

Polarization Dependent Flexible GaN Film Nanogenerators and Electroluminescence Properties

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Abstract : We present that the electroluminescence (EL) properties and electrical output power of flexible N-face p-type GaN thin films can be tuned by strain-induced piezo-potential generated across the metal-semiconductor-metal structures. Under different staining conditions (convex and concave bending modes), the transport properties of the GaN films can be changed due to the spontaneous polarization of the films. The I-V characteristics with the bending modes show that the convex bending can increase the current across the films by the decrease in the barrier height at the metal-semiconductor contact, increasing the EL intensity of the P-N junction. At convex bending, it is also shown that the flexible p-type GaN films can generate an output voltage of up to 1.0 V, while at concave bending, 0.4 V. The change of the band bending with the crystal polarity of GaN films was investigated using high-resolution photoemission spectroscopy. This study has great significance on the practical applications of GaN in optoelectronic devices and nanogenerators under a working environment.

Keywords : GaN, flexible, laser lift-off, nanogenerator

Conference Title : ICMSAPE 2014 : International Conference on Materials Science, Applied Physics and Engineering

Conference Location : Los Angeles, USA

Conference Dates : September 29-30, 2014