Localized surface plasmon effect for ZnO nanoparticles based devices

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As a compromising material for future optoelectronic devices, ZnO attracted many concentrations for its wild applications. Compared with traditional LED fabrication, the technology for the nanoparticle based LED is relatively simple and less cost[1, 2]. But the emission efficiency needs to be increased.

P-type ZnO nano particles were produced by arc-vapor technique and n-type ZnO thin film were produced by MOCVD and sputtering. The light enhancement mechanism of SPP is based on electronic waves coupling between the metal nanostructures and the semiconductor emissions. We use metal particles LSP effect on ZnO nanoparticle based LEDs which is more convenient for varied wavelength light emitting enhancement.

The light emission efficiency modified in ZnO nanoparticle based LEDs by using metal particles resonant and off-resonant localized surface plasmon interaction. The phenomena of photoluminescence enhancement for ZnO particles were observed at Ag nanoparticles resonant conditions. Since electrostatic effect also induces the light emitting enhancement[3], we also studied the image effects caused by induced electronic field for Ag nanoparticles at off-resonant conditions. These localized surface plasmon interactions dominated the PL enhancement at resonant frequency and electrostatic dominated at off-resonant frequencies.

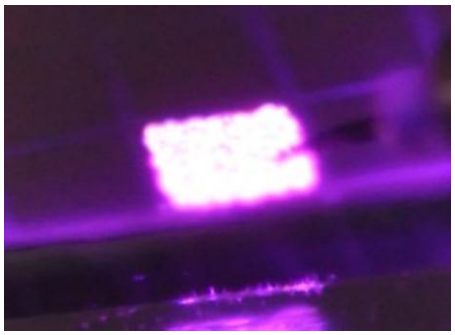

Figure 1: EL emission of ZnO nanoparticles based LED.

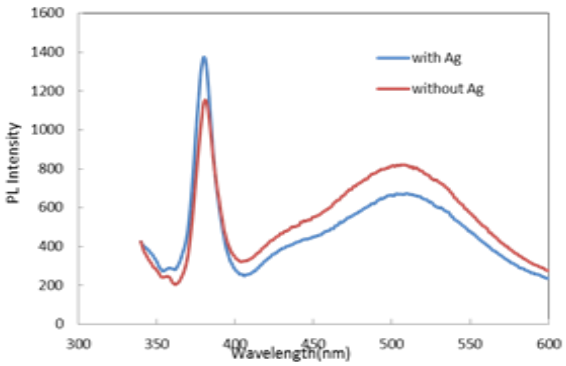

Figure 2: PL emission intensity for ZnO nanoparticles with and without Ag.

Acknowledgements

this work is supported by JSPS KAKENHI Grant Number 25630150.

Reference:

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