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SYNTHESIS AND ELECTRICAL CHARACTERIZATION OF GaN GROWN BY ELECTROCHEMICAL DEPOSITION

ABSTRACT

The III-Nitride semiconductor materials are wide bandgap materials and can be crystalline as the structure of wurtzite and zinc-blende types. Wurtzite InN, GaN and AlN have direct bandgap 1.9 eV, 3.4 eV and 6.2 eV, respectively [1]. GaN is an extremely promising material for the blue and white light-emitting diodes LEDs, laser and detectors [2].

In this study GaN thin films were deposited on Si (111) substrates at room temperature using an electrochemical technique. The deposition was done by placing the Si substrate in a solution of $\text{Ga}(\text{NO}_3)_3$ and NH_4NO_3 in deionized water at room temperature and applying a current density of 1 mA/cm². Good quality of Schottky diode was fabricated on the GaN thin films, with IV barrier height of 0.68 eV and CV barrier heights of 0.97 eV for GaN deposited using 1 mA/cm² current density. Deep-level transient spectroscopy measurements were performed, and electron traps with an activation energy of 0.47 eV and 0.29 eV were observed in GaN thin film grown by the electrochemical deposition technique. A more detailed explanation for GaN will be discussed and related to the structural and morphological of a sample using the X-ray diffraction, scanning electron microscopy.

Keywords: GaN, electrochemical deposition, Schottky diodes, DLTS, characterization.

References

- [1] Nakamura, Shuji, et al. "High-brightness InGaN blue, green and yellow light-emitting diodes with quantum well structures." Japanese journal of applied physics 34.7A (1995): L797.
- [2] S.J. Pearton, C.R. Abernathy, F. Ren, Gallium Nitride Processing for Electronics, Sensors and Spintronics, Springer, London, 2006.

Apply to be considered for a student ; award (Yes / No)?

Yes

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PhD

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