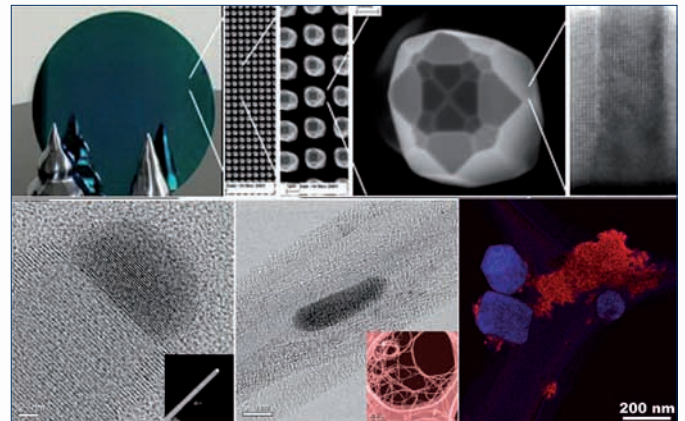


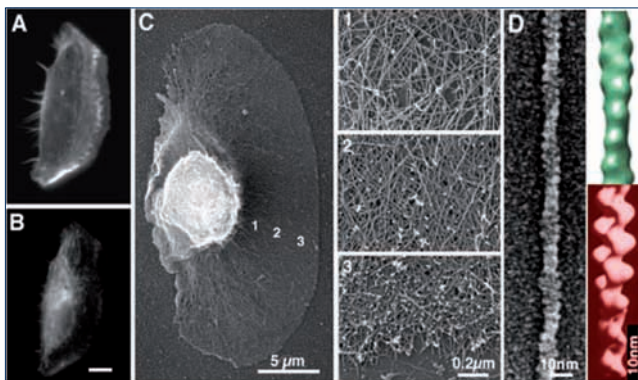
Electron Microscopy ETH Zurich (EMEZ)

Research Profile

Electron Microscopy ETH Zurich (EMEZ) is a centralized facility for user-focused, interdisciplinary research and service activities that employs electron microscopes and microanalytical tools to explore structure-function relationships in biological systems as well as structure-property relationships of solid materials. Both man-made and natural materials, including biological specimens, are characterized on the micro- and nano scales. The competences at EMEZ comprise sample preparation, observation using electron and ion beams as well as data analysis and interpretation; it ranges from atoms to the micro-domain scale for any materials of interest to the research community. The four major application fields are Materials Science and Engineering, Life Science, Physics/Chemistry and Earth Science. The center has 43 user groups from nine different ETH departments and several external partners from academia and industry. This diversity allows EMEZ to push electron microscopy applications to the frontiers of science by transferring techniques from one research field to another.



Imaging over different scales – Top: structured semiconductor material from μm to atomic lattice characterisation. Bottom left: atomic lattice imaging on nanowires, middle: Fe-core in a multiwall Carbon Nanotube, right: ESI map of Ce-red/Ba-blue complexes. Samples courtesy from Prof. K. Ensslin, Dr. M. Mouth and Ce/Ba images from Dr. F. Krumeich.



Multimodal images of cells and macromolecular complexes over a large range of scales: A,B) fluorescence LM images of keratocytes, C -1,2,3) cytoskeleton network images by SEM and D) F-actin filament images by HRSEM – green f-actin 3D model from SEM data and red 3D model from TEM data.

Competences / Infrastructure

- Five TEM, one STEM, five SEM, one FIB plus one CLSM and one cryo-FLM
- Broad expertise in methods for imaging, spectroscopy and diffraction
- Sample-preparation for life-science, soft condensed matter and solid materials
- Specific experience ion milling techniques
- Cryo-preparation and imaging facility for TEM and SEM (incl. “in-situ” cryo-TEM)
- Developments and support in data analysis, interpretation and representation

EMEZ is open not only to researchers within the ETH domain, but offers also service work for industry. Resources and pricing can be directly negotiated with the director of EMEZ.

