Enhanced water diffusion between graphene and mica under electric fields

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Abstract

The effect of electric fields on the diffusion of water between graphene and mica at room temperature is studied using atomic force microscopy (AFM). Upon applying an electric field perpendicular to the graphene-mica interface, an increase in the diffusion of water between mica and graphene is detected; observed changes are 2-3 orders of magnitude. We discuss our findings in terms of electrowetting, and electromelting of confined water at room temperature. In the latter case, our observations comprise the first experimental evidence, where findings have up to now been limited to molecular dynamics simulations [1].

References

[1] Qiu, H.; Guo, W., Phys. Rev. Lett., 110, (2013) 195701

Figures

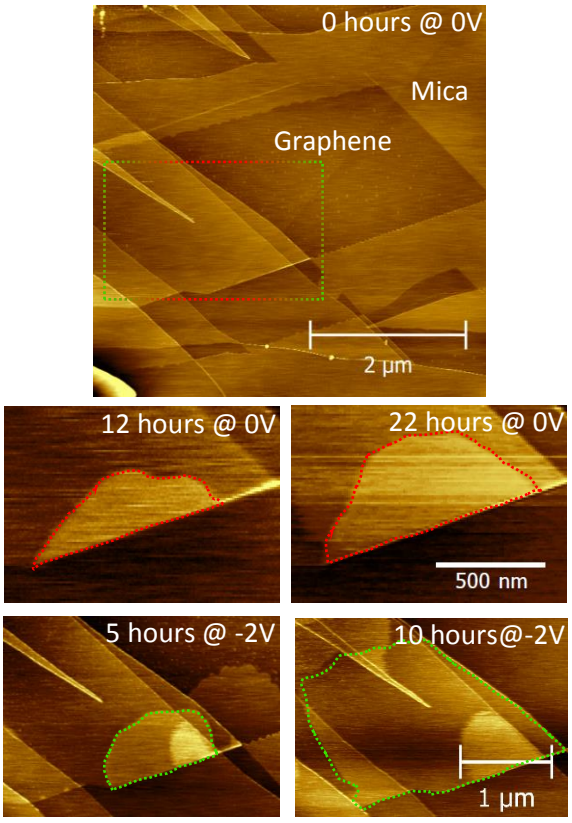

Figure 1: AFM images of a graphene blanket on mica at 83% relative humidity. A water layer intercalates. The water intercalation is enhanced by applying -2V between the graphene and a counter electrode under the mica.

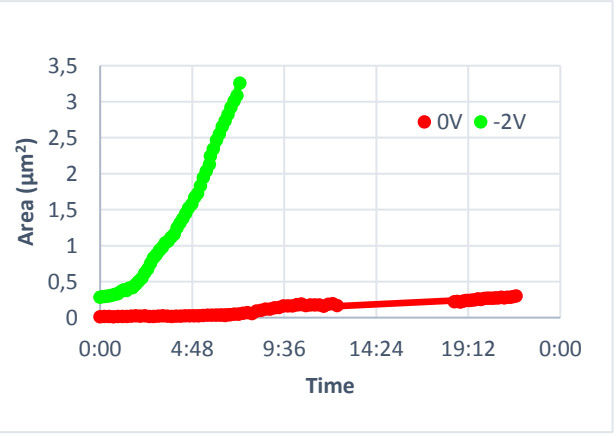

Figure 2: Area as function of time without electric field (red) and with electric field (green).