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We present the results of a series of studies on the optical properties of GaN and AlGaN/GaN heterstructures using a variety of spectroscopic tecniques. Strain effects were found to have a strong influence in determining the energies of excitonic transitions. The observations of spectral features associated with the transitions involving the ground and excited excition states make it possible to directly estimate binding engergy for the excitions in GaN. Optical pumping experiments were performed on AlGaN/GaN separate confinement heterostructures (SCH) grown on sapphire by MBE and SiC by MOCVD. the threshold pumping powers were fornd to be an order of magnitude lowere than that for regular GaN epilayers. Nonlinear four-wave-mixing experiments were carried out in both femtosecond and picosecond regimes to study the intensity and time reponse of scattering efficiency, as well as the pump-induced nonlinear refractive index change.

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