

TEM Study of GaN Thick Film Crystals Grown by HVPE

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Gallium nitride (GaN) semiconductor is intensively under investigation for commercialization of short wavelength light emitting devices and laser diodes. One of serious obstacles to overcome is to reduce the defect density in GaN film grown by various techniques such as MOCVD, HVPE, etc. Many research groups including SAIT are trying to improve the defect density to $10^6 - 10^7/\text{cm}^2$ from the level of $10^8 - 10^{10}/\text{cm}^2$. We have investigated epitaxial growth behaviour of GaN thin and thick films under hydride vapour phase epitaxy (HVPE) condition. In this report, we present the microstructural and crystallographical characteristics of the GaN films grown on sapphire(0001) substrate which were studied by both conventional and high-resolution transmission electron microscopy (TEM). Also we present some microscopic analysis results obtained from GaN films grown by ELO(epitaxial lateral overgrowth)-HVPE and from GaN quantum well structures grown by MOCVD. Another serious problem in growing GaN thick film by HVPE is internal micro-cracks. We also comment the origin of the micro-crack.

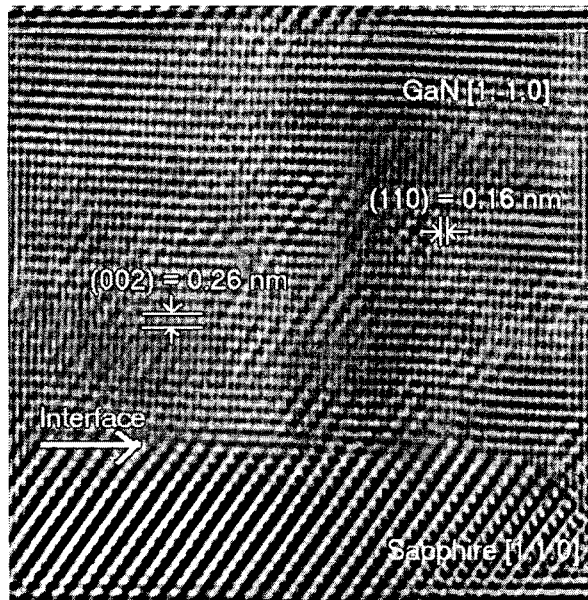


Fig.1 TEM lattice image of GaN[1,-1,0]thick film grown on sapphire(001).

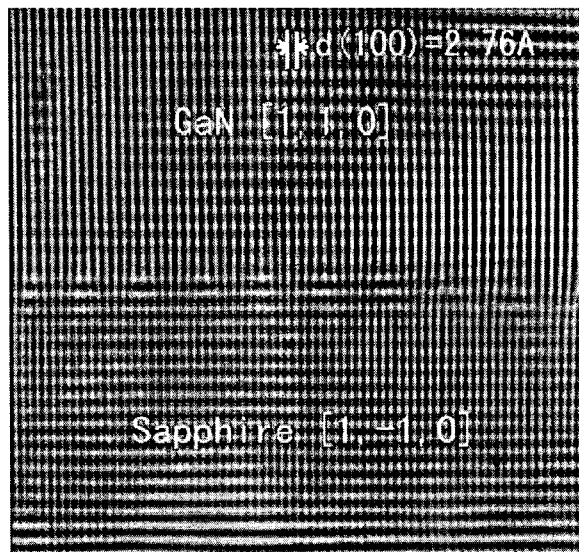


Fig.2 TEM lattice image of GaN[1,1,0] thick film grown on sapphire(001), showing edge dislocations corresponding to lattice mismatch ratio at the interface.