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Optical absorption and giant Faraday rotation in strained graphene VITOR PEREIRA, National University of Singapore, NUNO M.R. PERES, RICARDO M. RIBEIRO, Universidade do Minho, Portugal, ANTONIO CASTRO NETO, Boston University — Slightly doped or undoped graphene is characterized by an universal optical absorption coefficient of $\pi\alpha$ (nearly 2%), which is constant in a frequency band spanning the near UV, down to the far IR. Strain-induced anisotropy breaks this universality, while keeping the optical response constant up to energies close to the van-Hove singularity of the spectrum. This allows for the possibility of exploring the photoelasticity of graphene towards the development of atomically thin, broadband optical elements. We show, and analytically quantify, the amount of polarization rotation and dichroism expected for uniaxially strained graphene. The effect can be used to tailor the optical response of graphene or, conversely, to use light to measure the amount and direction of uniaxial strain in graphene for sensing applications. Exposure to an external magnetic field brings about the Faraday effect, which is shown to be extremely large in comparison with conventional materials. Moreover, the sharp enhancement of Faraday rotation and absorption at the field and stain tunable cyclotron frequency opens the possibility of tunable broadband optics in atomically thin transparent membranes.

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