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Single and Multijunction InGaP PIN-Diode Radioisotope Batteries CORY CRESS, Rochester Institue of Technolgoy, RYNE RAFFAELLE, Rochester Institute of Technology — A direct-conversion radioisotope battery (DCRB) utilizes a semiconductor diode to convert the high energy nuclear emissions of a radioisotope source into electrical power. Research regarding the experimentally measured single junction (PIN) diode performance and computer-simulated multijunction (PINI) diode performance of InGaP DCRBs will be presented. InGaP p/n and PIN diodes with various layer thicknesses and doping concentrations were grown using organometallic vapor phase epitaxy. The power output of these devices measured under simulated air mass zero (AM0) illumination and under alpha- and beta-particle irradiation, is provided. In addition, the radiation-tolerance of the devices is assessed by measuring the power output under simulated AM0 illumination as a function of total alpha-particle fluence. The computer-simulated performance of multijunction PINI devices under photon illumination and alpha-particle irradiation are also provided. The multijunction diode structure increases the energy absorption cross section of the device thereby increasing its theoretical efficiency. Additionally, the selective contacting scheme results in drift-field assisted minority carrier extraction, which reduces the influence of radiation-induced lattice defects on minority carrier lifetime.

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