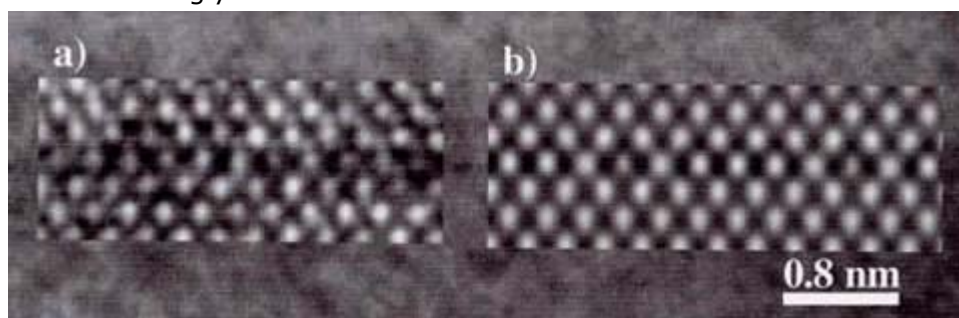


## TEM - Transmission Electron Microscopy

The TEM laboratory, established during 2002, is part of the Centre for Electron Microscopy of the TASC-INFN National Laboratory whose equipment includes the sample preparation facilities, the laboratory for simulating TEM images and spectra and the AFM facility. The Centre for electron Microscopy, (CEM) has the mission to represent a TEM facility for the scientific and industrial community and to explore and to develop new TEM methodologies to be applied to the study of the solid state matter. The latter task has to strongly take into account the location of the CME: inside the TASC laboratory and close

to the synchrotron storage ring of ELETTRA.

A JEOL JEM 2010F UHR TEM/STEM is installed in a dedicated laboratory at TASC - MM building. A vibration-insulation



foundation for the microscope was built by anchoring a concrete platform directly on the caraic rock with only weak links to the MM building. The TEM laboratory is kept at constant temperature with a drift rate of less than 0.1°C/min, with low noise and minimal turbulence.

TEM instrument has an accelerating voltage of 200 kV and a low spherical aberration coefficient ( $(0.047 \pm 0.01)$  mm) objective lens yielding a phase contrast resolution - at Scherzer defocus - of 0.19 nm. The electron source is a thermally assisted field emission gun (FEG) with a ZrO/W [100] filament. The FEG is a high-brightness source producing a highly coherent electron probe with a diameter smaller than 0.13 nm and a resolution limit of 0.11 nm in phase contrast. The small probe size yields sub-nanometer resolution in analytical as well as spectroscopic measurements.

The instrument is currently equipped with an energy-disperse x-ray spectrometer (EDS) with ultra-thin window to enhance detection of light elements ( $Z > 5$ ). The available scanning transmission electron microscopy (STEM) attachment coupled with EDS can be used to obtain chemical profiles with high spatial resolution. Moreover, coupling between

### Contacts:

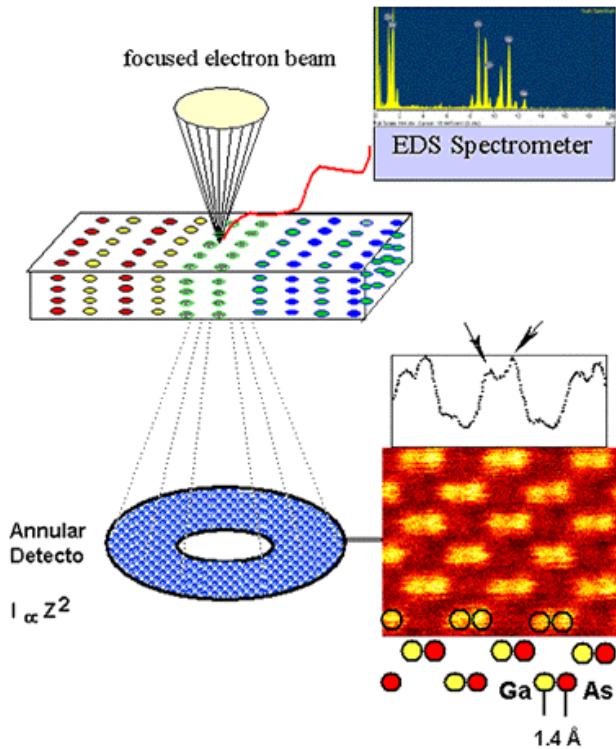
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the STEM attachment and the high-angle annular dark field (HAADF) detector is used to



obtain Z-contrast imaging. This technique is one of the most powerful evolutions of TEM methods for ultimate resolution. HAADF technique can be used to image a single atomic column down to a theoretical resolution of 0.123 nm and, at the same time, acquire the electron energy loss spectrum from the same single atomic column.

The Centre for Electron Microscopy of TASC is a facility open, in first place, to the whole INFM community. Potential users are requested to address to the CEM at TASC informal but detailed expressions of interest in TEM experiments. The head of the microscopy group, Dr. Elvio Carlino, (Elvio.Carlino@TASCdomain).

**Contacts:**

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