

Abstract Submitted
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Probing of the Nature of Carrier Recombination in GaInNAs epilayers using Optical Spin Injection¹ YUTSUNG TSAI, BIPLOB BARMAN, THOMAS SCRACE, ATHOS PETROU, SUNY Buffalo, M. FUKUDA, I.R. SELLERS, University of Oklahoma, M.A. KHALFIOUI, CRHEA-CNRS, France — Optical pumping experiments have been performed on as-grown and p-type MBE grown GaInNAs epilayers. The PL peak of the nominally undoped as-grown sample exhibits the characteristic S-shaped dependence of dilute nitride material for $T < 60$ K [1]. This is associated with carrier recombination via localized states at low temperatures. The reflectance spectra on the other hand map the band-to-band free carrier transition, displaying a Varshni-type behavior. In the p-type material the S-dependence of the PL disappears, and the PL peak coincides with the reflectance spectrum at all temperatures. This indicates band-to-band, rather than localized exciton recombination, in the p-type GaInNAs at all temperatures. This picture was verified by optical pumping experiments. In the undoped sample a large degree of circular polarization was evident only at $T > 60$ K: below 60 K the polarization is small, and coincident with the reflectance peak. In the p-type samples, on the other hand, non-zero circular polarization, whose maximum matches the peak PL energy, was evident at all temperatures.

[1] A. Polimeni *et al.* Phys. Rev. B. 63, 195320 (2001)

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