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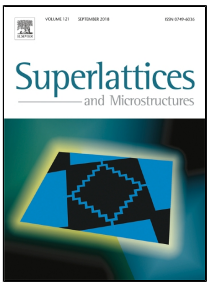

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Fabrication and photoluminescence enhancement of InGaN/GaN multiple-quantum-well nanotube structures

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ABSTRACT:

InGaN/GaN multiple-quantum-well (MQW) nanotube structures with good structural uniformity were fabricated using a top-down approach. Micro-Raman spectroscopy was used for characterization of strain relaxation in the multi-quantum-wells (MQWs) after nanotube fabrication. Micro-photoluminescence (μ-PL) measurements confirmed that the nanotube structures showed significant enhancement in PL intensity compared to the conventional *c*-plane planar LED. The PL enhancement was attributed to the increased internal quantum efficiency (IQE) and light extraction efficiency. The increased IQE was attributed to the enhancement of carrier localization and the reduction of quantum-confined Stark effect in MQWs of the nanotube structures by partial strain relaxation. Time-resolved PL measurements confirmed faster decay dynamics for the carriers in the MQW nanotube structures. These results can offer considerable insight into the nature of carrier localization and luminescence mechanism in the *c*-plane InGaN/GaN MQW nanotube LEDs.

Keywords: Nanotube; Multiple quantum wells; Carrier localization; Quantum efficiency; Photoluminescence