Temperature Dependence of Quantum Dots-In-Well Infrared Photo Detectors (QDIPs) using Photoluminescence

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Abstract: ***A research of quantity dots-in-well infrared photo detectors (QDIPs) produces helpful outcomes for creating a two-color QDIP. Quantum dot infrared photo detectors (QDIPs) have been shown to be a main technology in mid-and long-wavelength infrared detection owing to their capacity for normal incidence operation and low dark current. This research explores infrared detectors based on intersubband transitions in a novel heterostructure of InAs / In0.15 Ga0.85 As / GaAs quantum dots-in-well (DWELL). The InAs quantum dots are also positioned in an In0.15 Ga0.85 in the DWELL framework, which in turn is well positioned with the In0.1Ga0.9As obstacle in GaAs quantum. Using fourier transform infrared spectroscopy, the optical characteristics of the sample were researched using photoluminescence and photocurrent. Spectrally adjustable reaction was noted at 6.2μm and 7.5μm with prejudice and lengthy wave IR reaction.***

I. INTRODUCTION

High performance infrared (IR) photodetection is desirable for many applications involving thermal imaging, chemical analysis, night vision, remote sensing, space range, mine detection and fiber optic communications. Depending on the implementation, one may want either distinct requirements, either a wide, multicolor response from the detector, or a sharp single wavelength reaction. In addition to generating pictures with some color depth, multicolor IR detection has the capacity to determine the observed body temperature, so it is much more advantageous for a particular imaging scheme. Multi-color focal plane array (FPA) photodetectors are particularly helpful for medical and military imaging as well as environmental monitoring applications.

Quantum dots-in-well DWELL is component of a fresh technology of nano-photonic semiconductor devices, using stacked layers of quantum dots (QDs) as the active region in their constructions. DWELL photodetectors are a promising fresh advance that will hopefully overcome many of the shortcomings of current IR photodetection technologies. QDIPs use inter-subband absorption to detect small absorption, 3-5μm & 8-14μm atmospheric' windows' medium and long wavelength light radiation.

Significant research has been carried out into the study of QDIPs, but little in the way of multi-color QDIP development, despite their desirability for a wide variety of applications. The objective of this project is to acquire the sample's optical properties through photoluminescence and photocurrent measurement while analyzing the benefits and disadvantages of the quantum-dots-in-well photodetector. This paper involves studying the mixture or hybrid of quantum-dot and quantum-well, known as dot-in-well (DWELL), and optimizing the benefits of the QDIP hypothesis by this hybrid system. The aim of this paper is to study the optical properties of the DWELL QDIP sample

using experimental techniques. The experimental work on this project focuses studying the optical properties by the means of photoluminescence and photocurrent.

II. ENERGY BAND STRUCTURE

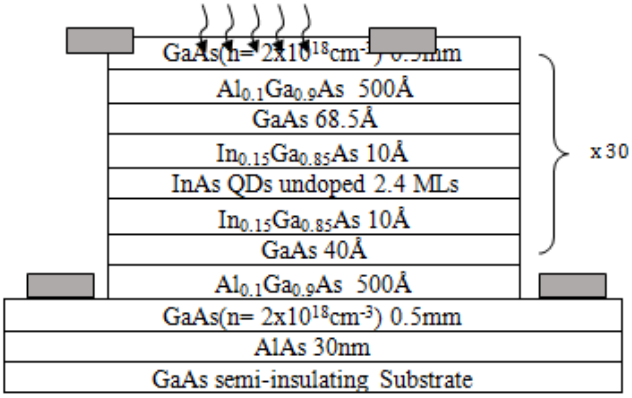

Fig. 1 Hetero structure of schematic of InAs/ $In_{0.15}Ga_{0.8}As$/GaAs dots-in-well infrared photo detector

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