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Getting the most out of your EDS in the TEM: M2T quantification, EDS based sample thickness measurements and more

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Abstract

The detection and characterisation of X-rays using Energy Dispersive Spectroscopy (EDS) within the TEM is a well-established process in most labs. EDS can be utilized to add another dimension to TEM data through the addition of material quantification, spectral images and more.

Advances in TEM EDS hardware have produced large area detectors with enhanced spectral resolution and high X-ray throughput. Resulting in greater X-ray collection at all sample tilts and the ability to acquire EDS data at high temperatures during in situ experimentation.

EDS quantification has also seen significant advancement through the introduction of M^2T, a refined TEM quantification routine capable of measuring sample thicknesses and performing advanced absorption correction to improve the quantification of thick samples and light elements.

In this tutorial we will discuss the fundamentals of EDS analysis within the TEM, highlighting ways to optimize X-ray generation and maximise EDS efficiency. We will explore the M^2T quantification routine, identifying its benefits over the conventional Cliff-Lorimer method and other advanced quantifications like the ζ-factor method. Examples of EDS based thickness measurements will be shared from conventional TEM lamella to graphene.

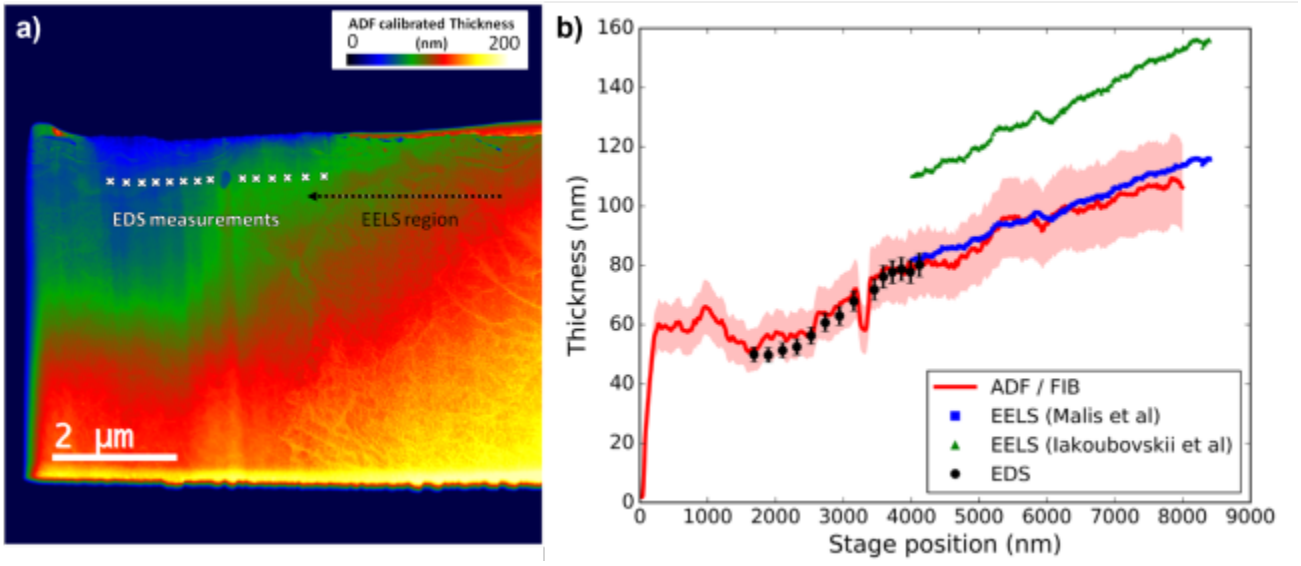

Figure 1 a) ADF calibrated thickness map of a TEM lamella, indicating non uniform sample thickness and location of EDS and EELS measurements. b) Plot of sample thickness measurements comparing the ADF contrast thickness, M^2T EDS measurements and EELS measurements.