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Publication date:
2014

Document Version
Publisher's PDF, also known as Version of record

P1.21

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Surface plasmonics from metal-dieletric interface has proven to be an effective mechanism of improving the internal quantum efficiency (IQE) of green InGaN/GaN quamtum-well (QW) light-emitting diodes (LEDs). Localized surface plasmon (LSP) modes from Ag nanoparticles (NPs) in the near field of an emitter can provide a fast decay channel due to its large density of states [1-2]. IQE of an emitter can be improved if the LSP mode can efficiently radiate the stored energy into free-space mode, which depends on scattering efficiency of the metal NP. It is well known from the dipole approximation that scattering dominates for large NPs while absorption dominates for small NPs, hence large NPs are preferred for IQE enhancement by LSP coupling. We investigate a simple approach of inserting SiN layer between GaN and metallic NPs to improve scattering of small NPs [2].

We fabricated Ag NPs on InGaN/GaN QW structure by rapid thermal annealing (RTA) process, using a thin film of 5, 10 and 15 nm Ag. To investigate scattering efficiency improvement we have also fabricated Ag NPs on samples with a layer of Si_3N_4 on GaN surface. **Fig. 1(a)** shows photoluminescence (PL) measurements where the reference is a sample without Ag NPs but with the specific SiN thickness. Without SiN a strong PL enhancement is observed for the 15 nm Ag RTA sample, while 5 and 10 nm samples show suppression or no enhancement. The situation is improved for 5 and 10 nm Ag when including a thin layer of 15 nm SiN between NPs and GaN surface, while the opposite holds for 15 nm Ag. The enhancement is reduced by increasing the SiN thickness to 120 nm indicating a reduced, but not absent, LSP-QW coupling. The resonance dips are seen to blue-shift due to SiN, as seen from the transmittance spectra of **Fig. 1(b)**. A thin layer of SiN is thus seen to improve the scattering efficiency of small Ag NPs, thereby allowing for improvement of emitter IQE using small NPs.

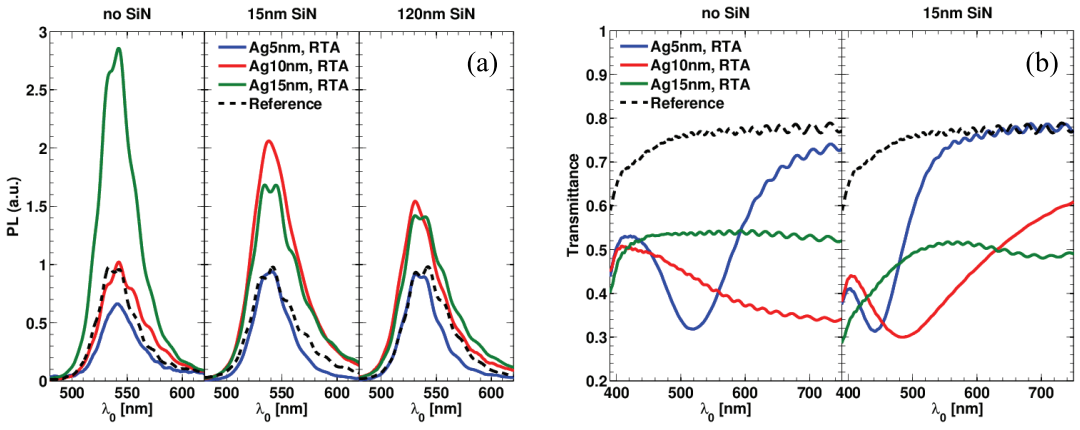

Fig. 1: (a) PL and (b) transmittance spectra of samples with various SiN thickness and Ag NPs size.

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[2] D.-M. Yeh, *et al.*, *Appl. Phys. Lett.* **91**, 063121 (2007).