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Scattering mechanisms in graphene suspended in liquids. I. Coulomb scattering (Experiment) A.K.M. NEWAZ, YEVGENIY PUZYREV, BIN WANG, SOKRATES PANTELIDES, KIRILL BOLOTIN, Vanderbilt University — Enhanced dielectric screening of charged impurities by high-κ environment of graphene is predicted to improve the electronic quality of graphene devices by suppressing Coulomb scattering. However, experiments reported so far demonstrate that electronic transport in graphene is only modestly modified by a high-κ environment. Here we fabricate large area multiterminal graphene devices suspended in liquids and study electronic transport in graphene as a function of liquid's dielectric constant. We observe a rapid increase of mobility μ with κ due to dielectric screening in non-polar solvents ($\kappa \leq 5$). We also find that charged ions present in polar solvents ($\kappa \geq 18$) cause a drastic drop in mobility counteracting the gains by dielectric screening in polar high-κ liquids. Furthermore, molecular dynamics simulations establish that scattering by out-of-plane flexural phonons is suppressed by the presence of liquids (next talk). We expect that our findings may provide avenues to control and reduce carrier scattering in future graphene-based electronic devices.

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