Electrical rectification in axial \textit{in-situ} doped Ge nanowire \textit{pn} junctions\textsuperscript{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 \textit{in-situ} doped \textit{pn} junction Ge nanowires (NWs). \textit{In-situ} doping of the NWs was accomplished by introducing dopant gases (diborane and phosphine) during growth, resulting in an axial \textit{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 \textit{pn} junction. The ideality factor of the junction current points to a significant generation-recombination contribution. The Ohmic characteristics in the \textit{p} and \textit{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.

\textsuperscript{1}Work at Brown supported by NSF award ECS-0701635.