CONTACT

Dr. Roger Wepf roger.wepf@emez.ethz.ch

ETH Zurich
Electron Microscopy ETH Zurich - EMEZ
Wolfgang-Pauli-Str.16
CH-8093 Zürich

www.emez.ethz.ch

SCANNING ELECTRON MICROSCOPY,
TRANSMISSION ELECTRON MICROSCOPY,
FROM MICRO-DOMAINS TO ATOMS

Strength of/Benefits from Electron Microscopic Investigations

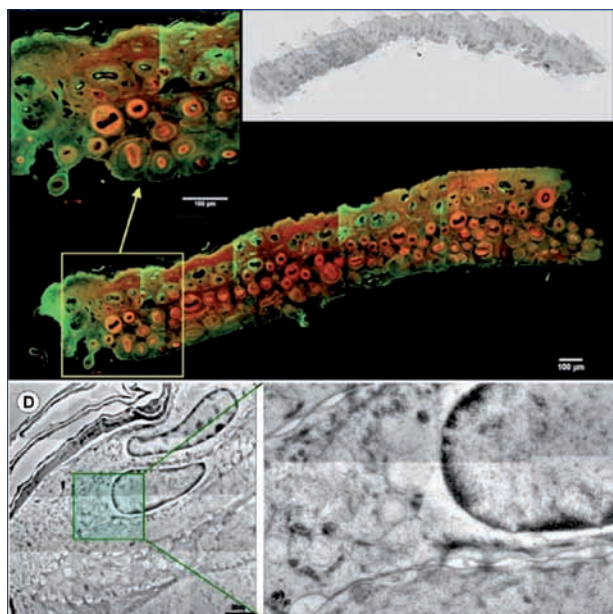
Electron microscopic techniques offer a large variety of modes for structural investigations for a wide range of materials. Its extraordinary strength lies in the broad range of accessible scales up to very high spatial resolution (from millimeters to the sub-nanometer range) of a single selected region of interest and in the ability to investigate the same specimen area by different techniques providing complementary information. The combination of morphological, chemical as well as crystallographic data from the same sample area offers a very comprehensive knowledge about the material with a high spatial resolution. Highly sophisticated – but sometimes time consuming – preparation techniques are available for the investigation of specimen preserved as close as possible to the native state.



Equipment at EMEZ: upper row FIB/SEM and HRSEM and a view into a cryo-SEM chamber. Lower row cryo and analytical TEM and a dedicated Cs corrected STEM (EMEZ).

Equipment

- 5 TEM: FEI Tecnai F30, FEI Tecnai F20, Philips CM 12, Zeiss EM 912, FEI Morgagni 286
- 1 STEM: Hitachi HD2700-Cs
- 5 SEM: FEI Quanta 200F ESEM, Zeiss 1530 Gemini, CamScan CS44LB, FEI Quanta 600, Hitachi S-900 FEG
- 1 FIB-SEM: Zeiss NVision40
- Dedicated light microscopy: Zeiss LSM-510 META, Zeiss Axioimager M1M
- Preparation facilities: conventional tools for fixation, embedding, cutting, thinning, coating & dedicated devices for cryo-preparation and ion milling
- Details: <http://www.emez.ethz.ch/equipment>



Multimodal imaging of a mouse skin biopsy – colored images 3D confocal image stack projections with an TEM overview inset, D) zoom in by TEM on a region of interest and a higher magnification of the nucleus and cytoplasm context with resolved plasma membranes of individual cell in the viable skin layer (EMEZ).

Methods

- Imaging (S/TEM): BF, DF, HR-(S)TEM, EFTEM, HAADF, cryo- and tomography holders
- Imaging (SEM): SE, BSE, CL, cryo stage, tensile stage, low vacuum and ESEM
- Spectroscopy: EELS, EDX
- Diffraction: SAED, CBED, precession diffraction, EBSD, OIM, phase identification, texture analysis, crystal structure characterization
- Ion milling: Cross-beam FIB-SEM, GIS, nano-manipulation; Ar-ion etching
- Cryo preparation: High pressure freezing, plunge freezing, in-situ TEM cryo-preparation, freeze substitution, freeze drying, freeze fracturing, cryo vacuum transfer connectivity
- Ultramicrotomy, critical point drying, sputter and e-beam evaporation coating, etc.

Activities of EMEZ

- Consultant for structure research and finding the optimal methods and tools to solve structure and composition related questions in research, quality control and forensic
- Scientific service for ETH community and external customers
- Support for PhD-students and advanced researchers who use EMEZ-infrastructure for their research
- Training and supervision of instrument users, introductory courses into instrument operation and methods
- Teaching by means of lectures, exercises, practical courses
- Development of new preparation and analytical techniques to cope with the future needs