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Carbon nanotube diode performance and photovoltaic response
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— Due to their unique electronic properties, carbon nanotubes have been at the forefront in the development of next generation electronic devices. The p-n diode is arguably the most pivotal electronic and photovoltaic device. Up to now, nanotube diodes have had major drawbacks including complex quad-terminal device geometries to achieve electrostatic doping, large series resistances from the inclusion of an intrinsic region at the junction, unstable n-type doping, and Zener breakdown. We have developed a method to create two terminal abrupt junction diodes from single semiconducting carbon nanotubes with simple photo-patterned polymer layers defining air-stable p- and n-regions. These intratube diodes show nearly ideal behavior with relatively low series resistance and no sign of Zener breakdown at room temperature. Spatial doping profiles measured by micro-Raman spectroscopy and selective electrochemical gating of the n-region indicate that diode performance depends strongly on relative doping levels. A short circuit current of 1.4 nA with an open circuit voltage of 205 mV are measured when illuminated to saturation.

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