Development of THz radiation detectors based on graphene

Student:

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Introduction

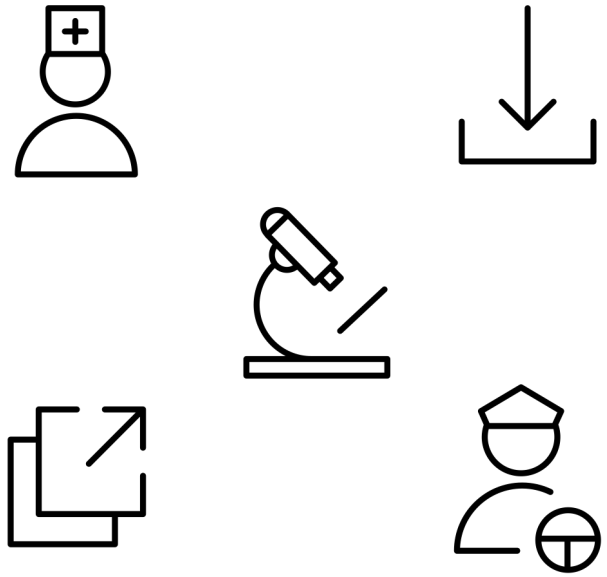

Fig. 1 - A wide spectrum of potential applications of terahertz range of EM spectrum

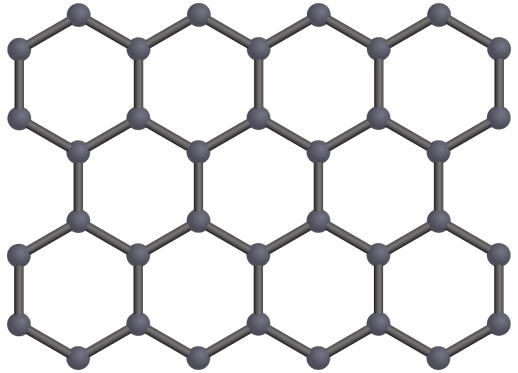

Fig. 2 - An ideal crystal lattice in graphene.

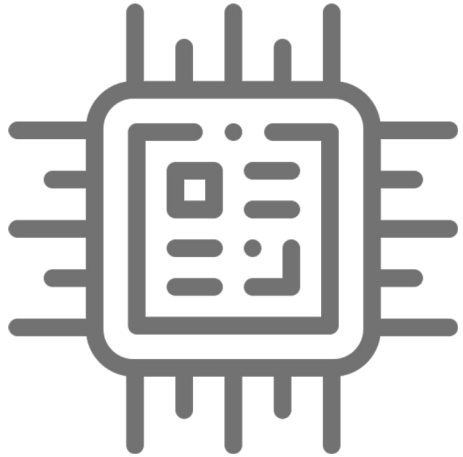

Fig. 3 - Fast, sensitive THz detectors that can be easily combined into arrays.

