Terahertz metadevices with carbon nanomaterials

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In recent years, terahertz technologies have gained considerable interest due to their potential applications in different sectors such as security, quality control, information and communications, biology and medical sciences, environmental monitoring and others [1]. However, the technology for generating and manipulating terahertz radiation is still in its infancy. The use of graphene-based materials has already been proposed [2, 3] with the aim to revolutionise terahertz technologies. Our goal is to fabricate metasurfaces based on multilayer graphene films on flexible substrates for manipulating terahertz radiation. This includes developing a production method for multilayer graphene films of controlled thickness, optimisation of multilayer graphene film transfer onto target substrates and, finally, engineering metasurfaces by means of photolithography. For future work, we aim to explore multilayer graphene-based optical modulators with tunable transparency in terahertz range by electrolyte intercalation as well as using textile substrates with graphene metasurfaces for wearable terahertz communication applications.

References

[1] M. Tonouchci, Nature Photonics, 1(2007) 97-105.
[2] J. Shi, Z. Li, D. K. Sang, Y. Xiang, J. Li, S. Zhang and H. Zhang, J. Mater. Chem. C, 6 (2018) 1291-1306.
[3] M. Wang and E.-H. Yang, Nano-Structures & Nano-Objects, 15 (2018)107–113.