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High efficiency graphene solar cell by chemical doping[1] XIAOCHANG MIAO, SEFAATTIN TONGAY[2], MAUREEN K. PETTTERSON, KARA BERKE, ANDREW G. RINZLER, Department of Physics, University of Florida, Gainesville, Florida 32611, United States, BILL R. APPLETON, Nanoscience Institute for Medical and Engineering Technologies, University of Florida, Gainesville, Florida 32611, United States, ARTHUR F. HEBARD, Department of Physics, University of Florida, Gainesville, Florida 32611, United States — We demonstrate single layer graphene/n-Si Schottky junction solar cells that under AM1.5 illumination exhibit a power conversion efficiency (PCE) of 8.6%. This performance, achieved by doping the graphene with bis(trifluoromethanesulfonyl)amide (TFSA), exceeds the native (undoped) device performance by a factor of 4.5 and is the highest PCE reported for graphene-based solar cells to date. Current–voltage, capacitance–voltage, and external quantum efficiency measurements show the enhancement to be due to the doping-induced shift in the graphene chemical potential that increases the graphene carrier density (decreasing the cell series resistance) and increases the cell's built-in potential (increasing the open circuit voltage) both of which improve the solar cell fill factor.

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