Graphene-based perfect absorption in the visible to Terahertz rang and their optoelectronics applications

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Abstract

Graphene has unique properties which make it an ideal material for photonic and optoelectronic devices. However, the low light absorption in monolayer graphene seriously limits its practical applications. In order to greatly enhance the light absorption of graphene, many graphene-based structures have been developed to achieve perfect absorption of incident waves. In this work, we discuss and analyze various types of graphene-based perfect absorption structures in the visible to terahertz band. In particular, we demonstrate recent advances and optoelectronic applications of such structures. Indeed, the graphene-based perfect absorption structures offer the promise of solving the key problem which limits the applications of graphene in practical optoelectronic devices.

References

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Figures

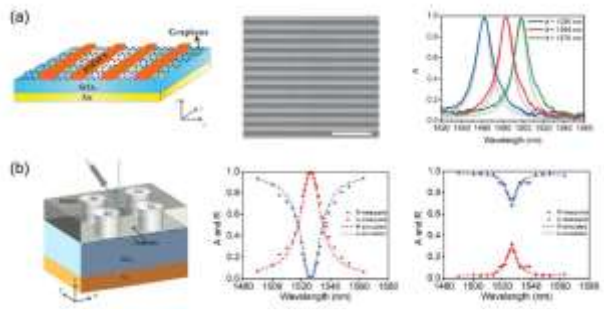

Figure 1: (a) Left: schematic image of the perfect absorption structure realized by coupling graphene with 1D PMMA grating. Middle: SEM image of a fabricated structure. Right: measured (solid line) and simulated (dashed line) absorption spectra of structures with different grating periods under normal incidence of a white light source with TE polarization. (b) Left: schematic image of the perfect absorption structure realized by coupling graphene with 2D subwavelength grating. Middle: measured (dot line) and simulated (dashed line) spectra of a fabricated perfect absorption structure. Right: measured (dot line) and simulated (dashed line) spectra of a resonant structure without graphene.

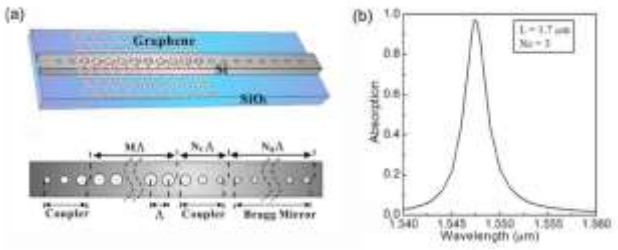

Figure 2: (a) Schematic of the waveguide-cavity (covered by graphene)-waveguide (WCW) system. (b) The absorption of graphene when $N_C = 3$.