Electron microscopy/resolution

This article was checked by pedagogue

This article ws checked by pedagogue, but later was changed.

Checked version of the article can be found here (https://www.wikilectures.eu/index.php?title=Electron_microscopy/resolution&oldid=18563).

See also comparation of actual and checked version (https://www.wikilectures.eu/index.php?title=Electron_microscopy/resolution&diff=-&oldid=18563).

Resolution

Definition

Resolution is the quality or definition that we can see something.The resolving power of a microscope is directly related to the wavelength of the irradiation used to form an image. Reducing wavelength increases resolution. Therefore, the resolution of the microscope is increased if the accelerating voltage of the electron beam is increased.

Typing

1. Resolution of the transmission electron microscope (TEM): Resolution values in the TEM can vary depending on the KiloVolt potentials used to accelerate the TEM's beam. As KiloVolt potentials have increased and wavelength of the electrons decreased, TEM resolutions have improved from 10 nano-meters down to 0.05 nano-meters.

2. Resolution in the scanning electron microscope (SEM): The resolution of the SEM depends on the size of the electron spot, which in turn depends on both the wavelength of the electrons and the electron-optical system that produces the scanning beam. The resolution is also limited by the size of the interaction volume, or the extent to which the material interacts with the electron beam. The resolution can fall somewhere between less than 1 nm and 20 nm. However the highest resolution ever obtained was 0.4nm at 30KV.

Limits

In the SEM the resolution is limited by the width of the exciting electron beam and the interaction volume of electrons in a solid. The limit of resolution obtainable in a TEM may be described in several ways, and is typically referred to as the information limit of the microscope. One commonly used value is a cut-off value of the contrast transfer function, a function that is usually quoted in the frequency domain to define the reproduction of spatial frequencies of objects in the object plane by the microscope optics. A cut-off frequency, qmax, for the transfer function may be approximated with this equation, where Cs is the spherical aberration coefficient and λ is the electron wavelength. I DOUBT WHETHER YOU UNDERSTAND WHAT YOU ARE WRITING

Links

References

- http://www.jic.ac.uk/microscopy/intro_em.html
- http://www.microbehunter.com/2009/01/22/electron-microscopes-vs-optical-light-microscopes/
- http://en.wikipedia.org/wiki/Scanning_electron_microscope