

## **Imaging of Atoms**

### **Carl Zeiss SMT hands over totally unique electron microscope to the caesar Research Center in Bonn**

Bonn/Oberkochen, 14 June 2007. During an official inauguration ceremony, Carl Zeiss SMT is today handing over a totally unique transmission electron microscope (TEM) to the caesar Research Center (center of advanced European studies and research) in Bonn. The so-called CRISP (Corrected Illumination Scanning Probe) system was developed and produced by the Nano Technology Systems (NTS) division of Carl Zeiss SMT AG in Germany. Thanks to leading edge technologies in image capture with electrons, CRISP provides unparalleled insights into the innermost properties of materials, right down to the atomic level. The system is used in materials research and in the field of the life sciences. It allows special examinations of the functionality of materials. Scientists can use the results of the examinations to better understand and selectively optimize the composition of materials, allowing the development of better and new materials.

Dr. Stephan Irsen, responsible for electron microscopy at the caesar Institute, was highly satisfied at the successful handover of the CRISP microscope: "The possibilities offered by the system are outstanding, providing our researchers and partners with images of atomic structures during scanning operation and a spectroscopic characterization of the atomic specimen structure at the highest level." Dr. Markus Dilger, Managing Director in the Nano Technology Systems division of Carl Zeiss SMT stresses: "Basic research increasingly needs the possibility of analyzing the structure and properties of materials at an atomic level. This is precisely the potential offered by the CRISP transmission electron system, strengthening not only the caesar Research Center, but also the whole of Germany as a research site.

Carl Zeiss SMT is one of the world's leading manufacturers of transmission electron microscopes. For many years now, the company has been heavily investing in the further development of its TEM systems, enhancing them constantly right up to the limits of technology.

### **Details of the technology**

In addition to the established projection imaging of the specimen structure, a special CRISP application is the possibility of scanning the object with an atomically fine electron probe and constructing an image of the specimen using the specimen signals generated in the process (scanning TEM). The special corrector in the CRISP illumination system leads to an improvement of the spatial resolution down to atomic resolution, i.e. it is possible to image atoms with distances of less than one ten millionth of a millimeter (= 1 Angstrom). Furthermore, the corrector permits the use of a beam current that is a factor of 10 higher than traditional systems, which significantly improves the reliability of chemical analyses and the acquisition time of the measurements.

A monochromator, which reduces the energy width of the electron beam from its original 800meV to 150meV, has been added to the technological highlights of the CRISP. This reduces the chromatic aberration in the image and permits a sustained increase in the spectroscopic resolving power of the microscope. Furthermore, during the chemical element analysis using electron energy loss spectroscopy (EELS/ELNS), an energy resolution is enabled that could only be achieved in the past with synchrotron radiation.

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PI 106/2007  
June 2007

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