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Optical studies of III-V semiconductors under shock and ramp wave loading[1] PAULIUS GRIVICKAS, MATT MCCLUSKEY, YOGENDRA GUPTA, WSU — Low temperature photoluminescence of GaP and GaAs was investigated under conditions of uniaxial strain generated using shock and ramp wave loading along the [100], [111], and [100] orientations. In GaP, the exact band gap shifts were measured up to 5 GPa longitudinal stress and accurate optical deformation potentials of GaP were derived. The parameters established were used to explain nonlinear optical response and ionization of isoelectronic nitrogen impurities in shocked GaP. In GaAs, the crossing between the direct and the indirect conduction bands was observed below 5.5 GPa for all loading orientations. The exact transitions for different orientations were obtained by correlating the PL intensity changes in ramp wave experiments with simultaneous VISAR measurements. Modeling of this phenomenon showed that unlike hydrostatic pressure, where the direct-to-indirect transition is possible only between G and X conduction bands, the shear component of uniaxial strain can produce the transition between G and L bands as well. As the result, the accurate deformation potentials of all three conduction bands of GaAs were derived.

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