The theoretical part

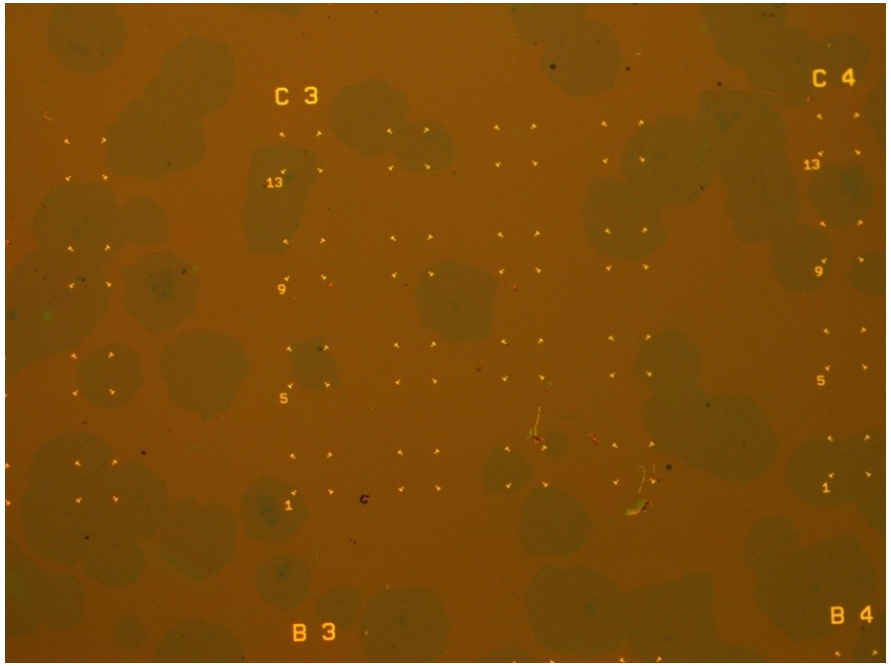

Fig. 1. Optical image of the graphene with gold alignment signs on a Si/SiO_2 substrate.

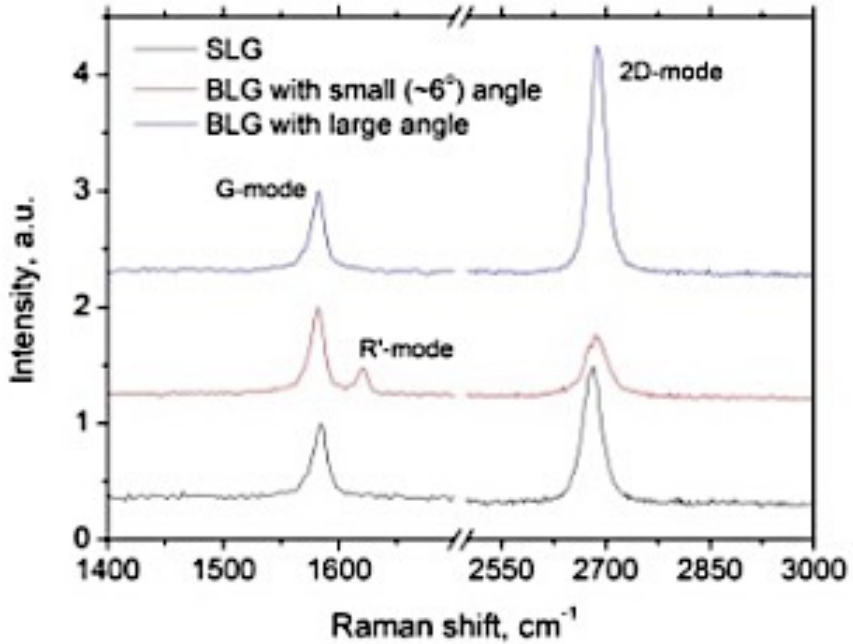

Fig. 2. Characteristic Raman spectra of the graphene grain surface recorded at different points.

The practical part

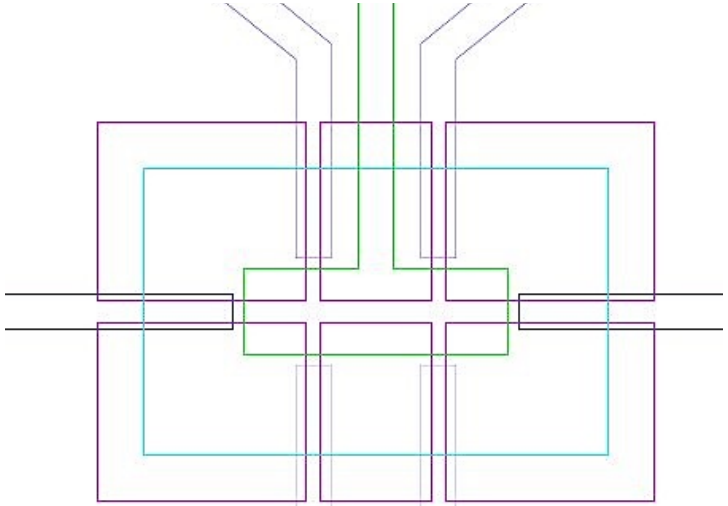

Fig. 1 - The scheme of the experimental device. In the diagram: green is the gate electrode, blue is the cover from Al_2O_3, purple is the graphene channel.

