Peak shift and Temperature effects in ZnO nanoparticle-based solution-processed LEDs

○ (D) Raj Deep[1], Islam Mohammad Shafiqul[2], Akazawa Takuma[1], Toshiyuki Yoshida[1],

Yasuhisa Fujita[1]

Graduate School of Natural Science & Technology, Shimane University[1]

Interdisciplinary Graduate School of Science & Engineering, Shimane University[2]

E-mail: n21d103@matsu.shimane-u.ac.jp

Solution-processed optoelectronic and electronic devices are attractive owing to the potential for low-cost fabrication of large-area devices and the compatibility with lightweight, flexible plastic substrates. However, the overall performance of solution-processed including their efficiency, efficiency roll-off at high current densities, turn-on voltage, and lifetime under operational conditions remains inferior to that of the best vacuum-deposited LEDs [1]. Humidity and temperature are some of the important parameters that determine the device's lifetime. In this study, we studied the effects of temperature variation in ZnO nanoparticle-based solution-processed LEDs.

We fabricated ZnO nanoparticle-based solution-processed LEDs [2]. The output emission of the LEDs was in the near-UV region. We varied the surface temperature of the LEDs using a Peltier module and the temperature was recorded by a thermal camera as shown in figure 1. We studied the LEDs parameters like Electroluminescence (EL) and *I-V* characteristics by varying the surface temperature of the LEDs. Results were also measured by varying injection current into the LEDs at variable temperatures. Figure 2 depicts the redshift as the input voltage was increased due to the higher injection current density. The device fabrication process and thermal analysis will be discussed in detail.

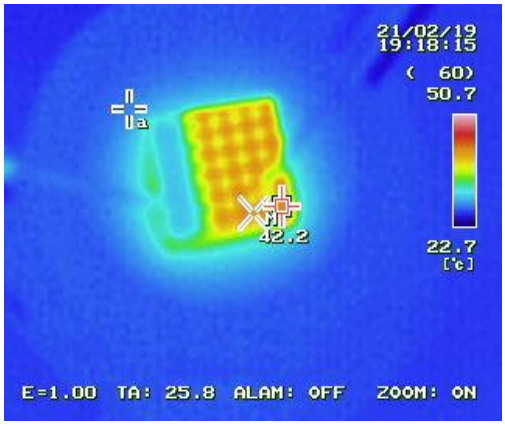

Figure 1. Thermal image of the LED.

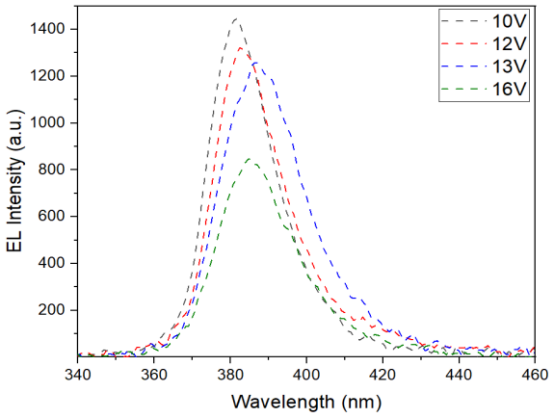

Figure 2. EL spectra of the LED.

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References

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