Nanoscale Optical Imaging of Graphene using s-SNOM

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Visualisation of the Dirac plasmons propagating along graphene was for the first time observed using the nea-SNOM infrared near-field microscope [1, 2].

Graphene plasmon interference mapping allows extraction of local material properties, e.g. conductivity, intrinsic doping, defects. Direct control of propagating surface plasmons on graphene with resonant antennas & conductivity patterns was also demonstrated using the same s-SNOM technology [3, 4].

During this presentation, photocurrent measurements on graphene, simultaneously recorded with optical and AFM images, will be to be shown [5]. Furthermore, Mid-infrared probing of the conductivity dynamics in single and multi-layer graphene using ultrafast near-infrared excitation of electrons will be presented [6].

With more than 30 high impact articles published in the recent few years on the 'flatland optics', the neaSNOM is the best tool for nanoscale imaging and spectroscopy of the graphene.

References

[1] Z. Fei et al., Nature, 487 (2012) 82;
[2] J. Chen et al., Nature, 487 (2012) 77;
[3] P. A. Gonzales et al., Science 344 (2014), 1369;
[4] M. B, Lundeberg et al., Nature Mat. (2016);
[5] A. Woessner et al., Nature Comm. 7 (2016);
[6] M. Wagner et al., Nano Lett. 14 (2014) 4529.

Figures

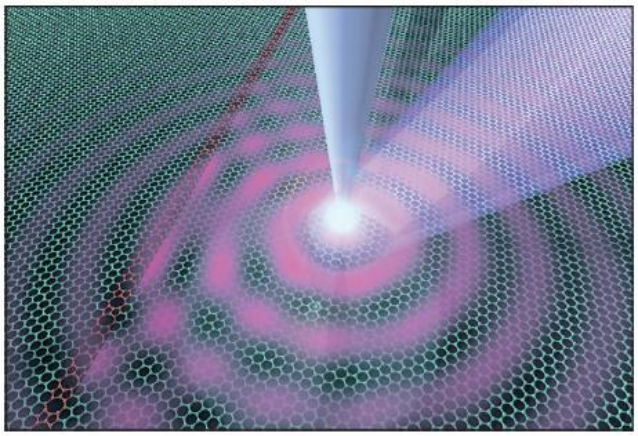

Figure 1: Diagram of the Infrared nano-imaging experiment. Concentric circles illustrate plasmon waves launched by the illuminated tip.

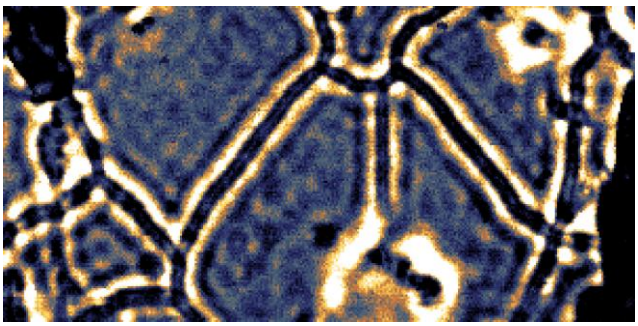

Figure 2: Image of infrared amplitude recorded on a graphene 1x2 μm^2 area. This image shows a characteristic plasmon interference pattern close to graphene edges and grain boundaries.