



1993, Volume 32, Number S3, pag. 466

Luminescent and Photoconductive Properties of $\text{AgGa}_{2.5}\text{In}_{2.5}\text{S}_8$ and $\text{CuGa}_{2.5}\text{In}_{2.5}\text{S}_8$ New Semiconductors

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<https://doi.org/10.7567/jjaps.32s3.466>

Abstract

Results of a complex study of photoluminescence (PL), photoconductivity (PC) and photo-voltaic (PV) spectra in $\text{AgGa}_{2.5}\text{In}_{2.5}\text{S}_8$ and $\text{CuGa}_{2.5}\text{In}_{2.5}\text{S}_8$ single crystals are presented. The values of indirect ($E_g^i=2.25$ eV) and direct ($E_g^d=2.60$ eV, $T=300$ K) gaps in $\text{AgGa}_{2.5}\text{In}_{2.5}\text{S}_8$ have been determined. PL spectrum of $\text{AgGa}_{2.5}\text{In}_{2.5}\text{S}_8$ is shown to consist of two overlapping bands with the maxima at 1.57 and 1.95 eV ($T=77$ K), while $\text{CuGa}_{2.5}\text{In}_{2.5}\text{S}_8$ is characterized by a single PL band, the position of its maximum (1.72–1.77 eV) depending upon the excitation power density. The radiative electron transitions in $\text{CuGa}_{2.5}\text{In}_{2.5}\text{S}_8$ are assumed to occur from the quasicontinuously distributed traps below the bottom of the conduction band to an acceptor level with 0.07 eV activation energy.