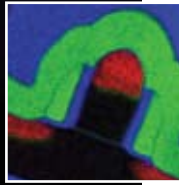
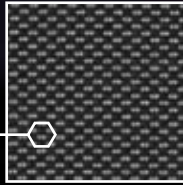


ANY WAY YOU LOOK AT IT,
FEI PROVIDES THE WORLD'S BEST VIEW.



Titan™ S/TEM Family

The World's Most Advanced S/TEM Solutions

The future starts now

Now you're ready to push the limits and explore new frontiers. With many of today's advanced devices reaching far below 90 nm, it's safe to say that the future is here. Clearly, these rapid developments in nanoelectronics have created a demand for the sub-Ångström, ultra-high resolution that is increasingly required for metrology and defect characterization. While new discoveries on the structure-property relationships of materials are becoming feasible at ever decreasing scales, you need what the leading edge of transmission electron microscopy (TEM) technology can offer today. Given the immense pressure to win the race to volume production, you can't afford resolution limits, now or in the near future. To seamlessly transition into tomorrow's production nodes today, it's essential to image nanostructures and defects quickly, effectively and with the highest degree of accuracy, down to the sub-Ångström level. Drawing from FEI's rich legacy of pioneering solutions in sub-surface imagery, the Titan 80-300 kV S/TEM is the world's most advanced S/TEM, delivering sub-Ångström, ultra-high resolution for metrology and defect characterization.

Minimize the time it takes to:

- *Bring products through their development cycles*
- *Produce the highest-resolution STEM and TEM images*
- *Characterize sub-nm "sub-wafer surface" defects*
- *The time it takes to chemically map subsurface structures with sub-nm accuracy*

Increase:

- *Your production-ramp yields by engineering your products at the atomic level*
- *The likelihood of identifying sub-nm "sub-wafer surface" killer defects*
- *The advanced development capability of your lab*
- *Your future node imaging capability with field upgradeability (even with one aberration corrector)*

RIGHT
First the first time
FIRST
First to market
FAST
Fast to volume

Applications:

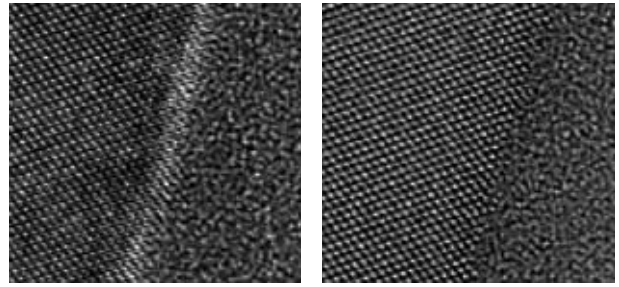
Failure Analysis

- HR-TEM imaging
- General purpose TEM imaging
- X-Ray analysis
- STEM detector
- EMI active cancellation

Characterization and Analysis

- Sub Ångström resolution
- High throughput STEM mode
- Probe corrector
- Image corrector
- Monochromator
- EELS
- GIF
- Holography

- Standard
- Optional



High-resolution images of a Si/SiO_x interface taken with a Titan + Image Cs corrector where the corrector was off and on in the left and right images, respectively. The minimization of the Cs value by the image corrector means that no delocalization is present in the corrected image which, as a result, shows a clear, unambiguous interface.

Achieving better results in the corrector age

Titan breaks the paradigm of classical electron microscopy. Until now, aberration-correction technologies in electron microscopes were treated as accessory components for standard S/TEM systems, often highlighting flaws in the basic platform design when implemented. Titan 80-300 is a premium solution, designed from the ground up for a new era of corrected TEM technology.

Enjoy these features at the atomic level:

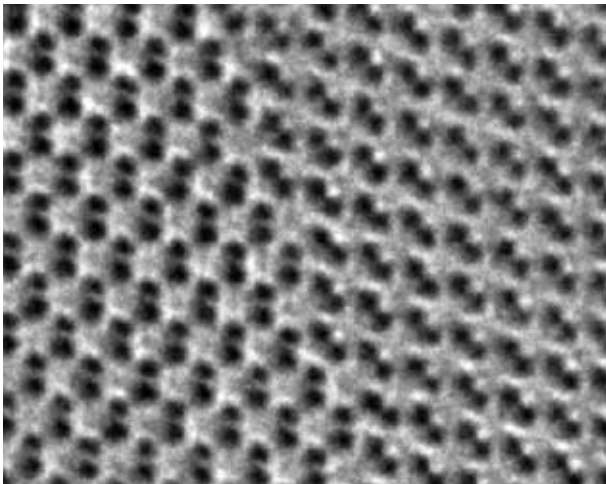
- *Dedicated Cs corrector and monochromator system*
- *Sub-Ångström performance in S/TEM*
- *Advanced energy resolution in EELS for band gap and fine structure studies*
- *Easy to reach high resolutions*
- *Upgradeable design for single corrector in the field*
- *Advanced performance, stability and flexibility*

Product	Energy Spread	Point Resolution	Information Limit	STEM Resolution
Titan Base Platform	0.7 eV	0.2 nm	< 0.1 nm	0.136 nm
Titan + Image Corrector	0.7 eV	< 0.1 nm	< 0.1 nm	0.136 nm
Titan + Probe Corrector	0.7 eV	0.2 nm	< 0.1 nm	< 0.1 nm
Titan + Monochromator	0.2-0.3 eV*	0.2 nm	< 0.1 nm	0.136 nm**

