NanoMEGAS
Advanced Tools for electron diffraction

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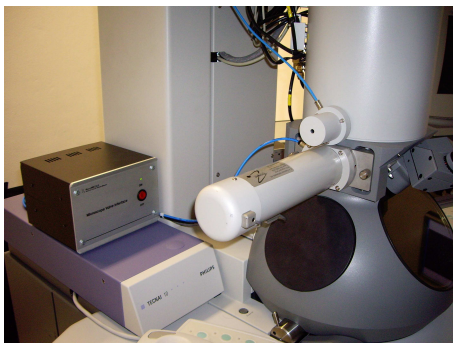
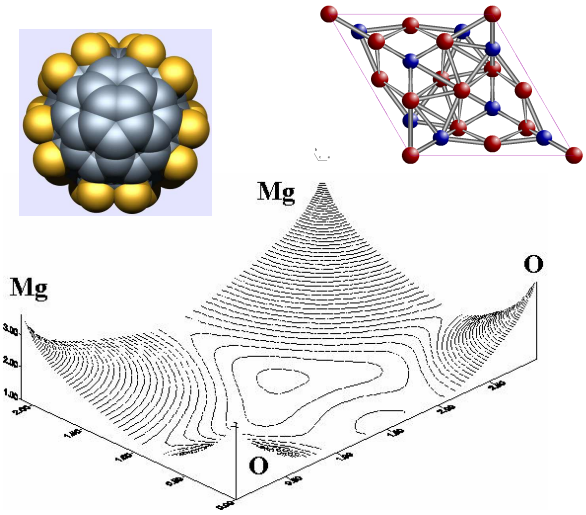
Electron Diffractometer PLEIADES

the link between accurate atomic structure and physical properties of nanocrystals





- Unique Patented techique for structure determination of nm size crystals
- Compatible with any TEM (100-400 KV) at 35 mm port through special Fischione interface compatible with CCD cameras and/or HAADF detectors
- Patented technology to measure through the whole dynamic range of electron diffraction intensities at 24 bits (16.000.000 grey levels) with absolute linearity
- Ultra-accurate measurement of ED intensities (through preselected number of averagings for every reflection) combined with fast data collection
- Electron diffraction intensity measurement in standard and precession mode in combination with special precession interface « Spinning Star »)

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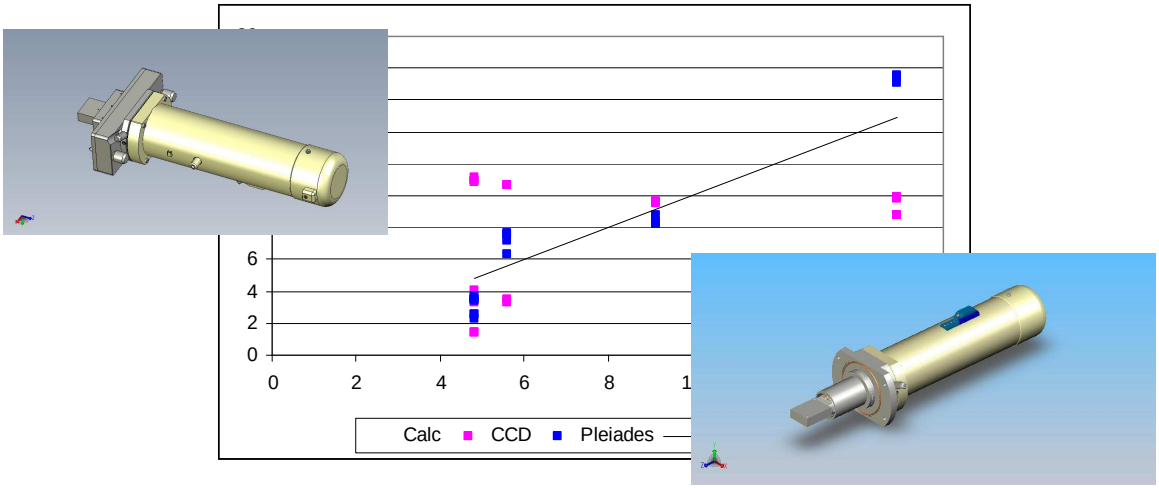
Superior data accuracy for structure determination



Silicon electron diffraction intensities registered with CCD (16 bit) camera (red spots) compared with accurate intensities measured with "Pleiades" (24 bit , blue dots) ; diffractometer data fit much closer (R=21% instead of R = 48% for CCD) to theoretical intensities (linear solid curve) Picture upper left : Fischione 35 mm diffractometer housing for FEI TEM and dedicated design for Fischione housing for JEOL TEM (lower right).

Method description:

Transmission Electron Microscopy (TEM) is well adapted to the imaging and the analysis of nanocrystals , however electron diffraction was rarely used in the past as a standard tool for crystal structure analysis, mainly because the electron interactions with the matter are about 10,000 times stronger than the ones observed with X-Rays. As a result, the scattering is not kinematic but dynamical so that the diffracted intensities are so much altered that they cannot be trusted and used for crystal structure determination.

Electron beam precession technique recently proposed by Vincent & Midgley [1] offers a solution to this problem by greatly reducing the dynamical behaviour of electron diffraction. Precession intensities can be used directly for ab-intio structure determinations of unknown nanomaterials **[2].Our precession interface "Spinning Star" can be interfaced to any TEM (any KV older or brand new).**

New developed electron diffractometer "Pleiades" can collect and measure electron diffraction intensities (in precession mode as optional in combination with "Spinning Star") by means of specially developed Faraday cage detector linked with an ultra-sensitive electrometer. Diffraction patterns are scanned through the detector and intensities are measured with very high precision in a total linear scale through their whole huge dynamic range (24 bits or 16.000.000 grey levels) .Typical measurement time is 1 min for 500 reflections (same zone axis pattern). Measured intensities are not saturated (including central beam) and are found to be much more accurate when compared with same intensity values measured with CCD (16 bit, 64.000 grey level) cameras.

Electron diffractometer "Pleiades" is a mandatory tool for precise nanocrystal structure determinations (example: light atom determinations) and electrostatic potential measurement, useful for crystal bonding characterization [2].

1.Vincent & Midgley Ultramicroscopy **53** (1994) 271
2. Ultramicroscopy special issue vol.107 , issue 6-7,June 2007