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# ELECTRON ENERGY LOSS SPECTROSCOPY (EELS)

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<sup>1</sup> An EELS spectrum consists of a monotonically-decreasing background on which several broad peaks, each characteristic of a particular inelastic scattering process, are superimposed. The spatial resolution is limited by the diameter of the incident illumination focused on the sample.

## Possible Applications

- Quantitative elemental analysis,<sup>2</sup> both fixed-point and time- and position-resolved<sup>3</sup> with sensitivity down to 1 atomic percent
- Thickness determination<sup>4</sup>
- Observation of band structure effects, oxidation state determination<sup>5,6</sup>
- Measurement of short-range order (radial distribution function)<sup>7</sup>

## Specimen Requirements

Specimens should be thin (<50nm) to avoid plural scattering effects; for high spatial resolution, specimens should be beam-insensitive; specimens should have clean surface for quantitative analysis; may be prepared by all conventional techniques used to prepare specimens for high resolution imaging.

## Limitations

Spectra from thick specimens (>50nm) may be difficult to interpret because of plural scattering. Characteristic edges on features are broad and often overlap. Interpretation of fine structure sometimes requires sophisticated calculations.

## Suitable Microscopes

This technique is available on the following instruments:

- JEOL ARM200F
- Nion UltraSTEM 100
- JEOL JEM 2010F
- Philips CM200-FEG
- Topcon 002B

## References

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