

Smart Materials & Structures

June 15 -17, 2015 Las Vegas, USA

Effect of interfacial layer on the performance of Type-II In As/GaSb superlattices infrared photodetectors

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Infrared photo detector can be used for a variety of applications in the industrial, security, military, scientific, and medical areas. Various device materials been used for the growth of infrared device structures, such as quantum dots, quantum well and Type-II superlattices (T2SL). InAs/GaSb T2SLs are a considerable interest the last decade as a promising candidate in middle and long infrared photodetector and imaging application. InAs/GaSb T2SL was proposed by Sai-Halase *et al.* in 1977 [1]. The T2SL is formed by alternating InAs and GaSb layer over several periods. These structure have broken-gap energy alignment, where the separation of electrons and holes into the InAs and GaSb, respectively. The T2SL can be easily tuning optical and electronic properties by varying the layer thickness. One of major challenge is the control of overall strain, caused by the small lattice mismatch between InAs and GaSb.

In this study, we report on the optical and electrical device performance of T2SL based infrared photodetectors. The T2SL of p-i-n structure were grown using molecular beam epitaxy with As₂ and Sb₂ cracker source on a n-type GaSb substrate. We used an InSb interfacial layer for the strain compensation. The high-resolution x-ray diffraction (HR-XRD) and fourier transform infrared spectroscopy (FTIR) are used for structural and optical characterization. The cut-off wavelength of T2SL was red shifted (~0.14 μm) at 77 K due to the InSb interfacial layer. In order to demonstrate the effect of InSb interfacial layer were compared using the dark current.

Biography

Jun Oh Kim received the Ph.D. degree in physics from Kyunghee University, Korea, in 2010. His research interests include physics and development of infrared optoelectronic devices, including semiconductor detectors, lasers, and photovoltaic devices. He specializes in III-V semiconductor growth, device fabrication, and characterization. He has been an author for more than 30 publications in various in peer reviewed journal, participated in multiple conferences.

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