [Cu]/[In + Ga] ratio greater than unity, as measured by energy dispersive spectroscopy, is presented. Analysis of the excitation intensity and temperature dependence of the PL spectra suggested the excitonic nature of the observed near-band-edge emissions peaks. Free and bound excitons in CIGSe single crystals with both 7% and 12% Ga content are clearly observed, analysed and identified. An activation energy of 19 meV is determined for the free exciton in the PL spectra of the sample with 12% Ga. The presence of the excitons demonstrated a high structural quality of the material.

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