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Nano-silver microcavity enhanced UV GaN light emitter

Abstract

We report results of measurements that help to clarify the role of silver in the reflection of UV emission light from GaN. A GaN as an active layer was sandwiched between two silver metal reflectors. GaN layer on sapphire showed a photoluminescence (PL) peak around 364 nm and its full width half maximum was about 6.7 nm. Two types of microcavity, were fabricated: half-cavity GaN/sapphire/silver and full-cavity silver/ GaN/sapphire/silver. Photoluminescence measurements showed a two-fold intensity enhancement in half-cavity back mirror. In the full cavity samples, the amplitude of the photoluminescence is enhanced ten times when we used 50 nm silver as a front mirror. A tremendous more than 16-fold enhancement is obtained when silver mirror of 25 nm was used as a front mirror. The increase in the photoluminescence intensity is explained in terms of competition between increasing absorption in the cavity, silver surface plasmon coupling and increasing optical field-enhancement due to resonator.

Keywords

GaN; Nano-silver; Photoluminescence; Plasmon frequency