Plasmon resonance in multilayer graphene nanoribbons - DTU Orbit (08/11/2017)
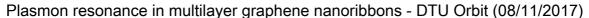
Plasmon resonance in multilayer graphene nanoribbons: Plasmon resonance in multilayer graphene nanoribbons

Plasmon resonances in nanopatterned single-layer graphene nanoribbons (SL-GNRs), double-layer graphene nanoribbons (DL-GNRs) and triple-layer graphene nanoribbons (TL-GNRs) are studied experimentally using 'realistic' graphene samples. The existence of electrically tunable plasmons in stacked multilayer graphene nanoribbons was first experimentally verified by infrared microscopy. We find that the strength of the plasmonic resonance increases in DL-GNRs when compared to SL-GNRs. However, further increase was not observed in TL-GNRs when compared to DL-GNRs. We carried out systematic full-wave simulations using a finite-element technique to validate and fit experimental results, and extract the carrier-scattering rate as a fitting parameter. The numerical simulations show remarkable agreement with experiments for an unpatterned SLG sheet, and a qualitative agreement for a patterned graphene sheet. We conclude with our perspective of the key bottlenecks in both experiments and theoretical models.

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