



Hungary-Romania
Cross-Border Co-operation
Programme 2007-2013

Two countries, one goal, joint success!

European Union
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SMARTMAT NanoLab

www.hungary-romania-cbc.eu
www.huro-cbc.eu



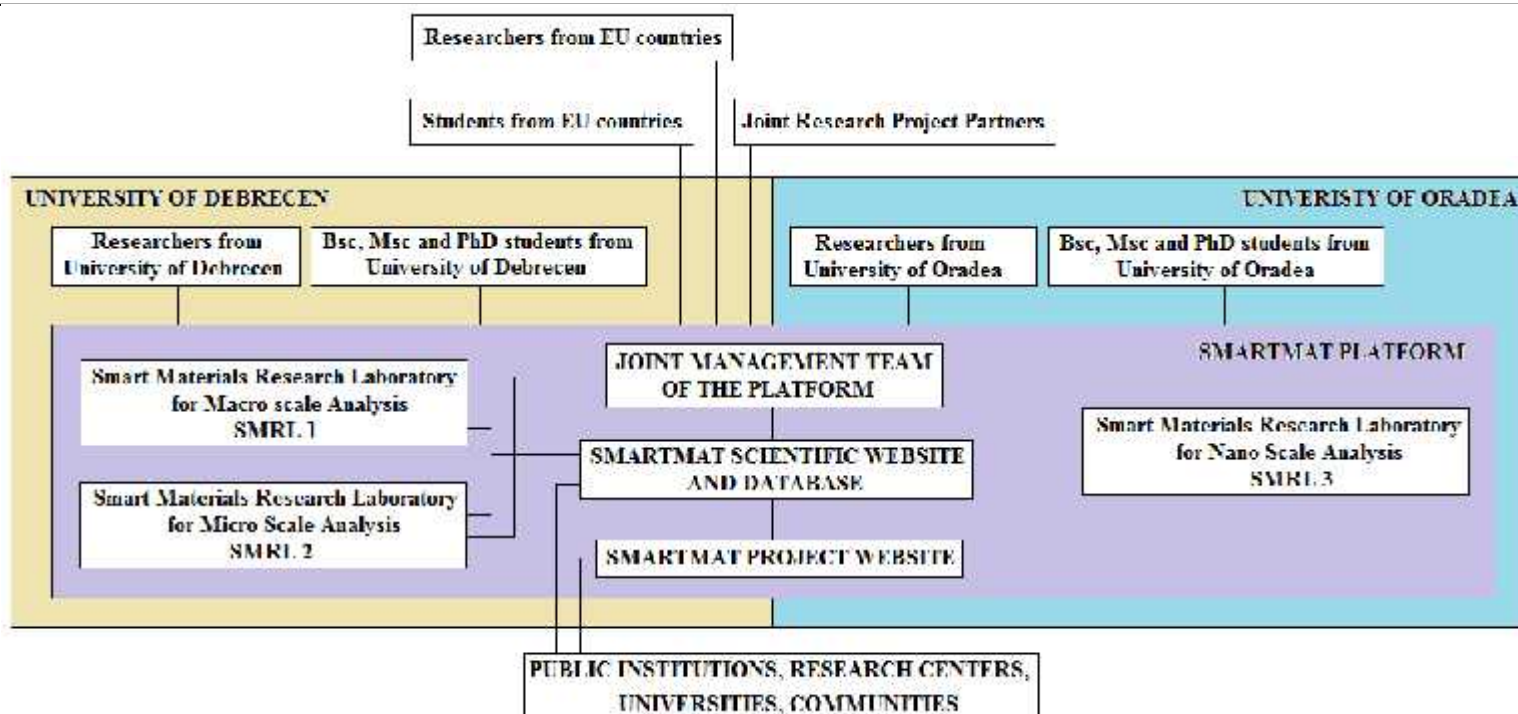
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The place of NanoLab in the SMARTMAT project



