Stefan Hummel[1,2]
M. Winhold[1], B.C. Bayer[2], K. Elibol[2], P. Frank[1], C.H. Schwalb[1]
[1]GETec Microscopy GmbH, Vienna, Austria
[2]Physics of Nanostructured Materials, University Vienna, Vienna, Austria

stefan.hummel@getec-afm.com

Correlative in-situ AFM & SEM mechanical analysis of suspended 2D materials

Understanding of mechanical properties of Graphene and other two dimensional (2D) materials is crucial for almost all current and future applications regarding those materials. Although the mechanical properties of Graphene have been investigated intensively by atomic force microscopy (AFM) and other techniques, experiments on freestanding 2D membranes still remain challenging and interpretation of the results are controversial. Hence, to obtain a thorough understanding of mechanical AFM experiments on freestanding membranes, complementary measurements (e.g. Raman Spectroscopy [1], Scanning Tunneling Microscopy (STM) [2]) are necessary. Here, we will show recent results of our in-situ corrleative AFM & SEM (scanning electron microscopy) study on suspended graphene. By using our novel AFSEM™ technology [3], we are able to investigate the effect of a scanning probe on freestanding few-layered graphene with full force control of the AFM and directly visualize the deformation of the membrane with the SEM. Since we are capable of performing several other AFM modes (conductive, magnetic force, thermal, KPFM) AFSEM™ allows for a range of characterization techniques and direct correlation with scanning electron images.

References

[1] K. Elibol, B.C. Bayer, S. Hummel, J. Kotakoski, G. Argentero, J.C. Meyer; Sci. Rep. 6, 28485 (2016)
[2] F. Eder et.al.; Nano Lett., 2013, 13(5)
[3] J. Kreith et.al; Review of Scientific Instruments, 2017, 88(5)

Figures

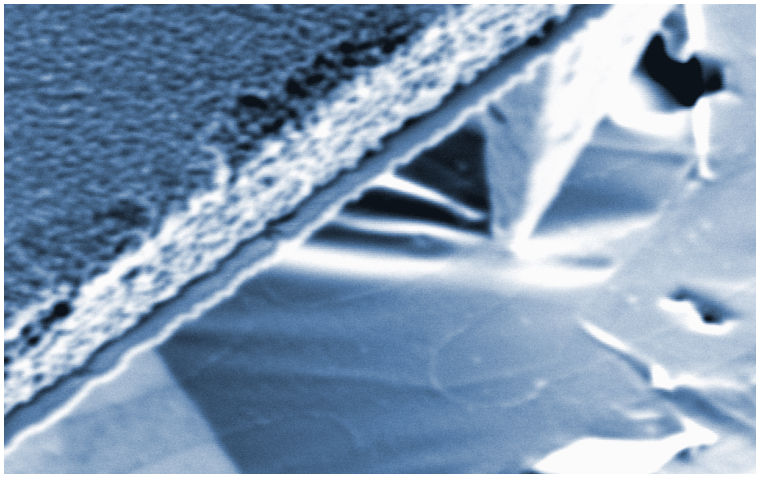

Figure 1: In-Situ SEM image of a scanning AFM tip on suspended, few-layered graphene