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Spectral threshold extended photoresponse in asymmetrical p-GaAs/AlGaAs heterostructure-based infrared detectors[1] DILIP CHAUHAN, A. G. UNIL PERERA, Department of Physics and Astronomy, Georgia State University, Atlanta, Georgia, 30303, USA, LIANHE LI, LI CHEN, EDMUND H LINFIELD, School of Electronic and Electrical Engineering, University of Leeds, Leeds LS2 9JT, United Kingdom — The spectral photoresponse threshold λ_t of a semiconductor photodetector is conventionally determined by $\lambda_t = hc/\Delta$, where Δ is the minimum energy gap of a material, or the interfacial energy gap of a heterostructure. In addition, the Δ at the material interface is the key parameter to determine the dark current and noise levels of the detector. Therefore, lowering the Δ to detect longer spectral region will have a trade-off with increased noise levels. Here, we present infrared detection in very-long-wavelength infrared (VLWIR) in a detector designed with a Δ for mid-infrared (MIR) region, in p-GaAs/AlGaAs heterostructures. Specifically, a detector designed with Δ = 0.40 eV (λ_t = 3.1 m) showed an extended wavelength threshold up to 68 m, 45 m, and 60 m, under positive, zero, and negative biases respectively, at 5.3K. The dark current, however, was seen to correspond to Δ = 0.40 eV, which was confirmed by a fitting obtained by using a 3D carrier drift model.

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Dilip Chauhan
Georgia State Univ

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