A MIRROR-CORRECTED SCANNING ELECTRON MICROSCOPE

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In materials science and biological research the Scanning Electron Microscope (SEM) has a long tradition. In recent years the interest in the imaging of sensitive samples and the material contrast at a high lateral resolution has grown. Lowering the primary electron energy on one hand helps to reduce the sample damage. On the other hand the interaction volume is decreased, thus increasing the lateral information from the backscattered electron signal. Even in Transmission Electron Microscopy a very low acceleration voltage is desired to get lateral information on an atomic scale from samples which could not be imaged without dose-induced artifacts otherwise.

However, the low primary electron energy is extremely demanding to the electron optics, if not too much of the lateral resolution should be lost due to the increased wavelength of the electrons. In a suitable instrument typically the spherical and the axial chromatic aberration have to be corrected. Additionally, innovative detector schemes can provide enhanced analytic capabilities and can avoid limitations by signal noise and residual instrumental instabilities.

In our presentation we will discuss a mirror-corrected SEM, offering high-resolution analytics with efficient productivity to visualize even the most sensitive materials by use of electrons with energies far below 1keV. At these energies the resolution of conventional instruments is often very poor, but compensating for the primary aberrations of the objective lens can overcome this obstacle. The aberration correction by means of an electron mirror significantly increases the resolution especially for low energies; this has been proven in a unique spectro-microscope over the last 15 years.

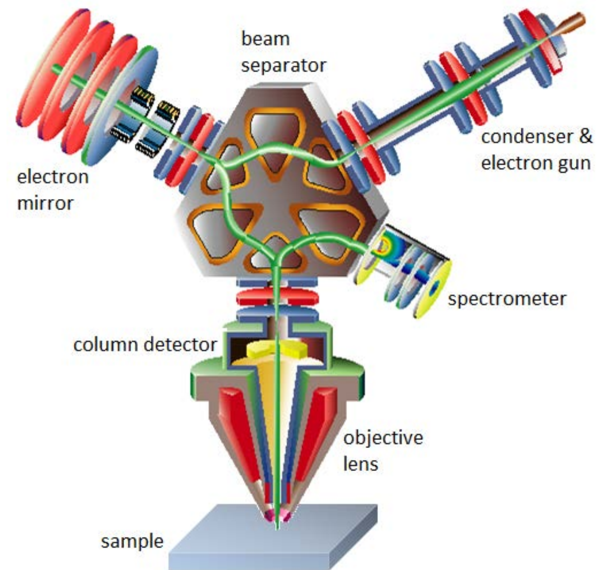

FIGURE 1. Schematic view of the mirror-corrected scanning electron microscope.