Magneto-plasmonic terahertz resonances in patterned graphene metasurfaces

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When the time reversal symmetry is broken by a magnetic field, graphene displays strong non-reciprocal magneto-optical effects in the terahertz range such as magnetic circular dichroism [1] and the Faraday rotation [2]. Here we demonstrate that both these effects can be tuned over a large portion of the THz range due to strong magneto-plasmonic resonances that appear in patterned graphene [3]. We studied different patterned types of graphene metasurfaces, such as periodic arrays of anti-dots, squares and metal-ring resonators. In all these structures the resonances are observed at room temperature. More importantly, the frequency and the intensity of the resonances can be efficiently controlled by electrostatic doping. Overall, combining this plasmonic control with magnetic and electronic biasing demonstrated that non-reciprocity in graphene can be modulated and tuned at frequencies well beyond the cyclotron resonance in unpatterned graphene samples.

References


Figures

Figure 1: (a) Diagram of the measurement configuration. tox = 280nm, tsub = 525 nm (b) left: SEM pictures of the nano-patterned graphene scared lattice sample. Right: Faraday rotation measured on this sample for different magnetic fields. (c) and (d) same as (b) but for hybrid metal-graphene sample and anti-dot square array.