TITLE

Plasma-Assisted Atomic Layer Epitaxy of Cubic and Hexagonal InN Films and its alloys with A1N at Low Temperatures

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This Application claims the benefit of U.S. Provisional Application 61/661,016 filed on June 18, 2012.

BACKGROUND

[0002] Among III-nitride semiconductors, indium nitride (InN) has the smallest direct band gap, largest electron saturation velocity and mobility, and smallest electron effective mass. It has long been an attractive semiconductor material for application in optical, electrical, and optoelectronic device technologies such as solar-cells and high electron mobility and high frequency devices. The most thermodynamically stable phase of the InN is a wurtzite structure (a hexagonal phase), however, the growth of zincblende (a cubic phase) InN on InAs/GaAs has been demonstrated at 450 °C by plasma assisted molecular beam epitaxy (MBE) . Cubic InN has a smaller band gap and superior electronic properties as its lattice is isotropic and possesses lower phonon scattering.

BRIEF SUMMARY

[0003] In a first aspect of the present disclosure, there is provided ~~one embodiment,~~ a method for growing indium nitride (InN) materials, comprisinges growing hexagonal and/or cubic InN using a pulsed growth method at a temperature lower than 300 °C.

[0003a] In a second aspect of the present disclosure, there is provided a material comprising InN in a face-centered cubic lattice crystalline structure having an NaCl type phase.

BRIEF DESCRIPTION OF THE DRAWINGS

[0004] FIG. 1 shows variation of growth rate (GR) and In/N ratio with a trimethylindium (TMI) pulse of 0.06 seconds.

[0005] FIG. 2 depicts the x-ray diffraction (XRD) peaks from three of the samples - namely InN (60nm) on GaN/$A1_2O_3$ template with T_g=183°C (top) and on a-plane $A1_2O_3$ with T_g= 240°C (middle) and 183°C (bottom)).