Optically and electrically improved graphene/metal mesh hybrid transparent electrodes via UV-ozone treatment for near-ultraviolet GaN-based LEDs.

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Abstract

By introducing optically and electrically improved graphene/metal mesh hybrid transparent electrodes (TEs) via UV-ozone treatment for near-ultraviolet (NUV)-range gallium-nitride (GaN)-based light emitting diode (LED) applications, this study offers a practical solution. The UV-ozone treatment of the transferred graphene serves oxidation doping and surface contamination removal, with the added benefit of optical transmittance improvement [1,2]. The hybrid TEs, applied to various UV-ozone-treated graphene with a metal mesh, are tested on GaN-based 375-nm NUV LED [3]. The results demonstrate a significant increase in light output power, with a 48.3% increase compared to the untreated LED and 18.3% increase compared to the conventional ITO-based LED, after just 300 seconds of treatment. This research paves the way for overcoming ITO limitations for UV applications, inspiring the commercialization of graphene-based optoelectronics.

References

[1] Yuan, J. et al, ACS Nano, 7(5), (2013) 4233-4241
[2] GÜNeŞ, F et al, Nano, 06(05) (2011) 409-418
[3] J.H. Min et al, RSC Advances, 5(92) (2015) 75325-75332

Figures

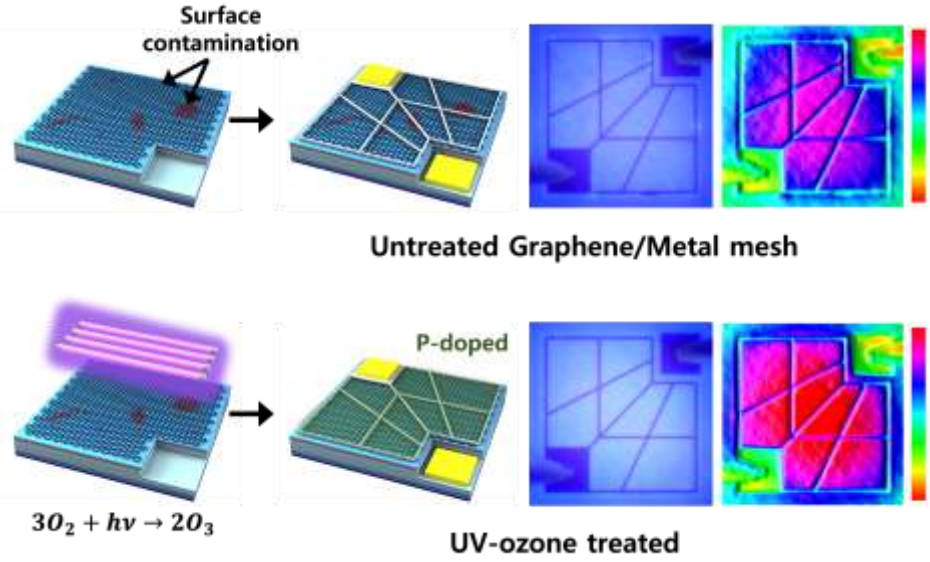

Figure 1: Schematics of untreated and UV-ozone-treated hybrid TEs models and emission and intensity contour images of hybrid TEs applied NUV LEDs.