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Title

Correlated terahertz acoustic and electromagnetic emission in dynamically screened InGaN/GaN quantum wells

Source

Physical Review B (Condensed Matter and Materials Physics), vol.84, no.8, 15 Aug. 2011, 085317 (8 pp.). Publisher: American Physical Society, USA.

Abstract

We investigate acoustic and electromagnetic emission from optically excited strained piezoelectric In0.2Ga0.8N/GaN multiple quantum wells (MQWs), using optical pump-probe spectroscopy, time-resolved Brillouin scattering, and THz emission spectroscopy. A direct comparison of detected acoustic signals and THz electromagnetic radiation signals demonstrates that transient strain generation in InGaN/GaN MQWs is correlated with electromagnetic THz generation, and both types of emission find their origin in ultrafast dynamical screening of the built-in piezoelectric field in the MQWs. The measured spectral intensity of the detected Brillouin signal corresponds to a maximum strain amplitude of generated acoustic pulses of 2%. This value coincides with the static lattice-mismatch-induced strain in In0.2Ga0.8N/GaN, demonstrating the total release of static strain in MQWs via impulsive THz acoustic emission. This confirms the ultrafast dynamical screening mechanism in MQWs as a highly efficient method for impulsive strain generation.(28 References).