Orientation and structural quality of the deposited GaN layers were assessed by means of x-ray diffraction measurements. It was found that the GaN film grows along [0001] direction. Figure 4 shows an omega x-ray diffraction rocking curve of (0002) GaN reflection. The full width at half maximum (FWHM) of the x-ray rocking curve is 546 arcsec. It should be noted that this value is more than twofold larger than typical FWHM values for GaN layers grown on sapphire substrates. Rather broad XRD rocking curve indicates that optimum growth conditions have not been achieved yet.

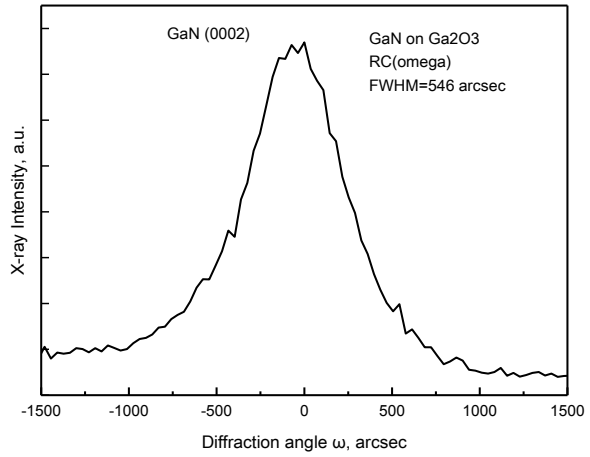

Fig. 4. X-ray diffraction ω-scan of GaN epitaxial film on β-Ga_2O_3 substrate.

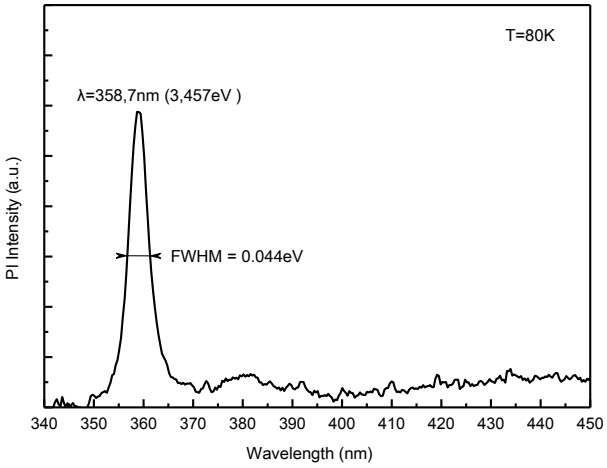

Fig. 5. Low temperature (80K) photoluminescence spectrum of the GaN epitaxial film on β-Ga_2O_3.

Optical quality of the GaN films was analysed by photoluminescence (PL) measurements. PL spectra were obtained at liquid nitrogen temperature (80K) using pulsed nitrogen laser excitation (337 nm). Typical PL spectrum for the GaN film on β-Ga_2O_3 substrate is shown in Figure 5. A strong bandedge emission peak centred at 358.7 nm was observed. A low intensity bump at 385 nm (3.2 eV) is possibly related to donor-acceptor pair recombination. The FWHM of the dominant peak is 44 meV, which is comparable to that for GaN layers grown on sapphire. The intense and narrow band-to-band transition indicates high optical quality of the GaN layer.

4. Conclusions

In conclusion, β-Ga_2O_3 crystals were grown from melt by seedless crystallisation. The crystals were cleaved into (100) platelets which were used as substrates for GaN epitaxial

growth. To the best of our knowledge this is the first report on GaN growth on β-Ga_2O_3 substrates by HVPE technique. Although the quality GaN epitaxial films was somewhat inferior when compared to that of GaN films grown on sapphire under optimised conditions, the initial results provide a compelling proof of concept of β-Ga_2O_3 as a new substrate material for GaN growth.

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