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Tuning optical conductivity of large-scale CVD graphene by strain engineering GUANGXIN NI, JING WU, ORHAN KAHYA, CHEE TAT TOH, Department of Physics, National University of Singapore, JONG HYUN AHN, School of Mechanical Engineering, Sungkyunkwan University, VITOR M. PEREIRA, BARBAROS ÖZYILMAZ, Department of Physics, National University of Singapore — Strain engineering has been widely recognized as an effective way to tailor the electrical properties of graphene. In the optical domain, the strain effect is also predicted to alter the optical conductivity of graphene, making graphene possible for the atomically thin optical elements. However, a direct experimental observation is still missing. Using the nanopillar structure, here we show that optical conductivity of CVD graphene under nonuniform strain exhibits periodic modulation as a function of polarization. The optical absorption can be further modulated via the application of an external uniaxial strain, which is confirmed by Raman spectroscopy as well as AFM images. Our experimental observations are quantitatively interpreted within the Kubo-Greenwood formalism. The manipulation of the optical properties of graphene demonstrated in this study can be effectively utilized in the novel type of optical devices and strain sensor applications.

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