



## Aberration-Corrected Scanning/Transmission Electron Microscope

EMSL's aberration-corrected Titan 80-300™ scanning/transmission electron microscope (S/TEM) provides high-resolution imaging with sub-angstrom resolution and spectroscopic capabilities. This state-of-the-art instrument is equipped with a Schottky field-emission electron source, an electron gun monochromator, CEOS hexapole spherical aberration corrector for the probe-forming lens, high-angle annular dark field (HAADF) detector, an X-ray spectrometer (EDS), and a high-resolution Gatan Imaging Filter (GIF). The selection of electron energy between 80 kV and 300 kV enables optimized imaging for a variety of samples, including electron beam sensitive materials.

### Research Applications

**Materials science and engineering** – probing the microstructure and chemical composition of energy materials, ceramics, semiconductors, metals, alloys, and composites

**Nanoscience and technology** – detailing nanoscale structures provides insight into the structure-property relationships, nucleation and growth phenomena, phase transformations, material interfaces, and material defects

**Chemistry** – understanding particle surface interactions, atomic-level structure and chemistry, electronic structure and coordination, valence state charge transfer, and catalytic mechanisms

**Biogeochemistry** – providing structure and chemistry analysis across a spectrum of soft and hard materials, such as in biomineralization

**Environmental science** – identifying aerosol structure and chemistry and enabling trace analysis for environmental remediation and emission pollutant analysis



### Quick Specs

- Electron Beam Energy: 80–300 keV
- S/TEM-HAADF Point-to-Point Resolution at 300 kV: < 0.1 nm
- HRTEM Phase Contrast Resolution (information limit at 300 kV): < 0.1 nm
- EELS Energy Resolution (with monochromator “on”): 0.15 eV
- High-tilt Crystallographic and Tomographic Analysis
- Silicon-Lithium [Si(Li)] X-ray EDS
- Cryogenic Imaging Capability
- Sample Tilt Range: -70°–+70°
- Charge Coupled Device Camera: 2 k by 2 k (2048 x 2048 pixels)
- Exit Wave Function Reconstruction from Focus Series Images
- Manufacturer: FEI Company

## EMSL's S/TEM Offers:

**Aberration-corrected S/TEM HAADF** – provides direct structural imaging with sub-angstrom resolution

**High-resolution TEM (phase contrast)** – affords atomic-level structure analysis

**Energy-filtered imaging (EFTEM)** – available for mapping the spatial distribution of chemical species

**3-D tomographic imaging** – provides morphology, structure, and chemical identity in three dimensions

**Electron energy loss spectroscopy (EELS) with monochromated electron gun** – allows chemical and electronic structure analysis with a single atomic column resolution and band gap measurement

**Energy-dispersive spectroscopy** – available for chemical composition analysis

**Lorentz microscopy** – to study magnetic domains of magnetic samples

**Electron holographic imaging** – allows researchers to study electric and magnetic fields in thin films to determine magnetic domain or charge distribution.



To learn more about EMSL's capabilities and how they are being applied to EMSL users' research, see: <http://www.emsl.pnl.gov/capabilities>.

EMSL, a national scientific user facility, provides free instrument access for open-source research. Learn how to become a user and about upcoming proposal calls at <http://www.emsl.pnl.gov/access/calls/>.

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