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Graphene self-switching diode-based thermoelectric rectifier

Abstract

This Letter demonstrates thermoelectric rectification in graphene self-switching diode (GSSD) on SiO_2/Si substrate. Nanometre-scale nonlinear semiconductor device, called self-switching diode (SSD), has been utilised. Applied bias leads to a change in potential profile and effective channel width of GSSD resulting in diode like I-V characteristics. The excellent electronic properties of graphene potentially make it suitable for producing SSD's with high responsivity and low noise equivalent power (NEP). The designed GSSD demonstrates a high Seebeck coefficient (S) of 200 μV/K, voltage detection sensitivity, and NEP of 97.964 V/W and 0.6064 nW/$Hz^{1/2}$, respectively. Furthermore, the effect of applying backgate voltage on the Seebeck coefficient has also been demonstrated in this work. The GSSD is presented as a potential thermoelectric rectifier, which can convert the thermal energy into useful electrical energy.