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Determination of the band gap of AlGaN epilayers by FTIR reflectance spectroscopy

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Abstract content
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AlGaN alloys are used in high-power, high-temperature and high-frequency devices such as field-effect transistors, UV-light emitting LED's and laser diodes. Different electrical and optical properties can be obtained by varying the alloy composition of AlxGa1-xN by changing the amount of Al in the alloy. It is therefore essential to characterize the alloys to establish the various physical properties as a function of Al content.

Optical characterization is preferred as this technique has the advantage of being non-contact and non-destructive. In this work, infrared reflection spectroscopy was employed to evaluate 5 AlxGa1-xN epilayers grown with varying Al content by metalorganic vapour phase deposition (MOCVD) on sapphire substrates. Samples were investigated using a Bruker V80 FTIR/Raman instrument, in the wavenumber range 50000 – 10 cm-1. Measurements were taken at room temperature at 8 cm-1 resolution, using a Pike 10Spec specular reflection attachment, taking 100 scans. The band gap of the respective samples is obtained from the obtained reflectance spectrum at the transition between the interference fringes and a straight line in the spectra. In addition, the thickness of the layers could be obtained from the interference fringes. Results obtained indicated that the band gap varied between 3.6 and 5.1 eV, while the epilyer thicknesses were between 0.9 and 1.3 □m. The results corresponded very well with data obtained by techniques such as photoluminescence and growth parameters.

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