Synthesis and THz-characterisation of large-scale 2D materials

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Terahertz time-domain spectroscopy has developed into a powerful, versatile high throughput method for characterisation of the electronic properties of large-scale graphene. The absorption of terahertz radiation in the graphene layer directly links to the conductivity, and can reveal a number of key performance characteristics in far more non-invasive and convenient manner than conventional electronic measurements. By obtaining the full THz-spectrum in every point on a wafer or sheet of graphene, we shed new light on defects, imperfections, doping and grain structure, and even local variations in the Fermi velocity, which is particularly important for polymer substrates [2]. Due to graphene's high surface area, low carrier density and susceptibility to damage and contamination, high-quality metrology involves a number of challenges, which are important to understand. In the talk, I will overview the state of the art, highlighting learnings and accomplishments from the past few years of scientific collaborations on a variety of substrates and applications [3], and discuss what it will take to make THz-TDS conductivity mapping the golden standard of large-area graphene characterisation for wafer- and roll-to-roll production. I will also discuss some of our recent progress in large-scale graphene growth and transfer [4] and assembly of van der Waals heterostructures based on CVD materials [5].

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