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Imaging height fluctuations in free-standing graphene membranes
KYLE DORSEY, MARC MISKIN, ARTHUR BARNARD, PETER ROSE, ITAI COHEN, PAUL MCEUEN, Cornell University — We present a technique based on multi-wavelength interference microscopy to measure the heights of observed ripples in free-standing graphene membranes. Graphene membranes released from a transparent substrate produce interference fringes when viewed in the reflection mode of an inverted microscope(Blees et. al. Nature 524 (7564): 204-207 (2015)). The fringes correspond to corrugation of the membrane as it floats near an interface. A single set of fringes is insufficient to uniquely determine the height profile, as a given fringe spacing can correspond to an increase or decrease in height by $\lambda/2$. Imaging at multiple wavelengths resolves the ambiguities in phase, and enables unique determination of the height profile of the membrane (Schilling et. al.Phys. Rev. E, 69:021901, 2004). We utilize this technique to map out the height fluctuations in free-standing graphene membranes to answer questions about fundamental mechanical properties of two-dimensional materials.

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