DETERMINATION OF EMITTER PARAMETERS IN GaInP/GaAs HETEROJUNCTION BIPOLAR TRANSISTORS BY X-RAY DIFFRACTION

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GaAs heterojunction bipolar transitors (HBT's) are key microelectronic components, which have been widely used in digital wireless and cellular applications as well as in fiber-optic telecommunication systems. GaInP has been shown to be a preferred emitter material over conventional AlGaAs due to improved device performances and easier processing control. To model the device performance and to have a better control of device processing, it is necessary to accurately determine all the device structural parameters. At Nortel Networks, several different analytical tools have been employed to determine the thickness, composition and doping levels throughout the HBT structure. Here we report a fast turnaround, non-destructive way to accurately determine the GaInP emitter parameters.

Several different device structures and wafers from both in-house and outside venders were investigated. The X-ray diffractometer used in this study was a Philips MRD system. Both (004) and (002) reflections were measured. Dynamical simulations were performed for all the acquired data through which both the layer thickness and alloy composition were determined. Emitter thickness determined from X-ray diffraction measurements agrees well with that measured by transmission electron microscopy to within 1%. Detailed results will be presented at the conference.