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Pulsed THz-emission and carrier concentrations in InN RICARDO ASCAZUBI, INGRID WILKE, Rensselaer Polytechnic Institute, WILLIAM SCHAFF, Cornell University — InN grown on sapphire substrates with GaN or AlN buffer layers exhibits a variety of unique electronic properties for the development of brighter photo-conducting THz-radiation sources. Since InN is a narrow band gap semiconductor it is also an attractive candidate for compact and lightweight THz-spectroscopy and imaging systems based on femtosecond fiber laser operating at 1.55μm wavelength. The important properties of InN with regard to strong THz-emission are low probability of intervalley scattering and strong intrinsic electric fields near the surface. The electric fields at the InN surface are caused by a strong intrinsic electron surface accumulation. We report on THz-emission of n-type InN with carrier concentrations ranging from 10^{17}cm^{-3} to 10^{20}cm^{-3}. We observe a strongly increasing THz-emission with decreasing carrier concentrations. Based on charge neutrality the dependence of THz-emission on carrier concentrations is explained by assuming an underpopulated region behind the surface accumulation layer, across which the surface field interacts with photo-injected carriers generating THz-transients. The surface state density calculated within this model agrees well data obtained by high resolution electron energy loss spectroscopy data.

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