Proceedings of the International Conference of Theoretical and Applied Nanoscience and Nanotechnology (TANN'17)
Toronto, Canada – August 23 – 25, 2017
Paper No. 113
DOI: DOI: 10.11159/tann17.113

The Manufacture and Property of Nano-Sized InGaN/GaN Light Emitting Diodes

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Extended Abstract

It is crucial to fabricate nano photonic devices such as nano-LED in order to meet the requirements for the integration of photonic and electronic circuits on the nanometer scale [1-3]. The great difficulty is to fabricate traditional LED down to nano-size.

The GaN based LEDs with array nanorods structure have been fabricated by utilization of nanoimprint lithography (NIL). The sample structure is illustrated by Fig. 1. It demonstrates the uniform and bight emission, lower leakage current (~10-7), optimized turn on voltage (~3V). The luminescence property of nanorod LED is shown as Fig. 2. It is confirmed that strain accumulated in the film was released, quantum-confined Stark effect was reduced, the wave function overlap of electron and holes was increased and light extraction efficiency was improved.

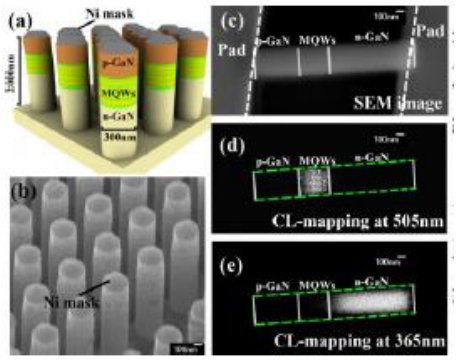

Fig. 1: The sample structure of nano-LED.

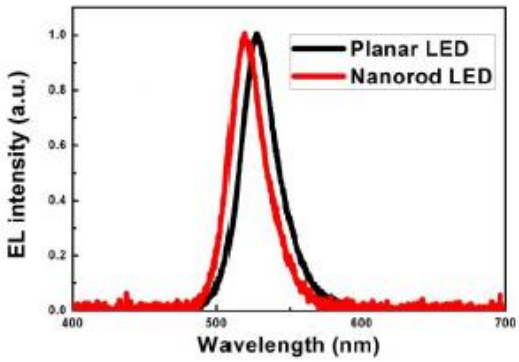

Fig. 2: The luminescence property of nanorod LED.

References

[1] Y.-J. Lu, M.-Y. Lu, Y.-C. Yang, H.-Y. Chen, L.-J. Chen and S. Gwo, *ACS Nano,* vol. **7,** pp. 7640-7647, 2013.

[2] Q. Zhang, G. Li, X. Liu, F. Qian, Y. Li, T. C. Sum, C. M. Lieber and Q. Xiong, *Nat Commun,* vol. 5, 2014.

[3] M. Tchernycheva, P. Lavenus, H. Zhang, A. V Babichev, G. Jacopin, M. Shahmohammadi, F. H. Julien, R. Ciechonski, G. Vescovi and O. Kryliouk, *Nano Letters,* vol. 14, pp. 2456-2465, 2014.

[4] Z. Zhe, G. Xu, Z. Guogang, L. Bin, Z. Rong, Z. Ting, T. Tao, G. Haixiong, R. Fangfang, X. Zili and Z. Youdou, *Nanotechnology,* vol. 24, p. 405303, 2013.