



BILKENT UNIVERSITY

unam - INSTITUTE of MATERIALS SCIENCE & NANOTECHNOLOGY

FACULTY OF SCIENCE

**MATERIALS SCIENCE and NANOTECHNOLOGY
GRADUATE PROGRAM SEMINAR**

**“Optical and structural properties of InN and InGaN layers
grown by High Pressure CVD”**

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Indium nitride and indium-rich group III-nitride alloys are promising materials for advanced optoelectronic device applications. Indium-rich alloys, e.g. $(\text{Ga}_{1-y}\text{Al}_y\text{In}_x)\text{N}$ will enable the fabrication of high-efficient light emitting diodes, THz emitters, radiation hardened magneto/optoelectronics, spectral tailored detectors, or advanced device structures for high speed optoelectronics and optical communication. The present limitation in this area is the growth of high quality indium-rich group III-nitride alloys at processing conditions compatible with wide band-gap III-N is a great challenge due to low growth temperatures required to stabilize the indium-rich alloys. The use of high-pressure chemical vapor deposition (HPCVD) allows the growth of single crystalline^{1,2} high quality InN at temperatures up to 850 °C at reactor pressures around 15 bar. Utilizing the pressure dependency of the thermodynamic growth parameter is a pathway to merge the processing window for the growth of indium-rich group III-N alloys and heterostructures. Results on the structural and optical properties of InN and InGaN layers grown by HPCVD are presented. Single crystalline InN layers grown at growth temperatures of 800-850 °C and reactor pressure at 15 bar are of high structural quality with XRD FWHM better than 200 arcsec demonstrating that the growth at elevated pressures successfully counters the decomposition of volatile nitrogen constituents. Additional experimental results and analysis on luminescence, infrared reflection, Raman measurements and transmission measurements are presented. Structural and optical characterization of $\text{In}_{1-x}\text{Ga}_x\text{N}$ epilayers are also presented for various growth temperatures and V/III molar ratio..

1. **M. Alevli**, G. Durkaya, W. Fenwick, A. Weerasekara, V. Woods, I. Ferguson, A. G. U. Perera and N. Dietz, **App. Phys. Lett.**, **89** pp. 112119 (2006).
2. N. Dietz, **M. Alevli**, R. Atalay, G. Durkaya, R. Collazo, J. Tweedie, S. Mita, Z. Sitar **Applied Physics Letter** , **92**, 041911 (2008)

Date : August 13, 2010 (Friday)

Time : 15:40

Place : Faculty of Science Building, A Block, Seminar Room (SA 240)

Tea will be served after the seminar