Grating-gated graphene-based heterostructures for detection of Terahertz radiation

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Graphene based devices show excellent properties (zero band gap, high mobility, …) and could be used to reach high frequency operation and specially toward terahertz technology. Graphene-based heterostructures with hexagonal boron-nitride (h-BN) show a high value of electronic mobility at room temperature [1] and even higher at low temperatures. Graphene field effect transistors (GFET) operating in the terahertz (THz) range are appealing as it is one of the least explored frequency regions and holds potential to revolutionize different fields like security, medical imaging or high-speed wireless communication making them ideal candidates for future high-frequency technology [2–3].

We report on direct detection of terahertz radiation by using graphene-based FETs with asymmetric grating gates (ADGG GFETs). The device was fabricated with a stack of h-BN/Graphene/h-BN on SiO_2/Doped-Si. The Doped-Si layer was used as a back gate and asymmetric dual grating metal top gates were defined (Fig.1). The response of the transistor under THz radiation at 0.15 and 0.3 THz was measured in a temperature range from 4K up to 300 K and a clear photocurrent was observed (Fig.2).

References

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Figures

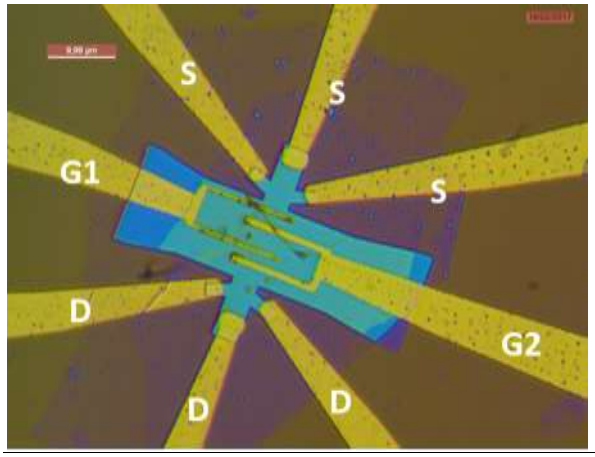

Figure 1: Top view of the GFET used for THz detection

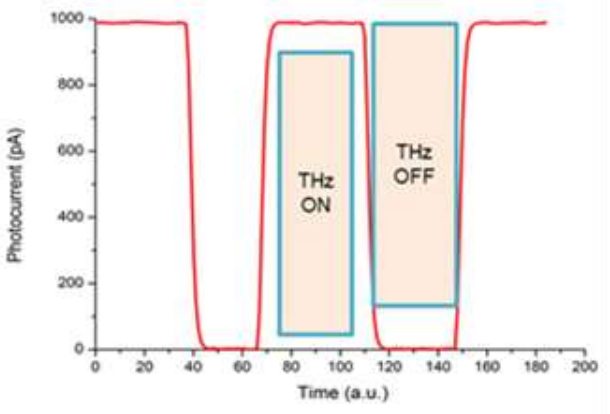

Figure 2: Photocurrent vs time when the THz beam at 300 GHz was switched on and off.