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Abstract
In this study, indium tin oxide(Ni-ITO)、zinc oxide(ZnO)、Aluminum-doped zinc oxide(AzO) films were deposited on double-polished sapphire by magnetron sputtering. After the deposition, the thin films were then thermally annealed(Furnace and RTA) in nitrogen ambient to alter their optical transparency and electrical resistivity.
The resistivity was measured with a Hall measurement method. The crystal structure was studied by X-ray diffraction.The optical transmittance measurements were carried out with a UV/visible spectrophotometer. Photoluminescence was performed to observe the optical properties of the thin films.
In addition, the thin films were applied to the device fabrication, which are disposed on the p-GaN layer. Before the formation of p-electrodes on the p-GaN，one needs to active the Mg atom in the Mg-doped GaN epitaxial layers so as to enhance its electric conductivity. The active condition is 750 ℃in nitrogrn ambient for 40min. In addition, to form a selective activation region in the Mg-doped GaN, silicon dioxide films were selectively deposited on the Mg-doped GaN layer before the thermal annealing process. It should be note that the SiO2-covered region exhibited a high-resistivity property behaving like a insulator or called intrinsic layer.
Finally, the transparent conductive oxide(TCO) films were also deposited onto the GaN layers to form the P-I-N or P-N structure. The Schottky barrier heights were evaluated by I-V and I-V-T characteristics. In addition, ultraviolet (UV) photodetector(PD) could exhibit a band-pass spectral responsivity ranging from 340 to 370 nm.
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