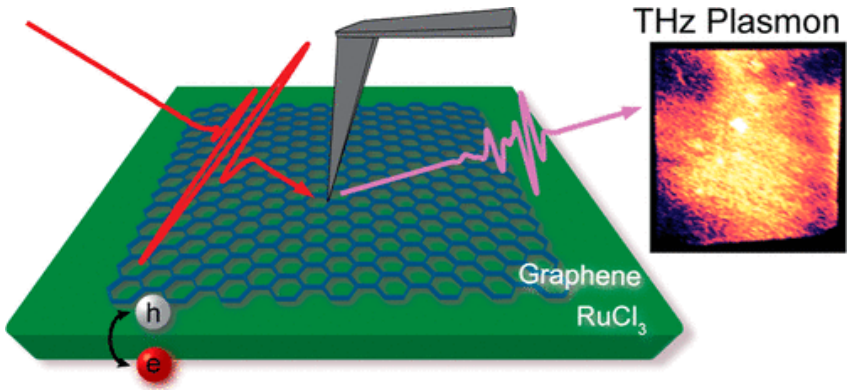
Studying Plasmonics in Graphene Cavities



The experimental setup of graphene on $RuCl_3$. The graphene undergoes a charge transfer process that dopes it with holes (positively charged vacancies). Incoming light (red pulse) couples to a metallic tip and then is backscattered (purple pulse). Inset: representative data of THz SPPs in a graphene cavity.

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DOI: 10.1021/acsnano.4c08441

Work was performed in part at NSLS-II

Scientific Achievement

Researchers observed surface plasmon polaritons (SPPs) in graphene cavities on a ruthenium chloride ($RuCl_3$) substrate.

Significance and Impact

Shaping graphene into cavity structures enables new ways to study SPPs – collective charge oscillations at the surface of a 2D metal dressed with electromagnetic waves – potentially driving SPP-based photonic and optoelectronic applications.

Research Details

- Graphene/$RuCl_3$ heterostructures were studied at the NSLS-II MET beamline with a custom optical atomic force microscope.
- Their response to terahertz (THz) EM light was measured, revealing long-wavelength THz SPPs in square graphene cavities of varying size.
- Measurements match theoretical predictions.