

Improvements in scanning electron microscope image resolution using reference image or a sample

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We present a robust method for determining the point spread function (PSF) of an electron beam in a scanning beam microscope (SEM). Once a psf is measured, it can be used with a corresponding image collected with that psf, to produce a restored image with improved resolution through the use of numerical optimization methods. As an example, a 4x improvement in resolution for images is demonstrated for a fine gold particle sample.

Since thermionic source instruments have high beam currents associated with large probe size, use of this approach implies that high-resolution images can be produced rapidly if the probe diameter is less of a limiting factor. Additionally, very accurate determination of the PSFs can lead to a better understanding of the instrument performance as exemplified by very accurate measurement of the beam shape.