Enhanced thermopower in multilayer CVD graphene

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A thermoelectric material allows the direct conversion of a temperature difference to an electrical voltage by the Seebeck effect. In terms of thermoelectric conversion, graphene exhibits a higher Seebeck coefficient (>60 $\mu V\ K^{-1}$ at room temperature) than other semiconductors and metals. This peculiar property, together with the high electrical conductivity, flexibility, and broadband absorption make graphene a potential material for the development of thermoelectric application ranging from the nanoenergy generation to the radiation detection. We demonstrate how graphene thermopower can be enhanced by tuning graphene structure in terms of carbon lattice modification (introduction of defects, heteroatoms or functional groups) and number of layer as well as by controlling the doping state. The last can be also exploited in photo-thermoelectric applications for boosting the graphene THz-MW absorption due to the intraband transitions.