Hamaker constant of freestanding graphene from STM and AFM measurements

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A direct measurement of the Hamaker constant of freestanding graphene is not straightforward. In force-distance curves on supported graphene the substrate will contribute significantly to probe-sample interactions. This makes it impossible to deduce a Hamaker constant being characteristic for the probe-graphene arrangement.

We have recently developed an approach, which utilizes STM measurements on freestanding graphene membranes in order to very sensitively measure tip-sample forces [1]. Additionally AFM force-distance curves allow to detect longer range interactions. The Hameker constants for the graphene probe arrangement turn out to be considerably smaller than those measured STM/AFM probes against highly oriented pyrolytic graphite (HOPG). This result could have been expected but the quantitative results provide a first impression how small a Hamaker constant resulting from a monolayer thick membrane really is.

References

1. B. Uder, H. Gao, P. Kunnas, N. de Jonge, and U. Hartmann, Nanoscale, 10 (2018) 2148

Figures

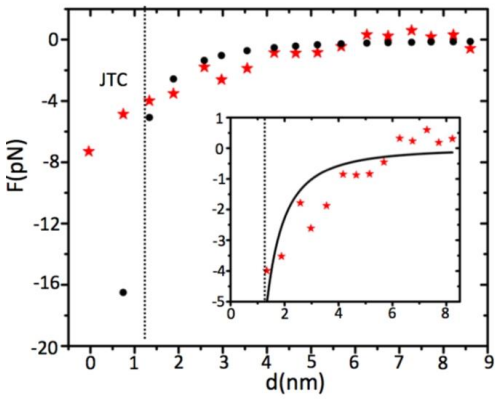

Figure 1. Force-distance curve on a freestanding graphene-membrane measured by AFM. The red points are averaged experimental results and the black points are obtained by fitting. The inset shows data prior to jump to contact (JTC) which is relevant for calculating Hamaker constants.