FEI COMPANY™
TOOLS FOR NANOTECH

Titan™ 80-300

Expanding the boundaries and achieving new results

spherical aberration can be corrected and the typical C_s constant is of less importance: the point resolution now equals the information limit. The information limit is governed by the stability of the microscope and is the best measure for corrected microscopy quality and performance. The requirement for unsurpassed stability calls for a corrected microscope design that complies with the stringent needs for maximum mechanical, electronic and thermal stability, as well as precision alignment of the advanced components.

The Titan 80-300™ microscope incorporates a newly designed platform dedicated to the principles of ultimate stability, ultimate performance and ultimate flexibility for corrector and monochromator technology and its applications. The microscope transfers information deep into sub-Ångström resolution making way for the highest performance available in both TEM and STEM. Titan obtains a better lateral resolution than 1 Ångström (see figure below) and energy resolution down to 0.1 eV. This presents new information of the electronic properties of materials such as bonding states or band gaps with unprecedented spatial resolution. An innovative modular and patented design makes a field upgrade with a C_s corrector possible, allowing you a two step approach to corrected microscopy in your laboratory.

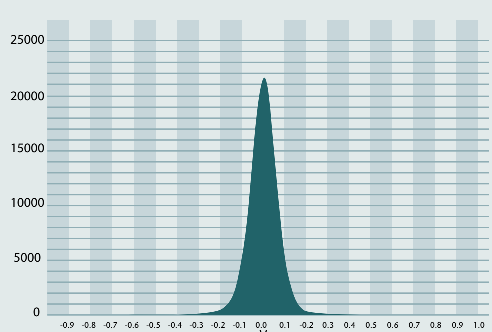
The stability, performance and ease-of-use of Titan enables corrected microscopy to be taken to the next level where new discoveries on the structure-property relationships of materials become possible at ever-decreasing scales. Titan is poised to bring electron microscopy into the new era by expanding the boundaries and achieving new results in nanoresearch.

Conquering the sub-Ångström Era

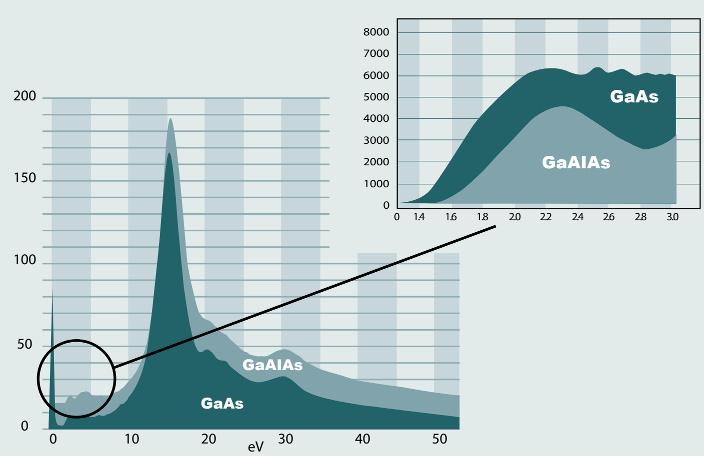
Nanoresearch strives to increase our understanding of nanostructures and functional materials by linking the macroscopic material properties to the properties at the smallest level of detail: down to atoms. This continuing drive pushes for the better understanding of local atom organization and for the characterization of atoms, chemical bonding and even the electronic structure.

The recognized and ever growing need to truly image and analyze nanostructures with the highest level of detail implies setting new standards for achieving new results in nanoresearch microscopy. Sub-Ångström aberration-corrected analytical microscopy is the benchmark and presents a new set of rules in this new era. A classical electron microscope's fundamental

Titan with monochromator



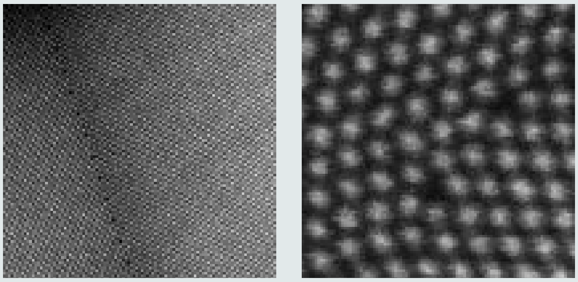
Energy resolution at 300kV using FEI proprietary monochromator with embedded Gatan Tridiem 866 is better than 0.2 eV with 1 second exposure time.



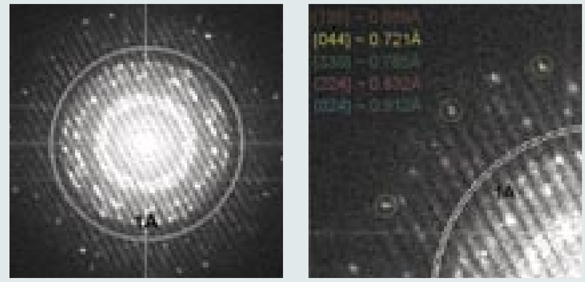
High-resolution EELS spectrum of GaAs and GaAlAs using Titan's monochromator technology. Uniquely, after subtraction of the zero-loss peak, bandgap thresholds can be measured as well as the energy shift due to the Al doping.

