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High Excitation Density Effects in Plasmonic GaAs-AlGaAs-GaAs Core-Shell Nanowires. MASOUD KAVEH-BAGHBADORANI, Department of Physics and Astronomy, James Madison University, Harrisonburg, U.S.A., QIANG GAO, CHAENNUPATI JAGADISH, Department of Electronic Materials Engineering, Research School of Physics and Engineering, Australian National University, Canberra, Australia, HANS-PETER WAGNER, Department of Physics, University of Cincinnati, Cincinnati, U.S.A. — We investigate the near-band emission of highly exited hybrid plasmonic GaAs-AlGaAs-GaAs core-shell nanowire (NW) heterostructures using time integrated (TI) photoluminescence (PL) measurements. The plasmonic structures are composed of 130 nm diameter zincblende NWs, either as bare NWs lying on an Au coated glass substrate or as Au coated NWs lying on a bare glass substrate. Intensity-dependent PL measurements on bare and plasmonic NW samples at high excitation densities reveal electron-hole-plasma (EHP) recombination. The EHP band shows a super-linear increase with increasing excitation intensity suggesting amplified spontaneous emission (ASE) at a threshold power density of around 60 microJ/cm2. Plasmonic NW samples excited above the threshold fluence reveal a weakly resolved sub-structure within the broad EHP band. The emerging sub-bands have a bandwidth which is by a factor of around 3 smaller than the width of the EHP background and are tentatively attributed to plasmonic lasing modes. This interpretation is supported by the fact that photonic lasing from 130 nm diameter thin uncoated GaAs NWs is theoretically not possible and that no sub-structure in the EHP band has been observed on bare nanowires.

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