Plasmon–Phonon Coupling in Large-Area Graphene Dot and Antidot Arrays Fabricated by Nanosphere Lithography

Nanostructured graphene on SiO2 substrates paves the way for enhanced light–matter interactions and explorations of strong plasmon–phonon hybridization in the mid-infrared regime. Unprecedented large-area graphene nanodot and antidot optical arrays are fabricated by nanosphere lithography, with structural control down to the sub-100 nm regime. The interaction between graphene plasmon modes and the substrate phonons is experimentally demonstrated, and structural control is used to map out the hybridization of plasmons and phonons, showing coupling energies of the order 20 meV. Our findings are further supported by theoretical calculations and numerical simulations.

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