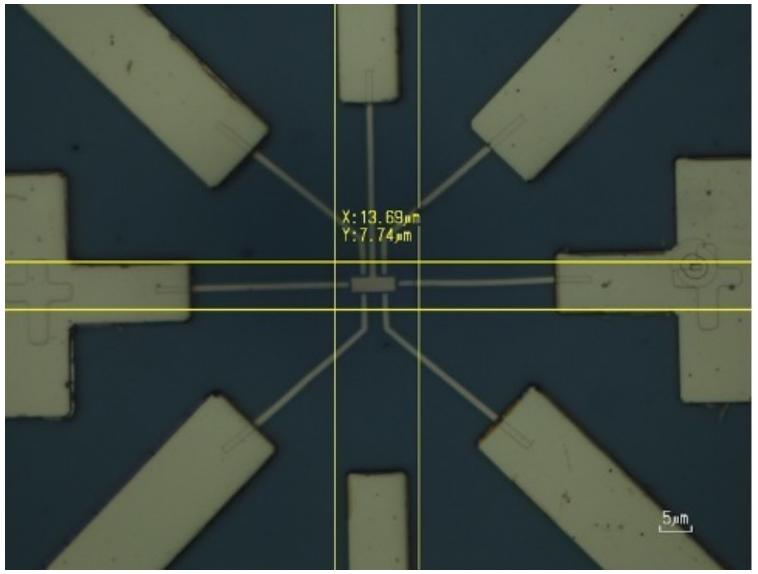

Fig. 2 - The optical photo of the experimental device.

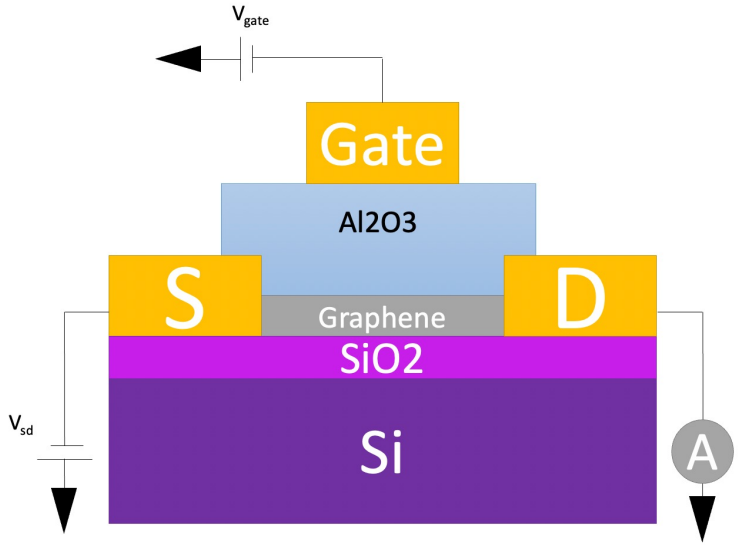

Fig. 3 - Schematic diagram of the experimental sample, cross-sectional view.

The practical part

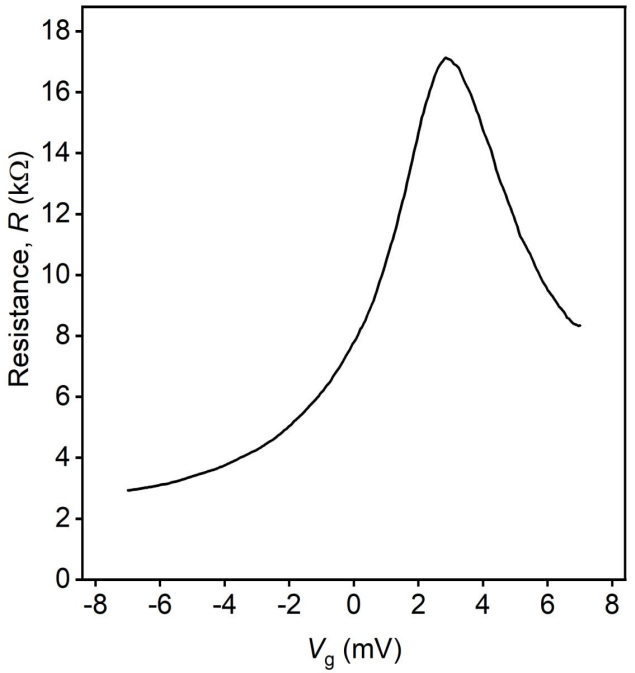

Fig. 1 - Dependence of graphene resistance on gate voltage.

