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**Optoelectronic Characterization of Impurity Supersaturated Silicon Junctions** DAVID HUTCHINSON, Rensselaer Polytechnic Institute, JOSEPH SULLIVAN, Massachussetts Institute of Technology, JAY MATHEWS, U.S. Army ARDEC-Benét Laboratories, DANIEL RECHT, AURORE J. SAID, Harvard University, DAVID J. LOMBARDO, Rensselaer Polytechnic Institute, CHRISTIE SIMMONS, TONIO BUONASSISI, Massachussetts Institute of Technology, JEFFREY M. WARRENDER, U.S. Army ARDEC-Benét Laboratories, MICHAEL J. AZIZ, Harvard University, PETER D. PERSANS, Rensselaer Polytechnic Institute — Intermediate band semiconductors have been proposed as a path to high efficiency photovoltaics. Silicon doped to high levels with impurities such as S, Se, Au, and Ti which can produce deep levels, may fulfill this promise. We report here on the optoelectronic properties of diode structures prepared by implantation of $10^{15}$ to $10^{16}$ impurity atoms/cm2 into a p-type or n-type wafers, followed by nanosecond pulsed laser melting and resolidification. Experimental results from wavelength and temperature dependent diode response, spatial quantum efficiency mapping, intensity dependent efficiency, and current-voltage characterization will be reported. Current-voltage measurements under photoexcitation yield information on the built in voltage and absorption mechanisms. Most devices show maximum quantum efficiency for excitation wavelengths between 900 and 1000 nm. The drop in quantum efficiency for short wavelengths can yield the minority carrier diffusion length in the hyperdoped material. Long wavelength response elucidates photocarrier excitation mechanisms. The fundamental properties of the junction and the supersaturated material will be discussed.

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