Ga2O3/GaN HETEROSTRUCTURE FOR DEEP UVC SENSING AND LED APPLICATIONS

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Introduction

The objective of this work is to develop a Ga2O3(β-phase)/GaN diode structure suitable for deep UVC sensing and LED emitting safe UV light that can't penetrate human skin and eye and therefore may be used as disinfectant in public settings for a very broad range of applications, such as healthcare, water purification, sterilization, and sensing [1].

Methods

Diodes comprising of n-type β-Ga2O3 (Si-doped) deposited on p-type GaN (Mg-doped) were manufactured by metal-organic chemical vapor deposition and pulsed laser deposition technology on undoped GaN on sapphire substrates. Reliable stoichiometry and thickness control of the (-201) oriented n-Ga2O3 were provided by PLD technique [2] while and state-of-the-art hole conductivity of the p-GaN were obtained by activation by RTP in N2 environment [3]. Typical resulting hole concentrations and mobilities were 5x1017 cm-3 and 9 cm2/Vs, respectively. Ohmic contacts to n-type Ga2O3(Si) were formed by depositing Ti/Au followed by RTP at 470 °C for 1 min in N2 and to p-type GaN(Mg) by depositing Ni/Au 20/100 nm with no annealing.

Results

Electrical characterization by I-V measurement was performed. Clear diode behavior can be observed. The diode structures were investigated for sensor applications with the photo current response measured for room light and UV light with a wavelength of 275 nm at different intensities of UV excitation light. Clear UVC response and visible blind characteristics was observed.

Conclusion

A Ga2O3(β-phase)/GaN diode structure suitable for deep UVC sensing and LED was successfully demonstrated by photo response and visible blind characteristics.