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Exciton Recombination in Nanometer-Wide GaN/AlN Quantum Wells ZHENWEN PAN, MADALINA FURIS, University of Vermont, Burlington, VT, ALEXANDER N. CARTWRIGHT, University at Buffalo - SUNY, Buffalo, NY, WILLIAM J. SCHAFF, Cornell University, Ithaca, NY — In nitride semiconductor heterostructures, the presence of very strong built-in electric fields, oriented perpendicular to the semiconductor layers, dramatically impacts the electronic states, excitonic recombination, and photoluminescence in these materials. The origins of these fields lie in the non-centro- symmetric character and the strong piezoelectricity of the heterostructures. We investigated electronic states in the presence of strong built-in fields ($\sim$ 5 MV/cm) in very narrow, nanometer-wide GaN/AlN quantum wells via time-resolved photoluminescence spectroscopy. We find that the strong confinement ($\sim$ 2eV in the conduction band) leads to significant overlap in the electron and hole wavefunctions, even in the presence of large built-in fields. The temperature dependence of radiative lifetimes and emission energies indicates the band-edge recombination contributions (i. e. excitonic and/or shallow -acceptor pair) dominate the PL spectrum. Wells narrower than 3 monolayers exhibit temperature-independent emission and 1 ns radiative lifetimes.

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