Characteristics of p-Cu_2O/n-GaN Heterojunction Prepared via Reactive Radio Frequency Magnetron Sputtering

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In this work, p-type cuprous oxide (Cu_2O) thin films were deposited on n-type gallium nitride (GaN) by radio frequency (RF) magnetron sputtering. The target used for deposition Cu_2O films was 3 inch diameter solid copper target with purity of 99.99%. The reactive sputtering was performed in a mixture of argon (Ar) and oxygen (O_2) gasses. The Ar flow rate was fixed at 16 sccm and the O_2 flow rate was varied from 2 to 4 sccm. The RF power and the deposition period was 200 W and 60 min, respectively. Structural and electrical properties of the Cu_2O/GaN heterojunction were studied. The X-ray diffraction results showed that the Cu_2O films were single phase polycrystalline with cubic structure. The surface morphologies and film thicknesses were obtained from field emission scanning electron microscope. For the electrical part, ohmic metal contact on Cu_2O and GaN thin films were formed using silver and aluminium, respectively. The type of conductivity, resistivity, carrier concentration and Hall mobility were determined by Hall Effect system based on the Van der Pauw technique. The Cu_2O/GaN heterojunction current-voltage (I-V) characteristics were examined using Keithley 4200-SCS semiconductor characterization system. Parameters such as threshold voltage and ideality factor from the I-V curves will be extracted.