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Thermoelectric properties of CVD grown large area graphene ANDRIY SHEREHIY, RUWANTHA JAYASINGHE, ROBERT STALLARD, GAMINI SUMANASEKERA, University of Louisville, ANTON SIDOROV, DANIEL BENJAMIN, ZHIGANG JIANG, Georgia Institute of Technology, QINGKAI YU, WEI WU, JIMING BAO, ZHIHONG LIU, STEVEN PEI, University of Houston, YONG CHEN, Purdue University — The thermoelectric power (TEP) of CVD (Chemical Vapor Deposition) grown large area graphene transferred onto a Si/SiO₂ substrate was measured by simply attaching two miniature thermocouples and a resistive heater. Availability of such large area graphene facilitates straight forward TEP measurement without the use of any microfabrication processes. All investigated graphene samples showed a positive TEP $\sim +30 \mu\text{V/K}$ in ambient conditions and saturated at a negative value as low as $\sim -75 \mu\text{V/K}$ after vacuum-annealing at 500 K in a vacuum of $\sim 10^{-7}$ Torr. The observed p-type behavior under ambient conditions is attributed to the oxygen doping, while the n-type behavior under degassed conditions is due to electron doping from SiO₂ surface states. It was observed that the sign of the TEP switched from negative to positive for the degassed graphene when exposed to acceptor gases. Conversely, the TEP of vacuum-annealed graphene exposed to the donor gases became even more negative than the TEP of vacuum-annealed sample.

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