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Carrier recombination in m-plane InN thin film WEI-SHENG CHEN, WEN-JING ZHAO, J.-Y. ZENG, DER-JUN JANG, LI-WEI TU, Department of Physics, Natl Sun Yat Sen Univ — Nonpolar m-plane InN thin films grown on $LiAlO_2$ substrates by plasma-assisted molecular beam epitaxy have been studied using time-resolved photoluminescence (TRPL) upconversion technique. The carrier densities of 1.97 x 10^{19} cm^{-3} and mobility of 420 cm^2/Vs were measured by van der Pauw–Hall geometry. The carrier temperature curves at different temperatures, derived from the time-resolved photoluminescence (TRPL) spectra at different time delay, indicate that hot carriers lost most of their excess energy by releasing LO-phonons. The effective LO phonon emission times increase with the lattice temperature, from 53 to 197 fs for 35 and 250 K, respectively. We found that the effective LO emission time of m-plane InN is smaller than that of c-plane InN. The recombination rates were derived from the TRPL measured at the energy closed to the bandgap energy. Similar to c-plane InN, the Shockley-Read-Hall recombination coefficient of m-plane InN shows a 3-fold increase for temperature increasing from 35 to 250 K. The Auger recombination was less effective as compared to that in c-plane InN.

Wei-Sheng Chen
Natl Sun Yat Sen Univ

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