Application of the 20–80 kV SALVE TEM to graphene

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Modern aberration-corrected transmission electron microscopy is able to routinely image sample structures with true atomic resolution with a resolution better than 1 Å. Unfortunately, light-element materials suffer severe damage via the knock-on mechanism at electron energies commonly used for high resolution imaging [1]. To avoid this kind of sample damage, imaging at lower acceleration voltages of 60–80 kV became popular to undercut the threshold for knock-on damage. Thanks to geometric aberration correction, an image resolution of below 2 Å can still be maintained. One interest when performing atomic resolution microscopy of thin and/or light-element materials lies in interfaces and defects and there, the aforementioned damage threshold is significantly lowered, thus, calling for even lower imaging electron energies [2].
Here, we demonstrate the use of the new chromatic and geometric aberration corrected SALVE microscope [3] with examples of point defects in graphene imaged at 20 kV and 80 kV with high resolution.

References

[1] Meyer et al., PRL 108 (2012) 196102
[2] Kaiser et al., Ultramicrosc. 111 (2011) 1239
[3] Linck et al., PRL 117 (2016) 076101

Figures

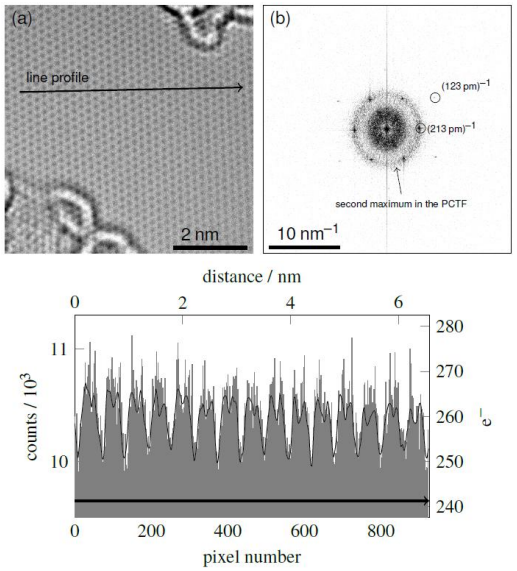

Figure 1: SALVE TEM image of graphene taken with 20 keV electrons with its diffractogram and line profile

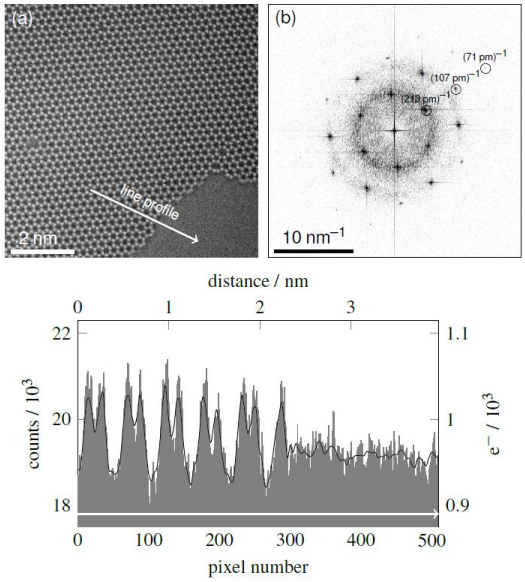

Figure 2: SALVE TEM image of graphene taken with 80 keV electrons with its diffractogram and line profile