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Atomically Flat Graphene on Mica Substrates LI LIU, CHUN HUNG LUI, KIN FAI MAK, GEORGE FLYNN, TONY HEINZ, DEPARTMENT OF PHYSICS, COLUMBIA UNIVERSITY, NEW YORK, NY 10027 COLLABORATION, DEPARTMENT OF CHEMISTRY, COLUMBIA UNIVERSITY, NEW YORK, NY 10027 COLLABORATION — Much recent interest has focused on the question of the intrinsic flatness of monolayers of exfoliated graphene. In studies of both suspended graphene [*Meyer et al, Nature 446 (2007)*] and graphene deposited on SiO_2 substrates [*Stolyarova et al, PNAS 104 (2007)*], graphene monolayers exhibited clear variations in height. For suspended films, this variation was attributed to an intrinsic rippling instability [*Meyer et al, Nature 446 (2007)*]. In the case of graphene on SiO_2 substrates, the role of intrinsic and substrate- induced effects remained unclear because of the corrugation of the substrate. In this paper we present results of a detailed study of the morphology of exfoliated graphene monolayers deposited on the atomically flat terraces of cleaved mica surfaces. Using high-resolution atomic force microscopy (AFM), we demonstrate that graphene monolayers on mica, when measured with lateral spatial resolution of $\sim$ 6nm, are flat to over micron lateral length scales to within the instrumental sensitivity of 50 pm. These results stand in sharp contrast to the behavior reported for both suspended graphene and graphene on SiO_2 substrates.

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