

Photonic crystal integrated Graphene-Silicon Schottky Diodes for IR-photodetection

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The study reports on the development of an infrared (IR) photodetector based on a graphene-silicon (Gr-Si) Schottky junction featuring tuneable sensitivity and responsivity [1,2]. Spectral sensitivity is achieved by mean of an integrated photonic crystal (PhC), where the PhC geometry, specifically, a periodic array of holes in the silicon layer, is used to control the peak responsivity of the device [3]. Simultaneously, the device responsivity is controlled by the reverse bias voltage applied on the junction. We successfully fabricated Gr-Si devices by transferring CVD-grown graphene on a silicon PhC slab with holes ranging from 150 to 280 nm. The device responsivity was measured by vertical illumination of the junction with a tuneable laser source [4]. Experimental results show a responsivity enhancement in the near-infrared (nIR), particularly around the 1550 nm telecommunications window. The PhC integration in the Gr-Si device yielded a four-fold increase in responsivity compared to a plain Gr-Si device. The demonstrated capability to tune the spectral selectivity through a PhC makes the device architecture highly promising for low-noise nIR communication applications.

References

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Figures

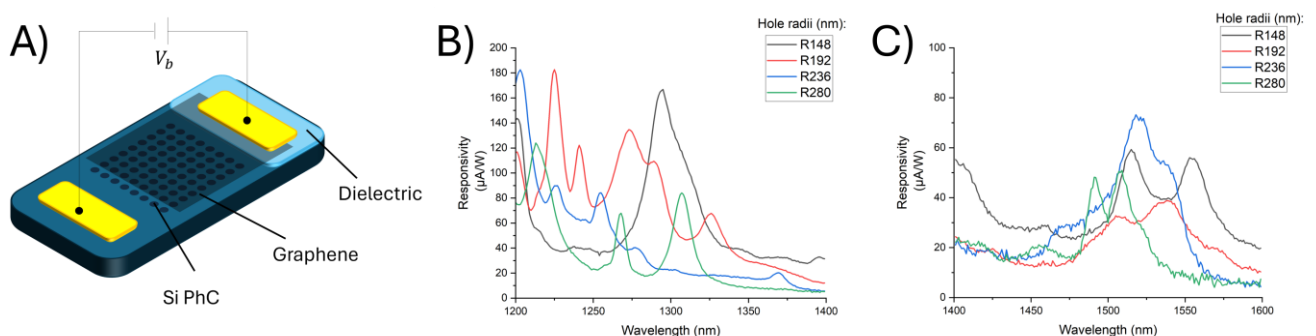


Figure 1: A) Schematic of the PhC integrated Gr-Si Schottky diode device B) Responsivity spectrum for different hole radii of the PhC between 1200-1400nm C) Responsivity spectrum between 1400-1600nm