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Mirror buckling of freestanding graphene membranes induced by local heating due to a scanning tunneling microscope tip[1] J.K. SCHOELZ, University of Arkansas, M. NEEK AMAL, Departement Fysica, Universiteit Antwerpen, P. XU, S.D. BARBER, University of Arkansas, M.L. ACKERMAN, Physics Department, University of Arkansas, P.M. THIBADO, University of Arkansas, A. SADEGHI, Departement Physik, Universat Basel, F.M. PEETERS, Departement Fysica, Universiteit Antwerpen — Scanning tunneling microscopy has been an invaluable tool in the study of graphene at the atomic scale. Several STM groups have managed to obtain atomic scale images of freestanding graphene membranes providing insight into the behavior of the stabilized ripple geometry. However, we found that the interaction between the STM tip and the freestanding graphene sample may induce additional effects. By varying the tunneling parameters, we can tune the position of the sample, in either a smooth or step like fashion. These phenomena were investigated by STM experiments, continuum elasticity theory and large scale molecular dynamics simulations. These results confirm that by increasing the tip bias, the electrostatic attraction between the tip and sample increases. When applied on a concave surface, this can result in mirror buckling which leads to a large scale movement of the sample. Interestingly, due in part to the negative coefficient of thermal expansion of graphene, buckling transitions can also be induced through local heating of the surface using the STM tip.

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