

Basics of TEM and STEM imaging

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Abstract

This lecture provides a brief introduction to the underlying physical principles of electron microscopy. It discusses the wave nature of the electron and its implication for the diffraction limit of the electron microscope, the classical fundamental resolution limits of electron lenses and how they can be overcome in modern, aberration-corrected electron microscopes. In this context, the lecture introduces the broad-beam transmission and the scanning transmission modes as the most basic imaging modes in a transmission electron microscope. Different contrast mechanisms, namely phase contrast and amplitude contrast mechanisms, as well as different detection strategies are discussed. The various imaging modes, from atomic-resolution imaging to medium- and low-resolution imaging modes, are illustrated on case studies and examples.

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