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Intra-valance transitions for uncooled short wave infrared detection[1] A.G. UNIL PERERA, S.G. MATSIK, P.V.V. JAYAWEERA, Georgia State University, H.C. LIU, M. BUCHANAN, National Research Council Canada, GEORGIA STATE UNIVERSITY USA TEAM, NATIONAL RESEARCH COUNCIL CANADA TEAM — An infrared detector based on p-GaAs/AlGaAs heterojunction exhibiting response in the 2-5 μm range at room temperature is demonstrated. The basic principle of the detector utilizes inter-valance (heavy hole, light hole, and split-off hole) absorption of a highly p-doped GaAs layer (emitter). The dark current is limited by the work function at the interface between the highly doped emitter and the undoped $Al_xGa_{1-x}As$ barrier. The barrier height can be tailored by varying the Al fraction to obtained the desired operating temperature. The split-off energy of the material determines the split-off threshold and the band offset determines the free carrier threshold for the photo excited carriers. Detector performance can be controlled by varying these two thresholds. A device consisting of 30 periods of 3×10^{18} cm^{-3} p-doped GaAs emitter and $Al_{0.57}Ga_{0.43}As$ barrier regions between two contact layers shows infrared detection up to 330 K with a peak responsivity of 1.4 A/W and D* of 2.6×10^{9} Jones at 2.5 μm . Different materials should give rise to different wavelength threshold infrared detectors operating at high temperatures.

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