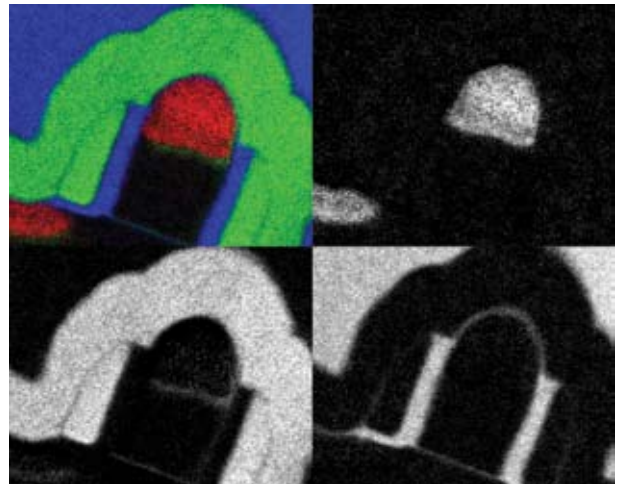
*Depending on energy filter option

**Monochromator off

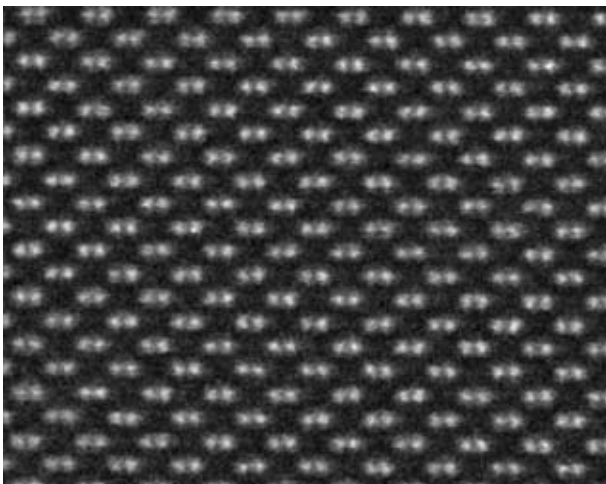
Note: All specifications are at 300 kV



Cs corrected TEM bright field image of a grain boundary in Si where both grains are oriented in the 110 direction relative to the electron beam.



Composite RGB map of logic transistor where red is Cobalt (upper right), green is Nitrogen (lower left), and blue is Oxygen (lower right).



High resolution (raw & unfiltered) high angle annular dark field (HAADF) STEM image of Si – taken in the 110 direction to reveal the classic “dumbbell” atomic splitting. The distance between these two atomic spacings in this direction is 0.136 nm.



Image of a gate oxide in a semiconductor device – taken with a Titan with image Cs corrector on at 80 kV. This is particularly significant since this voltage is below the damage threshold in carbon. The information limit at this voltage was still below 1 nm.

With resolutions far below one Ångström and energy resolution down below 0.2 eV (with high-resolution monochromator options), Titan delivers the highest performance available in both TEM and scanning transmission electron microscopy (STEM). In fact, Titan enables state-of-the-art imaging and analysis to get results you wouldn't be able to get any other way. New information on the electronic properties of materials, such as bonding states or band gaps, emerges with unprecedented spatial resolution. Engineering at the atomic scale is easier than you think.

Titan offers an unmatched microscope design that complies with the stringent needs for maximum mechanical, electronic and thermal stability. The highest performance dictates the most stable behavior possible of the entire system for the duration of the experiment, and Titan answers the call with a platform developed from the ground up to ensure repeatable results with the highest levels of detail and accuracy.

Break the next resolution barrier and enjoy high throughput with the Titan platform and its array of optional correctors. Thanks to an innovative and modular patent-pending design, field upgrades of aberration correctors are possible. You can enjoy a step-by-step approach to corrected microscopy in your laboratory.



Titan 80-300 kV is designed to deliver ease of switching between acceleration voltages so you can get results quickly and easily. Higher voltages allow improved spatial resolution and increased current in small probes, allowing higher-level analysis in less time than previously possible. For more sensitive specimens, a lower acceleration voltage can be used to avoid potential damage by the electron beam. Titan maintains its stability regardless of switching acceleration voltages, ensuring the integrity of your data. What's more, Titan seamlessly scales in line with decreasing device dimensions, particularly when correctors are employed with the high-performance base platform.

Simplified ownership from a superior supplier

Because FEI takes full responsibility for all hardware, software and third-party components in its Tecnai systems, ownership and support is cost-effective and easy. Plus you get the peace of mind that comes from working with the industry's true technology leader for sub-surface imaging solutions. In addition to being the world's most experienced provider of dual-beam solutions, FEI also offers the world's most advanced TEM solutions. You can take comfort knowing FEI will always provide the highest quality characterization, analytic and metrology data in the shortest time. These are just some of the advantages that ensure you have long-life solutions that are extensible through the next several technology nodes. With FEI, optimizing performance for your specific applications simply adds up to a more secure and faster return on your technology investment.

See more at www.fei.com.

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