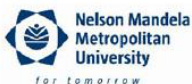




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ANOTHER METHOD TO DETERMINE THE REFRACTIVE INDEX OF Al_xGa_{1-x}N

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1. Introduction

AlGa_xN alloys continue to be of great interest due to the application of these alloys in high-power, high-temperature and high-frequency devices such as field-effect transistors, UV-light emitting LED's and laser diodes¹⁻³. A range of different electrical and optical properties can be obtained by varying the alloy composition of Al_xGa_{1-x}N by changing the amount of Al in the alloy. The characterization of these alloys to determine the various physical properties as a function of Al content is therefore necessary. Optical characterization is preferred as this technique has the advantage of being non-contact and non-destructive.

In this work, the use of infrared reflection spectroscopy to evaluate Al_xGa_{1-x}N epilayers grown with varying Al content by metalorganic vapour phase deposition (MOCVD) on sapphire substrates was investigated. The layer thickness was readily determined using interference fringes in the reflectance spectra of the samples⁴. However, this requires knowledge of the refractive index *n* as function of the wavelength. Determination of the refractive index of Al_xGa_{1-x}N is challenging, since the refractive index is a function of wavelength and the aluminium content of an Al_xGa_{1-x}N sample, as well as the temperature of the sample⁵. A number of techniques have been reported for the determination of the refractive index for Al_xGa_{1-x}N, including from the refractive indexes of AlN and GaN, ellipsometry measurements or Sellmeier type equations⁶.

The present investigation aims to provide an alternative method to determine the refractive index of Al_xGa_{1-x}N at room temperature. The method is based on the manipulation of earlier published experimental results⁶ (Fig.1) and relations from the slope and y-intercept of straight line graphs. The new formulation was then employed to obtain the thickness of the measured Al_xGa_{1-x}N epilayers, using the observed interference fringes (Fig. 2).

1. Results

Fig. 1 Examples of straight-line fits of previous results

Fig. 2 Interference spectra of two Al_xGa_{1-x}N epilayers

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