13th Day of Microscopy

Workshop 4

Material Science on Nano Scale

Height measurements in light- and electron microscopy

In scanning electron microscopy (EM), basically two different contrast modes are used: Backscattered electrons are detected, to acquire an image of the material composition of the sample. Moreover secondary electrons (SE) are detected to obtain images of the surface down to 1 nm lateral resolution. These electron optical images are two dimensional projections of the topography of the sample. A series of two-dimensional images of the surface taken from different viewing directions can be used to reconstruct the three-dimensional structure of the sample in high spatial resolution. On the basis of this three-dimensional reconstruction, a height profile of the topography can be obtained straight forwardly.

In optical microscopy by means of “Total Interference Contrast (TIC) Microscopy”, a cheap kind of interference microscopy, a vertical resolution down to 0.1 nm can be achieved. The capabilities of this method are demonstrated on mono- and bilayers of Graphene on semiconductor wafer, which can be distinguished by their heights and by their electronic properties. Monolayers are identified by a cross-section measured by TIC. For the invention of grapheme the Nobel prize was given in 2010, because of its extraordinary electronic properties.

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