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Room Temperature Photoluminescence and Absorption in InAlN/AlN/Sapphire quantum dot structures YURI DANYLYUK, DMITRI ROMANOV, GREGORI AUNER — We have grown InAlN self-assembled quantum dots (QD) on a AlN epitaxial layer with the average diameter of the QDs was as small as 20 nm and detected strong QD photoluminescence. The samples were grown by Plasma Source Molecular Beam Epitaxy on sapphire (0001) substrates. A 150 nm AlN buffer layer was grown at 400°C and a 200-700 nm InAlN at 500°C. In-situ RHEED scan mode measurements were used to define RHEED intensity oscillations, strain profiles, and coherence length profiles; they confirmed Stranski-Krastanov 3-dimentional regime of the film growth. The In composition of QDs is estimated 0.8 and 0.4 from the photoluminescence (PL) spectrum. Microscopic PL spectra were obtained using the 514.5 nm line of an Ar+ laser as excitation source. The laser spot was about 2-3 μm in diameter. We observe a reproducible double peak of very sharp and strong photoluminescence with FWHM of 1 meV at room temperature. We attribute these photoluminescence peaks to electron confinement in nano-hillocks of the InAlN film by the strong electric field of piezoelectric and spontaneous polarization; our model calculations of the localization energies agree with the experimental data.

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