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Study of structural damage in InGaN and InAlN thin films due to Cu⁺ ion irradiation

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In ion irradiation studies, ion beam bombardment is known to cause the formation of defects in thin films. Efforts in ion implantation studies on III-nitride thin films include ion modification of structural properties of the materials in order to induce improvements within the materials. In this work, InGaN and InAlN thin films, 20 nm thick grown on sapphire with GaN buffer layer, were irradiated with 130 keV 64Cu⁺ ions at various ion fluences ranging from 5 x 10¹⁵ to 5 x 10¹⁶ ions/cm². The ion irradiated samples were analyzed using Rutherford backscattering Spectrometry (RBS), Scanning Electron Microscopy (SEM), Raman Spectroscopy (RS) and X-ray diffraction (XRD). RBS analysis showed a reduction in the thicknesses of the InGaN and InAlN top layers after ion irradiation at high fluences. Peak shifts observed from Raman spectra may suggest recrystallization in the top film due to ionization by the incoming ion beam as observed from previous studies.

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Dr. M. Madhuku
iThemba LABS
madhuku@tlabs.ac.za

Primary author: Mr KHOELE, Joshua (iThemba LABS)

Co-authors: Dr MADHUKU, Morgan (iThemba LABS); Dr MOLOI, Sabata (University of South Africa)

Presenter: Mr KHOELE, Joshua (iThemba LABS)

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