

Near-field spectroscopy of optically doped graphene

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Scattering near-field infrared spectroscopy with its spatial resolution in the 20 nm region is an ideal spectroscopic tool to study graphene. Our previous work has revealed important insight in the SiO₂ substrate graphene interaction and showed an enhancement and blueshift of the SiO₂ surface phonon resonance in the mid-infrared spectral region due to plasmon phonon coupling [1]. Additionally, pronounced plasmonic effects occurred in the form of standing wave patterns near interfaces and boundaries in single- and bilayer graphene for ungated and gated samples [2]. Here we extend our previous studies and report on optically induced effects for single- and bilayer graphene on SiO₂ substrates. 100 fs near-infrared laser pulses are used to change the carrier density of graphene via optical pumping before probing the sample's mid-infrared scattering near-field response. We analyze the effects on the hybrid plasmon-phonon system with respect to the pump power and time-delay between pump and probe pulses. [1] Z. Fei et al., Nano Lett. 11, 4701 (2011). [2] Z. Fei et al. arXiv:1202.4993

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