

TEAM Project Achieves Microscopy Breakthrough

September 6 2007

The highest-resolution images ever seen in (S)TEM electron microscopy have been recorded using a new instrument developed jointly by U.S. Department of Energy national laboratories, FEI Company and CEOS GmbH, in Heidelberg, Germany. This breakthrough in electron microscopy -- with 0.5 Angstrom and below performance -- is a result of The TEAM Project (Transmission Electron Aberration-corrected Microscope).

Electron microscopes can be used to observe fine details of the inner structure of materials. The ability to characterize the atomic-scale structure, chemistry, and dynamics of individual nanostructures makes this type of microscope a very powerful tool for scientists in all disciplines. With the extraordinary 'vision' of the special TEAM microscope it will become possible to study how atoms combine to form materials, how materials grow and how they respond to a variety of external factors. These constitute many of the most practical things that science needs to know about materials and will improve designs for everything from better, lighter, more efficient automobiles, to stronger buildings and new ways of harvesting energy.

The landmark performance was achieved using both TEM (transmission electron microscope) and STEM (scanning transmission electron microscope) imaging -- two methods used by researchers to directly view the basic building blocks of all matter.

The unprecedented performance recorded in these two imaging modes

has been achieved on a single instrument developed by FEI Company -- using Titan(TM) S/TEM technology -- equipped with two CEOS-designed spherical aberration correctors, dramatically improving the microscope's imaging and other abilities. The special TEAM microscope is the result of a series of new technology breakthroughs, providing for higher stability than previously possible and incorporating the newly designed aberration correctors. TEM images obtained show an information transfer down to 0.5 Angstrom. In STEM mode, frequencies better than 0.5 Angstrom were recorded.

"This is a great achievement in electron microscope development," said Ulrich Dahmen, TEAM project Director and Director of Lawrence Berkeley National Laboratory's National Center for Electron Microscopy. "As the first big collaborative project for the microscopy community, TEAM set ambitious goals. To have reached the 0.5 Angstrom goal early in the project is a significant milestone for the collaboration, and a validation of the Department of Energy's investment in the development of world-leading scientific instrumentation. Now we look forward to transferring the remarkable performance of the TEAM microscope into a tool for exploration of atomic structure in the nanoworld."

"As the limits of nanotechnology are expanded ever further, FEI is committed to continually breaking through the most challenging barriers of imaging and analysis," commented Don Kania, FEI's president and CEO. "The TEAM collaboration's success underscores the strength of FEI's technology and FEI's commitment to innovation. This achievement is an important breakthrough in our mission to create tools and applications that deliver new, ultra-high resolution information at the extremes of performance."

Max Haider, CEO of CEOS GmbH, also commented on the results of the collaboration. "The performance achieved by the TEAM microscope

sets a landmark in the history of high resolution TEM and STEM imaging. This important milestone for the TEAM Project is a giant step towards establishing aberration free imaging below 0.5 Angstrom."

Further details and examples of the benefits for nanoscience and research can be found on the TEAM website: ncem.lbl.gov/TEAM-project/ .

Source: FEI

Citation: TEAM Project Achieves Microscopy Breakthrough (2007, September 6) retrieved 24 August 2025 from <https://phys.org/news/2007-09-team-microscopy-breakthrough.html>

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