EFTEM Spectrum Imaging at High Energy Resolution – Methods and Applications

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Energy-filtering transmission electron microscopy (EFTEM) allows to rapidly map elemental and chemical properties of specimens by recording images with electrons of a characteristic energy-losses. It combines high spatial resolution and a large field of view at comparably low acquisition times. EFTEM spectrum imaging (EFTEMSI) is a method of collecting an almost complete data set in both the spatial and energy-loss dimension by combining a series of EFTEM images closely spaced on energy-loss axis [1]. The energy resolution of the spectrum images is usually limited by the width of the energy selecting slit which is typically 2 – 5 eV for common imaging filters [2].

In this work we show that EFTEMSI is possible with an energy resolution less than 1 eV for suitable small slit widths. However, at increased energy resolution spectral aberrations of the imaging filter (mainly non-isochromaticity) play a more pronounced role and data post processing becomes necessary. Spatial and energy drift during acquisition also need to be corrected for and data correction of the combined effects is not straightforward, but always has to be carried out simultaneously. We will present a new artifact correction scheme and give an overview of recent EFTEMSI applications at energy resolutions of ~0.8 eV [3].

![Comparison of GaN EEL spectrum acquired in spectroscopy mode with spectrum extracted from EFTEMSI of the same sample.](image)

FIG. 1. Comparison of GaN EEL spectrum acquired in spectroscopy mode with spectrum extracted from EFTEMSI of the same sample.

References

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