T-P04

InAs/GaSb Superlattice Detector Operating at Room Temperature

Sang Jun Lee[1], Sam Kyu Noh[1], Sanjay Krishna[2]

[1]Korea Research Institute Standards and Science, [2]University of New Mexico, USA

Type II InAs/GaSb superlattice(SLs) infrared detector emerges in recent years has shown its great potential for operating at room temperature and sensing in a wide range from 2 ㎛ up to 30 ㎛ at least. The performance of the strain layer superlattice infrared detectors (SLIP) based on these alloys are extremely good with a large quantum efficiency (~30-60%) and long carrier lifetime (~㎲). In this presentation, Optimization of various growth parameters for GaSb/InAs nanoscale superlattices and GaSb layers, grown by solid molecular beam epitaxy, has been undertaken. These include the As/Sb soak times and substrate temperature during the growth. We present optical and structural characterizationfor these heterostructures, using high resolution X-ray diffraction (HRXRD), photoluminescence (PL) and atomic force microscopy (AFM). Optimized parameters were then used to grow a thick structure suitable for mid-infrared detection. The n-i-p diodes were grown and fabricated with 300 periods of 8ML InAs/8ML GaSb SLS in the active region. Fig. 1. shows normalized spectral response from a 300㎛ diameter device for different temperatures. The spectral response from the SLS detector was clearly visible at 300K (at V_b = -0.3V). The cut-off wavelength was shifted from ~ 4.5 ㎛ at 77 K to ~ 5 ㎛ at 300K. Johnson noise limited D* reaches 4.6×10^9 cmHz $^{1/2}$/W at V = -0.3V. Scattering in the substrate was ignored for these measurements. This is the highest reported Johnson noise limted D* at room temperature for SLIP.

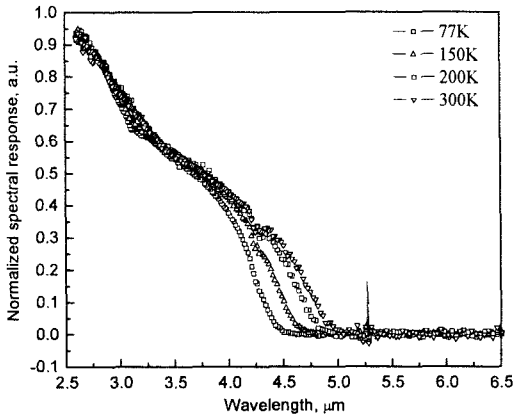

Fig. 1. The normalized spectral response from a 300 ㎛ diameter device for different temperatures.