Ultimate performance, ultimate stability, ultimate flexibility

Titan basic performance (no correctors)

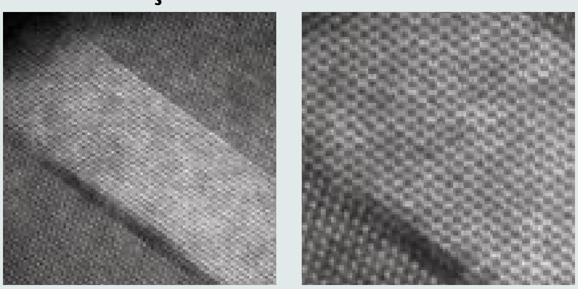


HR STEM. *Grain boundary in gold in <110> direction. (raw data). Missing atomic columns are visible at the boundary Sample courtesy C. Kisielowski NCEM Berkley (USA).*

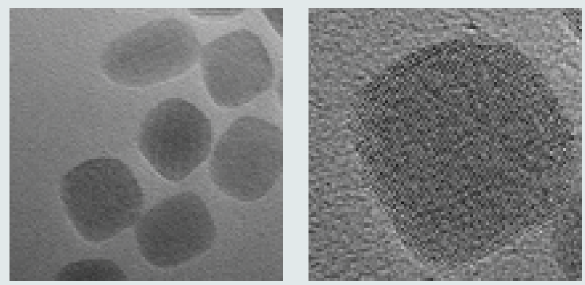


HR TEM. *New Rules: Classical "C_s" is now irrelevant and point resolution now equals information limit. Information limit is all about stability. Titan's Information Limit: Young's Fringes of poly crystalline gold. Fringes extend below 1.0 Å.*

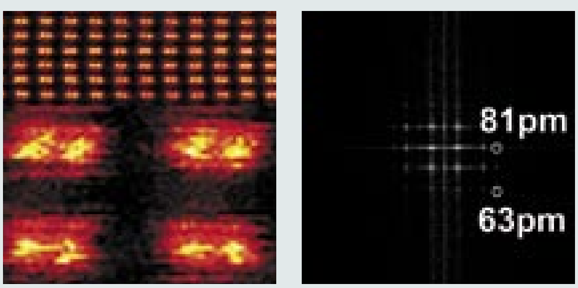
Titan with C_s corrector



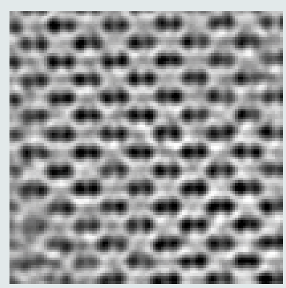
Atomic resolution HR-STEM image of diamond <110> using Titan's C_s probe corrector. Diamond dumbbells are shown at a spacing of 0.9Å. The twin and grain boundaries can be clearly imaged.



Atomic resolution HR-TEM direct image of Pt/Co nano particles using Titan's C_s image corrector. Individual atom columns and particle boundaries can be clearly resolved.

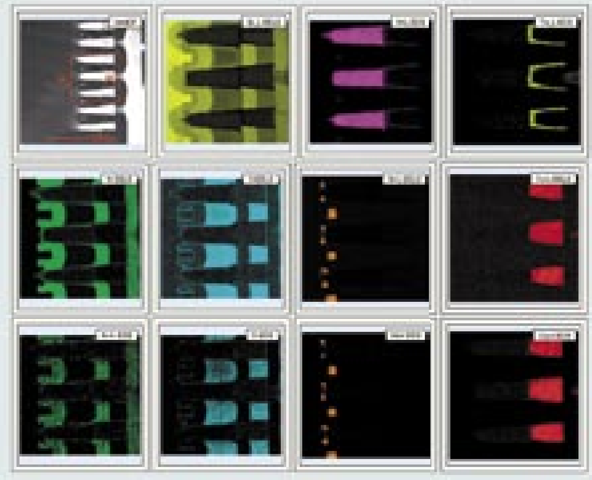


Atomic resolution HR-STEM image of Ge <112> using Titan's C_s probe corrector. The Germanium atomic distance of 0.81Å can be resolved in the real image(left). In Fourier space resolutions down to 0.63Å are resolved (right). Courtesy: Ernst Ruska Center, Germany.



Atomic resolution HR-TEM direct image of Silicon <110> using Titan's C_s image corrector. Individual atom columns can be clearly resolved.

Elemental maps using Titan's simultaneous acquisitions of EELS and EDS signals in STEM. Elemental maps reveal the entire chemistry (low Z and high Z) of the device under investigation. 200 x 200 pixels map with a scanning probe smaller than 5Å.



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TÜV Certification for design, manufacture, installation and support of focused ion- and electron-beam microscopes for the NanoElectronics, NanoResearch and NanoBiology markets.

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