Graphene Photoresponse for Mid-Infrared Light

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Abstract

In addition to its well-known electronic properties and the absence of a band gap, graphene shows optical properties which are tunable by varying the concentration of the charge carriers by using for example electrostatic doping. It is an ideal opto-electronic material for a broad frequency range from ultraviolet to THz [1].

Graphene photocurrent in the visible, near-infrared and THz frequency ranges has been widely studied [2,3,4], but a detailed study of the photoresponse mechanism for mid-infrared frequencies has to our knowledge not been reported so far.

We study graphene in the mid-infrared frequency range to elucidate the mechanism of photocurrent generation. We observe a photocurrent over a broad spectral range from 6 to 10 μm of wavelength. This photocurrent is tunable by applying a backgate voltage to vary the Fermi energy and therefore the number of charge carriers in the graphene. Using this tunability it is possible to switch the photocurrent on and off by Pauli blocking.

This work paves the way towards different applications, such as electro-optic switches and room temperature infrared photodetectors.

References

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