Abstract Submitted
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Scattering mechanisms in graphene suspended in liquids. II. Flexural phonons (Theory)[1] YEVGENIY PUZYREV, A.K.M. NEWAZ, BIN WANG, KIRILL BOLOTIN, SOKRATES PANTELIDES, Physics and Astronomy Department, VANDERBILT UNIVERSITY COLLABORATION — Recent experiments reported strong scattering of charge carriers by flexural phonons in suspended graphene in vacuum.[2] Our experimental data (previous talk) show that the carrier mobility observed for devices immersed in non-polar liquids, namely toluene and hexane, are significantly larger than the mobility limitation due to scattering by flexural phonons. We performed molecular dynamics simulations of graphene sheets suspended in hexane, toluene, and in vacuum at room temperature. We find that the interaction of molecules of the liquid with graphene suppresses the amplitude of the phonons by ∼50%. We show computationally that this suppression is equivalent to an effective increase of the bending rigidity[3] of graphene from a free-space value ∼1.3 eV in vacuum to ∼3.6 eV in liquids. Therefore, we demonstrated that scattering by out-of-plane flexural phonons is reduced by the presence of liquids.

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[2]Castro E. V., *et al.*, "Limits on Charge Carrier Mobility in Suspended Graphene due to Flexural Phonons," Phys. Rev. Lett. 105, 266601, 2010.
[3]Fasolino A., Los J. H., Katsnelson M. I., "Intrinsic ripples in graphene.," Nature Mat. 6, 858, 2007.

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