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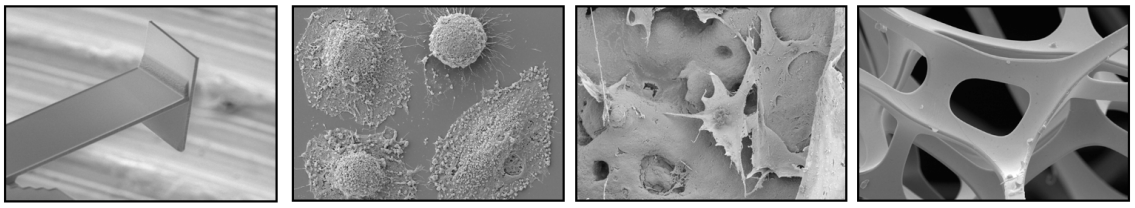
University of Basel
Swiss Nanoscience Institute

SNI SWISS NANOSCIENCE INSTITUTE
EINE INITIATIVE DER UNIVERSITÄT BASEL UND DES KANTONS AARGAU

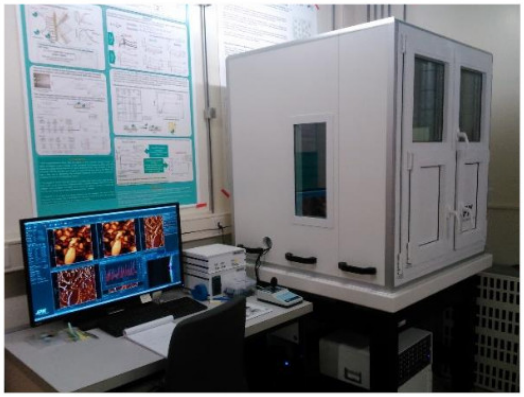
NANO IMAGING LAB

Newsletter

VOLUME II, 10.April 2017



New AFM system extends the possibilities of our service lab



We have recently acquired a new AFM system from JPK for our service lab. The NanoWizard4 NanoScience AFM combines closed-loop atomic resolution with a multitude of diverse imaging and force measurement modes in a tip scanning system with a large scan range of 100µm in XY. The NW4 is operable in air, fluid or inert-gas and ensures the lowest tip-sample interaction by the newly optimized QI mode.
(photo: Monica Schönenberger)

The NanoWizard4 offers a huge selection of surface characterization modes:

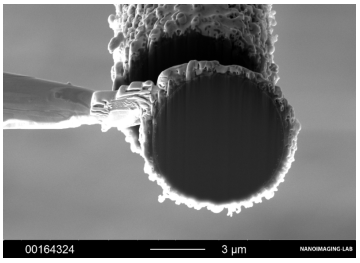
- Imaging modes: Contact mode with Lateral Force Mode, Advanced AC modes with optional

Q-control, Phase Imaging, Fast Force Mapping, Force Modulation, Contact Resonance, Kelvin Probe Microscopy, Electrical Force Microscopy, Scanning Capacitance Microscopy, Piezo Force Microscopy, Nano Manipulation, Nano Lithography, Magnetic Force AFM

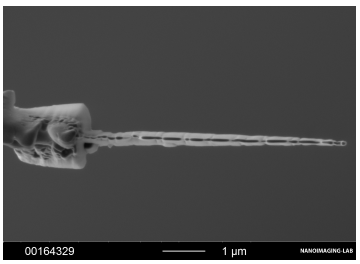
- Force Spectroscopy and QI Mode: Quantitative characterizationof mechanical and electrical properties
- Compatible with inverted microscope
- Environmental control (15 – 60°C)

Ultrathin sectioning of carbon fibers by FIB

In collaboration with Dr. W. Szmyt from the Institute of Polymer Engineering FHNW, we were able to produce ultrathin slices from carbon fibers (CF) using our Helios Nanolab 650.

