Bio-Integrated Flexible GaN LED

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BIOGRAPHY

Keon Jae Lee: Prof. Keon Jae Lee received his Ph.D. degree from the University of Illinois, Urbana-Champaign, in 2006. During his Ph.D course at UIUC, he was involved in the first co-invention of "High Performance Flexible Single Crystal Electronics", called microstructured silicon and GaN. From 2006 to 2008, he conducted a joint research project of Unisantis (Japan) and IME (Singapore) in the field of three dimensional surrounding gate nano-transistors (SGT) for the future logic technology. Since 2009, he has been an Assistant Professor in MSE at KAIST. His current research interests are flexible and nanobio devices for health, self-powered energy, and electronic applications.

TECHNICAL ABSTRACT

Keywords: Flexible GaN LED, Bio-integrated LED, Biosensor, Invivo f-LED, Self powered energy harvesting

III-V LEDs have superior characteristics, such as long-term stability, high efficiency, and strong brightness compared to OLED. However, due to the brittle property of inorganic materials, III-V LED limits its applications for the flexible electronics. This seminar introduces the flexible GaN LED on plastic substrates that is transferred from bulk GaN wafers. The superb properties of the flexible GaN LED in terms of its wide band gap and high efficiency enable the dramatic extension of not only consumer electronics but also the implantable biomedical applications. A bio-integrated LED is demonstrated as a prototype for detecting a cancer or even treating a disease in invivo condition. These results show that the III-V based flexible LED can be used as the future flexible light source and a type of implantable LED biomedical applications.

This seminar also introduces a highly efficient and printable BaTiO3 thin film nanogenerator on plastic substrates. Energy harvesting technologies converting external biomechanical energy sources (such as heart beat, blood flow, muscle stretching and animal movements) into electrical energy is recently a highly demanding issue in the materials science community. Herein, we describe procedure suitable for generating and printing a lead-free microstructured BaTiO3 thin film nanogenerator on plastic substrates to overcome limitations appeared in conventional flexible ferroelectric devices.

Fig 1. Flexible GaN LED
Fig 2. Schematic of bio-integrated flexible LED rolled upon blood vessel.

Fig 3. Schematic of flexible self-powered nanogenerators.

References

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