Few-layered graphene oxide embedded 1DPhC microcavity for amplified spontaneous emission source

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Extensive rich physical properties of graphene and its intermediate product graphene oxide (GO), make them promising candidates for photonic applications [1,2]. Optical micro-cavities can be designed by engineering structural defects in photonic crystals (PhCs) and used to control spontaneous emission from active materials [3, 4]. In this study, a novel amplified spontaneous emission (ASE) system based on GO embedded sol-gel fabricated all-dielectric one-dimensional photonic crystal (1DPhC) micro-resonator is presented. The schematic of the structure is shown in figure 1(a). Figure 1(b) compares the PL spectra obtained from a bare GO film on a Silicon substrate and that from GO layer inserted between two Bragg reflectors comprising of alternating layers of SiO₂ and SnO₂. It can be observed that the GO emissions at the micro-cavity resonance and at the band edges are extremely enhanced compared to the PL emission from the no-cavity structure and within the photonic stop-band it is completely suppressed. Continuous tuning of the a novel amplified spontaneous emission (ASE) peak by modulating the photonic stop band with the detection angle was also reported, making the GO incorporated 1DPhC a novel and attractive system for integrated optic applications.

Figures 1. (a) Schematic of the GO embedded Bragg Mirror. (b) Comparison of PL spectra of bare GO layer on a substrate and GO layer within the micro-cavity obtained under 325 nm excitation.

References