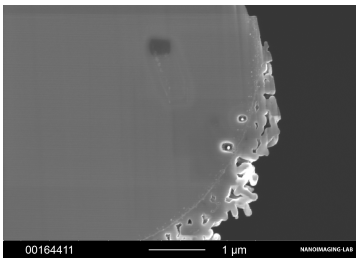


This was performed by first welding a nanomanipulator needle to the side of the loose end of a CF by platinum deposition. Then the cut was executed perpendicular to the fiber axis just above the needle.
(photo: Daniel Mathys)



The generated approximately 500 nm thick CF slice was further thinned down to 100 nm by polishing it with the ion beam from both sides.

(photo: Daniel Mathys)



The resulting ultrathin section could afterwards be analyzed by STEM and EDX in order to precisely localize and specify the containing iron nanoparticles at the inside of the CF close to the surface.
(photo: Daniel Mathys)

Published in Carbon 115 (2017) 347-362:
Protective effect of ultrathin alumina film against diffusion of iron into carbon fiber during growth of carbon nanotubes for hierarchical composites investigated by ptychographic X-ray computed tomography

W.Szmyt, S.Vogel, A.Diaz, M.Holler, J.Gobrecht, M.Calame, C.Dransfeld

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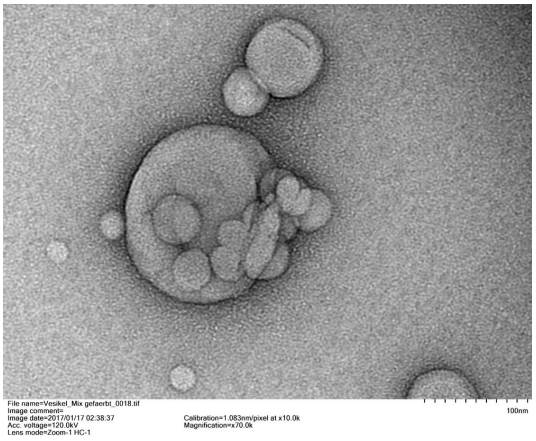
Replacement for our CM100

The NI Lab intends to replace the old CM100 TEM by a new versatile and modern TEM. Therefore we are currently evaluating the needs of its user group.

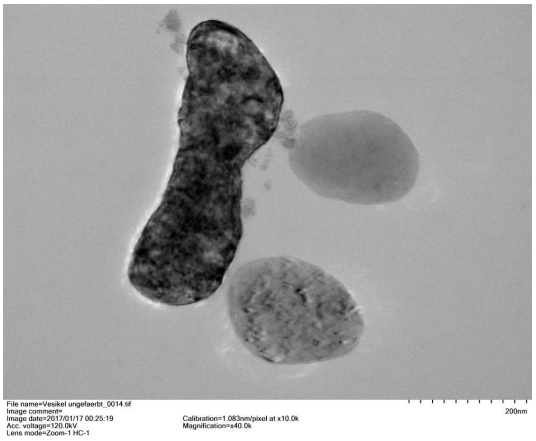
One adequate candidate for this purpose would be the HT7800 from Hitachi. This highly advanced TEM with its unique double-gap objective lense combines extremely high contrast and high resolution imaging modes even without staining. This could be a great feature for all users observing nanoparticles.

At the ETH Zürich we had the opportunity to personally use and evaluate this machine and challenged it with unstained samples of vesicles. The results are seen in the pictures below and show that unstained nanoparticles look different from the Uranylacetate stained ones, indicating a structural change during the staining process.



Vesicles stained with Uranylacetate

(photo: Dr. Thomas Schmidt, Hitachi)



Unstained Vesicles

(photo: Dr. Thomas Schmidt, Hitachi)

In combination with ultrarapid freezing and drying preparation, this could be of great benefit for your research. It would be possible to see wether vesicles are mono- or multilayered, filled or empty. Even a molecule layer on the surface has a chance to be seen.
Interested ? The approval of the financing for this new instrument depends on a strong demand of applications. So we would be happy to receive your letter of intent to support our efforts to get the financing for the Hitachi HT7800.

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