Abstract Submitted
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High Resolution Imaging of Graphene on SiC by Contact Resonance AFM: Experiment and Theory QING TU, BJOERN LANGE, Department of Mechanical Engineering and Materials Science, Duke University, Durham, NC, USA, JOAO MARCELO LOPES, Paul-Drude-Institut für Festkörperelektronik, Hausvogteiplatz 5-7, D-10117 Berlin, Germany, STEFAN ZAUSCHER, VOLKER BLUM, Department of Mechanical Engineering and Materials Science, Duke University, Durham, NC, USA — Contact resonance atomic force microscopy (CR-AFM)[1] is a powerful tool for mapping differences of the mechanical properties of layered, 2D materials. The deconvolution of stiffness contributions arising from the different layers is, however, difficult. Here, density functional theory (DFT) calculations can help interpret experimental results. Few-layer graphene (FLG; mono-, bi-, or tri-layer thickness) on silicon carbide (SiC) exhibits very clean and distinct surfaces and yields high-contrast CR-AFM images. To interpret the contributions from surface areas with different layer thickness and structure we use DFT to calculate atomic displacements for forces acting on FLG on SiC using the $\sqrt{3}\times\sqrt{3}$ and the $6\sqrt{3}\times6\sqrt{3}$ structure models. Based on these displacements we calculate an effective modulus using a simple spring model. The resulting moduli can then be compared with those extracted from experimental CR-AFM measurements of FLG on SiC.

[1] Yamanaka, K and Nakano, S, Applied Physics A: Materials Science & Processing, S313–S317, (1998)

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