

Abstract Submitted
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Study of a broadband high-gain InGaAs/InGaAsP quantum-well infrared photodetector J. LI, Princeton University, K.K. CHOI, US Army Research Laboratory, J.F. KLEM, J.L. RENO, Sandia National Laboratories, D.C. TSUI, Princeton University, PRINCETON UNIVERSITY TEAM, US ARMY RESEARCH LABORATORY COLLABORATION, SANDIA NATIONAL LABORATORIES COLLABORATION — Lattice-matched InGaAs/InP quantum well infrared photodetectors (QWIPs) exhibit high photoconductive gain but nonadjustable detection wavelength because of their fixed barrier height. The use of $\text{In}_x\text{Ga}_{1-x}\text{As}_y\text{P}_{1-y}$ (InGaAsP) as the barrier material is superior to that of InP with regard to flexibility of the operating wavelength. In this work we investigate the use of InGaAsP barriers in QWIPs for long-wavelength infrared detection applications. We studied a broadband quantum well InGaAs/InGaAsP detector covering 8-14 μm and found excellent agreement between observed and calculated responsivity spectra. This result shows the validity of our design model. To determine the usefulness of InGaAsP in long-wavelength detection, we also designed a GaAs/AlGaAs quantum well detector with a similar spectrum and compared its performance with that of the InGaAs/InGaAsP detector. Dark current noise measurement indicates that the gain of InGaAsP is 4.6 times larger than that of AlGaAs, showing that InGaAsP is a good candidate for long-wavelength high-speed infrared detection.

Jinjin Li
Princeton University

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