



Analyzing the AlGa_N/AlN/GaN Heterostructures for HEMT Applications

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Abstract



References



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In the present work, we have reported two high-electron-mobility transistor structures (HEMTs) with different thick AlN buffer deposited on sapphire substrates by metal-organic chemical vapor deposition (MOCVD). AlN buffer layer has a critical important for the device performance therefore its effect of heterostructures analyzed using mosaic model. AlGa_N/AlN/GaN heterostructures were examined by X-ray diffraction (XRD) and Atomic-force microscope (AFM). In order to evaluate the mosaicity of GaN, AlGa_N, AlN layers in the structures, mosaic model was also used. These layers of lateral and vertical crystal size, dislocations, tilt and stain are investigated with HR-XRD device by Vegard and William Hall (WH) semi-experimental methods. According to the XRD results; As the buffer layer thickness decreases, the FWHM values of symmetric (002) and asymmetric peaks (105) of epitaxial layers increase. The thicker buffer layer makes the structure more crystalized. According to the AFM results the lower thickness AlN buffer has more frequent pits and hillocks and has more rough. As a result, the 520 nm thick AlN buffer layer showed a better structural performance.

Keywords: AFM; ALGAN/ALN/GAN; HETEROSTRUCTURES; MOCVD; XRD

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