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Progress in Graphene Plasmonics

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摘要： Graphene holds great promise for ultra-compact and electronically controlled plasmonics. Recently, resonant coupling of propagating THz waves to plasmons in micro-ribbons has been demonstrated, while IR near-field microscopy has been applied to observe the coupling of graphene plasmons to phonons. In our work we use scattering-type scanning near-field optical microscopy (*s*-SNOM) to visualize propagating and localized infrared plasmon modes in graphene nanostructures in real space. By spectroscopic imaging we measure the graphene plasmon wavelength $_p$ as a function of excitation wavelength, which confirms the theoretically predicted plasmon dispersion. We observe that the plasmon wavelength $_p$ $_0$/40 is remarkably reduced compared to the illumination wavelength $_0$, which can directly be attributed to the two-dimensionality and unique conductance properties of graphene.Furthermore, we demonstrate tunability of the plasmon wavelength by gating graphene nanoribbons on a SiO_2 substrate.The possibility to tune plasmons of extreme subwavelength electronically opens up a new paradigm in optical and opto-electronic telecommunications and information processing.
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