Abstract Submitted
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Effect of film corrugation on the optical phonon lifetime in graphene[1] PETER EKLUND, Department of Physics, Department of Material Science and Engineering, Pennsylvania State University, University Park, PA 16802, AWNISH GUPTA, Department of Physics, Pennsylvania State University, University Park, PA 16802 — We present results of a microRaman study of n-layer graphene films supported on ∼atomically flat mica, Si/SiO_2 (or varying roughness) and suspended above a trench. Using the Raman G-band line width Γ_G, we find that the optical phonon lifetime $\tau \sim 1/\Gamma$ decreases linearly with increasing rms substrate roughness δ, and independent of the chemical composition of the substrate. In agreement with this general observation, we find that Γ_G for unsupported graphene is significantly higher (i.e., *the q=0* optical phonon lifetime is significantly lower) than observed when the film is supported on mica. Correlating Γ_G with values obtained from supported films, we infer an inherent rms roughness $\delta \sim 2\ nm$ for unsupported graphene, in reasonable agreement with recent STM reports that first suggested that graphene might prefer to spontaneously convert to a corrugated system. Our observations may then relate to the effect of the local bending of the sp^2 sheet on the electron-phonon interaction.

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