Multiple Quantum Well (MQW) InGaN Photo-detector nanostructures for detection of Selective Wavelengths

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Group III nitride wide band gap semiconductors have recently attracted considerable interest due to their applications for optical devices operating in the blue and ultraviolet (UV) wavelength regions. These materials were also found to be suitable for operation at high power levels, high temperatures and harsh environments. One of the main reasons for these III nitrides to have attracted a major attention in the last decade is due to their direct band gap and the ability to vary the band gap between 6.2eV for AlN to 1.89eV for InN by varying the alloy composition.

In this work, we take the advantage of these properties to design an InGaN MQW photo detector. The photo detector is used to detect selective wavelengths which will help us build a Raman system test bed for natural gas composition at near IR or visible wavelengths.

Growth of these MQW's is performed using Metal Organic Chemical Vapor Deposition (MOCVD) using Trimethyl Gallium (TMGa), Trimethyl Indium (TMIn) and Ammonia (NH_3) as precursors. The effect of number of MQW's and also the V / III ratio is discussed. Results from transmission line spectroscopy show that we could detect wavelengths around 410nm, and X-ray diffraction results show that the type of surface of the substrate used for these MQW growth effects the properties of the sample. From the results we have been able to establish that it is possible to fabricate devices using a combination GaN/InGaN MQW's to detect selective wavelengths by varying the composition of Indium in $In_xGa_{1-x}N$.