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Electrical rectification in axial *in-situ* doped Ge nanowire *pn* junctions[1] SON T. LE, Brown University, S. DAYEH, S. T. PICRAUX, Los Alamos National Laboratory, A. ZASLAVSKY, Brown University — We demonstrate the vapor-liquid-solid growth of and electrical rectification in axial *in-situ* doped *pn* junction Ge nanowires (NWs). *In-situ* doping of the NWs was accomplished by introducing dopant gases (diborane and phosphine) during growth, resulting in an axial *pn* junction. Contacts to the wires were defined using e-beam lithography, followed by Ni metallization. Four-point measurements of the fabricated devices at room temperature and at 77 K clearly show rectification with on/off current ratio of more than two orders of magnitude when the bias is applied across the NW *pn* junction. The ideality factor of the junction current points to a significant generation-recombination contribution. The Ohmic characteristics in the p and n regions outside the junction make it possible to estimate the doping levels. We also observed gate control of the NW junction current using the substrate as a back gate. Observed current modulation is in good agreement with the electrostatic depletion of the NWs as a function of diameter and doping.

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