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The band gap of the chalcopyrite and spalerite phases of epitaxial $ZnSnP_2$ PHILIPPE ST-JEAN, Genie Physique, Ecole Polytechnique de Montreal, Montreal (QC), H3C 3A7, Canada, GEORGE SERYOGIN, NEXX Systems, Billerica, MA 01821, USA, SEBASTIEN FRANCOEUR, Genie Physique, Ecole Polytechnique de Montreal, Montreal (QC), H3C 3A7, Canada — Using contactless electroreflectance, we accurately determined the band gap of the two known phases of epitaxial $ZnSnP_2$. Induced by small changes in Sn/Zn flux ratio during epitaxy, the order-disordered transition between the chalcopyrite and sphalerite phases considerably affects the band gap energy. The chalcopyrite ordered phase, unambiguously identified from x-ray diffraction of sphalerite forbidden reflection peaks, exhibits a band gap of 1.67 eV at 293K. A small splitting of this transition is observed at 80K, indicating the presence of a crystal field produced by a small tetragonal distortion and a deviation from the ideal c/a=2 ratio. The band gap of the disordered sphalerite phase is 1.38 eV, somewhat higher than the value of 1.32 eV reported from bulk crystals, indicating either a remaining trace of ordering or a slight deviation from stoichiometry. Tailoring the electronic and optical properties of $ZnSnP_2$ at a fixed composition through an ordered- disordered transition has interesting technological applications. For example, it is an interesting material for multijunction solar cells because of its non-toxicity, abundance and low-cost.

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