Ulm University, FEI Company and CEOS GmbH announced today that they have finalized the SALVE III microscope. "We are truly excited, the SALVE microscope is the first of its kind. Our long effort pays off," said Prof. Ute Kaiser, University of Ulm, head of the SALVE project. “We believe it will open the door to ground-breaking discoveries in the important class of electron-beam-sensitive materials."

The SALVE project partners Ulm University, FEI Company, and CEOS GmbH have finalized the Sub-Angstrom Low-Voltage Electron (SALVE) microscope III. "With the completion of this instrument we have reached a key project objective. The new SALVE microscope has even overachieved all specifications for high-resolution imaging at 80, 60, 40, and 20 kV accelerating voltages. Now our application-related work starts, we are enormously curious to do further research on 2D materials, thin classical materials, and even single molecules, to learn how far we can reach into the sub-nanoworld. Our microscopy community is enriched by the dedicated spherical and chromatic aberration-corrected low-voltage TEM. We feel it is our responsibility and great pleasure to explore its potential - in cooperation also with the world-wide community", said Prof. Ute Kaiser.

The FEI Titan Themis microscope's heart is CEOS's spherical and chromatic aberration corrector. Prof. Max. Haider, director of the CEOS company explains their new corrector: "To eliminate the chromatic aberrations occurring at low voltage, we have developed a corrector system over many years that accepts high opening angles and thus greatly improved the imaging mode. With this corrector we have now further advanced the limits of the instrument and the technique in aberration-corrected low-voltage transmission electron microscopy." "At 40 kV the instrument's resolution is 15 times the diffraction limiting electron wavelength", Prof. Harald Rose, member of the SALVE team, father of the practical-realizable aberration correction and Senior Professor at Ulm University, noticed happily. Thus, a new world record was reached.

The SALVE III TEM:
- operates at acceleration voltages between 20 kV and 80 kV; achieved a ratio of experimental information limit to wavelength of 15 (40 kV) to 18 (80 kV) corresponding to aperture opening angles between 67 mrad and 55 mrad, respectively
- supports cryo-EM techniques
- provides high-resolution electron energy loss spectroscopy (EELS) and energy-filtered TEM at low voltages
As images with sub-Angstrom resolution are now available at low operating voltages, dynamics can be studied atom-by-atom (Fig.

Bert Freitag, FEI's director of product marketing for Materials Science adds highlighting the excellent teamwork through the project: "We could not have developed this industry-leading microscope without the critical contributions of our partner CEOS and the close interaction with the University of Ulm."

Professor Ute Kaiser and her team at Ulm University are also relieved that the transition from ZEISS to FEI Company went so constructive. FEI could deliver the microscope in record time of less than two years. To the foundation partner belongs the company ZEISS, which had to withdraw from the SALVE project because of strategic company decisions."

Part of the SALVE project is also a new microscopy-building at the University of Ulm, which will provide the necessary environment for the new SALVE instrument. This new building is financed by Ulm University and the State of Baden Wuerttemberg with about 2 Million Euros and the public utility company in Ulm with another 1.6 million Euros. Until the move of the SALVE III microscope into the new Microscopy building, which is scheduled for September 2017, experiments with the SALVE III TEM will be conducted in Heidelberg at the CEOS Company.
“We are very proud that with the completion of the SALVE III microscope we have succeeded to write a piece of ‘microscopy history’ and to build on the approach set out in Darmstadt by Otto Scherzer in the field of aberration-corrected electron microscopy.”, the SALVE researchers and developers state. With his pioneering papers from 1936 to 1979, Otto Scherzer had created the framework for the SALVE project, not only concerning the fundamentals of aberration correction but also regarding the scattering potential of materials and the reduction of radiation damage in transmission electron microscopy.

**More information:**
www.salve-project.de