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Low Temperature Epitaxial Growth of Antimony Doped Silicon for Broadband Astronomical Charge-Coupled Devices MICHAEL HOENK, JORDANA BLACKSBERG[1], SHOULEH NIKZAD, Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA, STEVE HOLLAND, Lawrence Berkeley National Laboratory, Berkeley, CA — Future NASA missions will require exceptionally large focal plane arrays to explore the large-scale structure of the universe. High-purity, p-channel silicon CCDs provide a unique combination of high resolution, extended response in the near infrared, and improved radiation tolerance necessary for these missions. We have demonstrated low temperature growth of antimony-doped silicon on the back surface of high purity silicon charge-coupled devices (CCDs), enabling imaging at full depletion with high resolution, high quantum efficiency, and broadband response. Using molecular beam epitaxy, we were able to grow silicon layers less than 5 nm thick with an integrated dopant concentration greater than 10^{14} cm^{-2}. Our low-temperature process kept the device temperature below 450 C at all times, enabling growth on fully-processed CCDs. We will discuss the effects of surface preparation, temperature, Sb dose, and thickness on the leakage current and quantum efficiency of these detectors.

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