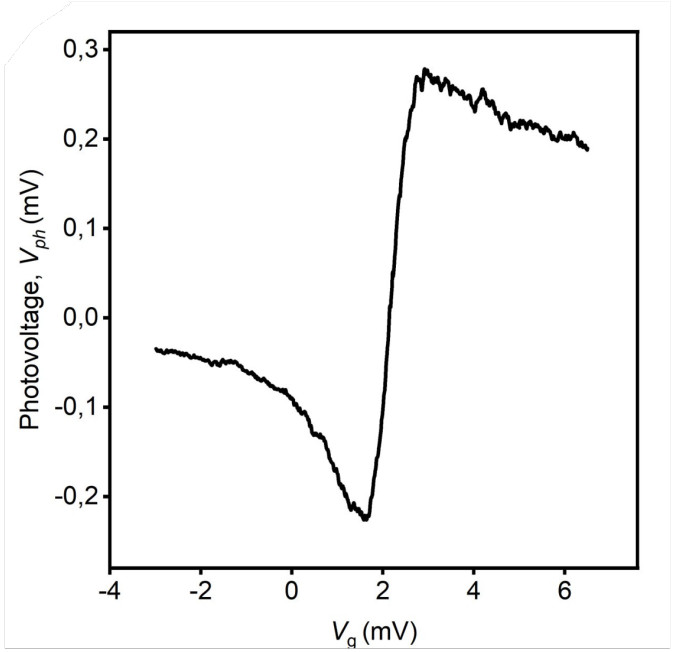

Fig. 2 - Photovoltage measured at 130 GHz as a function of Vg.

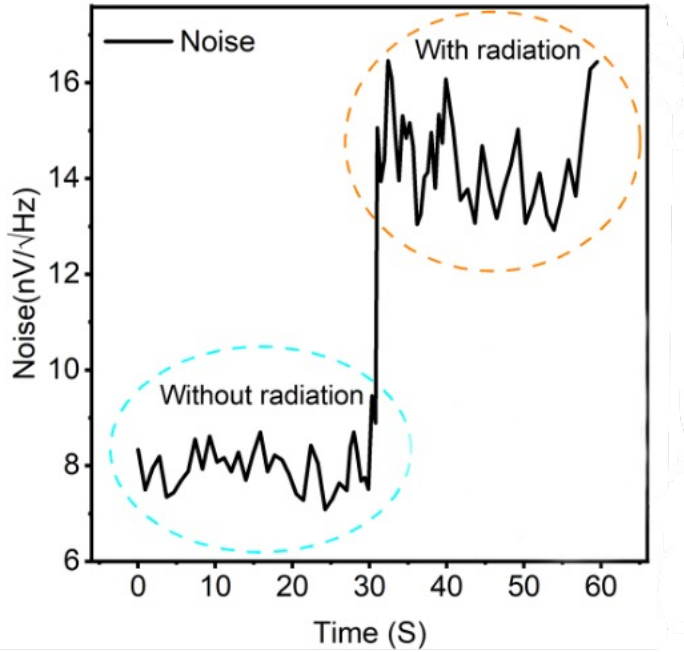

Fig. 3 - Sample noise readings in the presence and absence of radiation. Comparison of noise resistances with theory.

Conclusion

- We have produced and measured experimental samples.
- The measured noise is depend on electron temperature and can be used as detector signal as well as probe of electron temperature under terahertz radiation.
- The obtained data can help to optimize existing THz detectors based on the electron heating effect.