EUROPEAN UNION

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Nanobiotechnology

What we do

Mechanical properties (stiffness, hardness, elasticity) are the basic characteristics of all samples, including living cells, molecules and biomaterials. Change of stiffness is often related to a change of properties. In case of living cells change of mechanical properties may show a significant difference between healthy and abnormal cells – e.g. healthy vs. dystrophic cells, or metastatic and non-metastatic cancer cells. Change of stiffness on a molecular level may bring an interesting information about changes in its conformation, caused for example by interaction with other molecules. We found an interesting connection between our facility (CEITEC MU) equipped with AFM microscopes and advanced microscopy facility in VBCF Vienna, where so called Brillouin microscopes are developed. Both technologies provide information about mechanical properties of samples, certain advantages and disadvantages are associated with both techniques. Correlation of results and trans calibration of instruments would be useful for both research facilities, potential users would benefit from it. Agarose gels of different agarose content (0.25 to 3%) were chosen as a model sample for comparative study of both methodologies. After successful correlation, more complex samples such as 3D biomaterials (hydrogels) or living cells should be studied.

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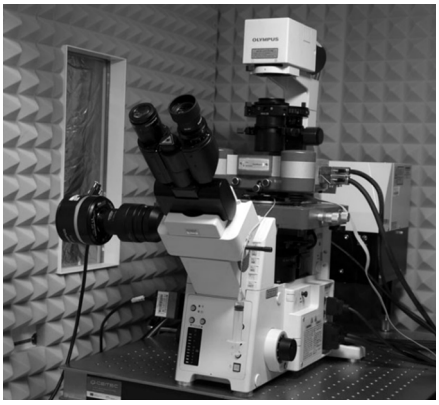
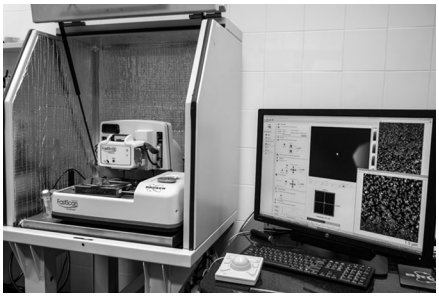


BioAFM: JPK NanoWizard 3
Imaging and nanomechanical characterization of bioobjects (biomolecules, bacteria, cells) under nearly physiological conditions (Petri dish heater, CO_2 chamber). Combination with optical/fluorescence/confocal imaging – overlay images. Automatic performance of interaction studies (ForceRobot). Batch processing of force distance curves (force maps) – providing maps of samples surface elasticity (Young's modulus maps).



High speed AFM: Bruker Dimension FastScan
High speed, high resolution imaging of individual molecules and nanoobjects – with sub nanometer resolution, rate up to 1 frame per second. Easy to use software environment, user support by ScanAsyst software feature – helps with hardware setting during preparation and measurement. Quantitative imaging provides maps of surface elasticity with high resolution and acquisition rate.

NTMDT Solver, Next
Standard AFM microscopes for solid phase imaging under laboratory atmosphere with nanometer resolution. Solver Next – semiautomatic measurements.

Services and Methodologies Provided

High resolution imaging and nanomechanical mapping (force distance curves) of living cells under nearly physiological conditions (37 °C, 5% CO_2). Biomaterials and other solid surfaces can be characterized, too. Topography images and/or maps of Young's modulus (stiffness maps) will be provided to users as a result of the measurements obtained after mathematical processing of force distance curves.

Equipment

- BioAFM: JPK NanoWizard 3 including ForceRobot head
- Fast speed AFM: Bruker Dimension FastScan
- NTMDT Ntegra Vita, Solver Next

Contact and Location

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