Enhancement of Photoluminescence and Microstructure of Undoped ZnO Thin Film Growth on Al_2O_3 (0001) Substrate by rf Magnetron Sputtering

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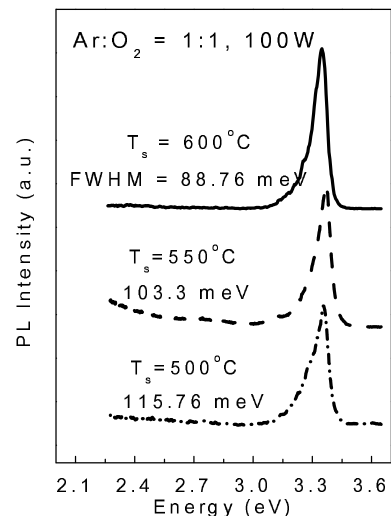

Fig. 1 PL spectra for ZnO thin film deposited at 100 W with the variation of substrate temeratures.

Due to wide band gap of 3.34 eV and large exciton binding energy of 60 meV at RT, ZnO has been emerging as a promising material for UV emission device. ZnO films were epitaxially grown by conventional rf magnetron sputtering on (0001) c-plane sapphire, and crystalline structure and optical properties have been investigated using Rutherford Backscattering Spectrometry (RBS), Photoluminescence (PL) and Transmission Electron Microscope (TEM). From the RBS analysis, the ZnO film deposited at 600°C and 120 W shows channeling yield minimum of 3.6 % at the surface. In PL measurement, only near band edge emission was observed at RT. The FWHM of PL peak was decreased from 115.76 meV to 103.3 meV as substrate temperature increased from 500□ to 550□, and that at 120 W and 600℃ showed 88.76 meV. In this study the effect of oxygen partial pressure and crystalline quality on PL properties were discussed.

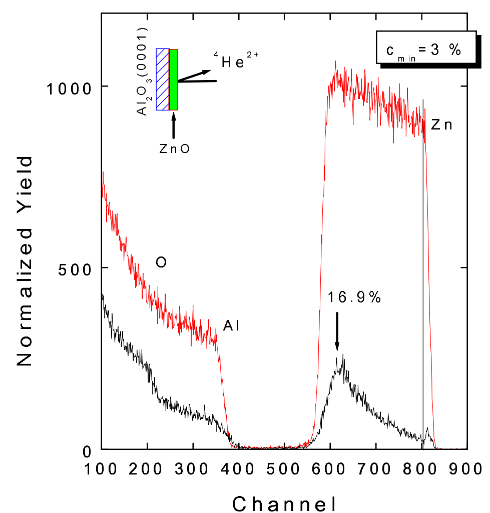

Fig. 2 RBS/Channeling spectra for ZnO film deposited at 600 °C, 120 W