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The budget of PP1

Total budget: 596850 EURO

- Staff costs : 59,000
- Equipment : 405,000
- Laboratory upgrading : 120,000

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The Upgrading



egyetem laboratorium uj.exe

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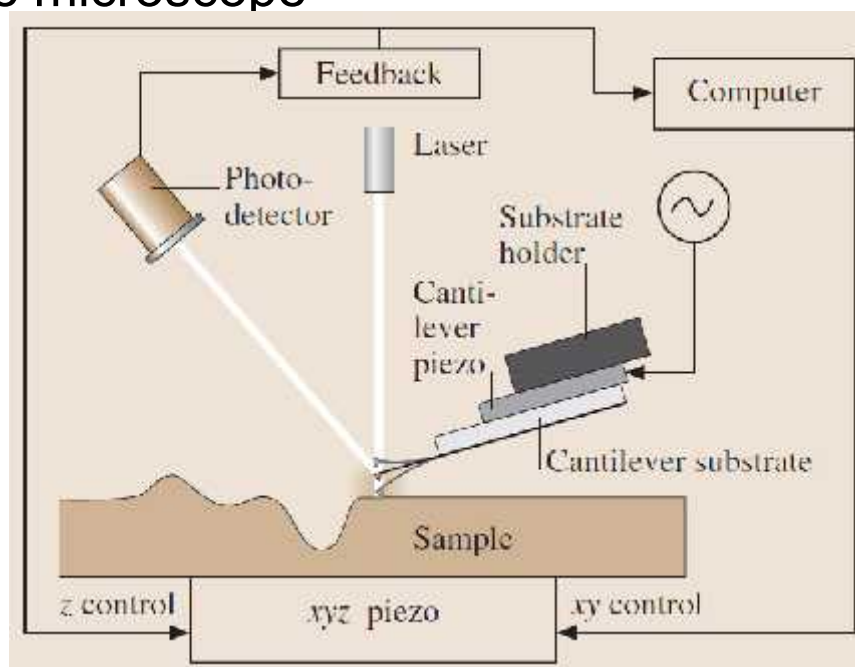
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The Equipment

1. Atomic force microscope



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The Equipment

1. Atomic force microscope

- Advantages of scanning probe microscopy

- The resolution of the microscopes is not limited by diffraction (as small as a few picometers).
- The interaction can be used to modify the sample to create small structures (nanolithography).
- Specimens do not require a partial vacuum but can be observed in air at standard temperature and pressure or while submerged in a liquid.

- Disadvantages of scanning probe microscopy

- The detailed shape of the scanning tip is sometimes difficult to determine.
- The scanning techniques are generally slower in acquiring images, due to the scanning process.
- The maximum image size is generally smaller.
- Scanning probe microscopy is often not useful for examining buried solid-solid or liquid-liquid interfaces.

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The Equipment

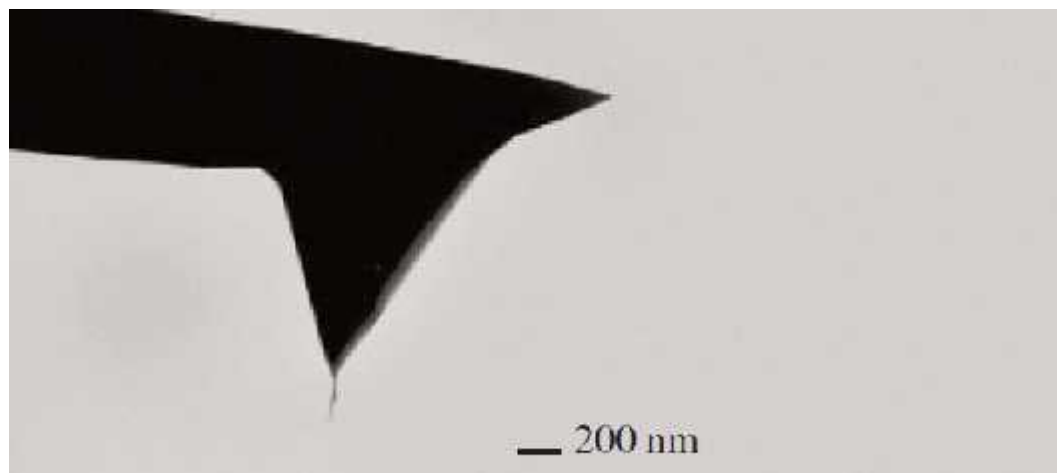
1. Atomic force microscope

- Operation modes :

- Contact AFM
- Non-contact AFM
- Dynamic contact AFM
- Tapping AFM

- SPM functionality :

- Chemical force microscope
- Kelvin probe force microscope
- Electrostatic force microscope
- Magnetic force microscope



Piezomax Technologies, Inc.

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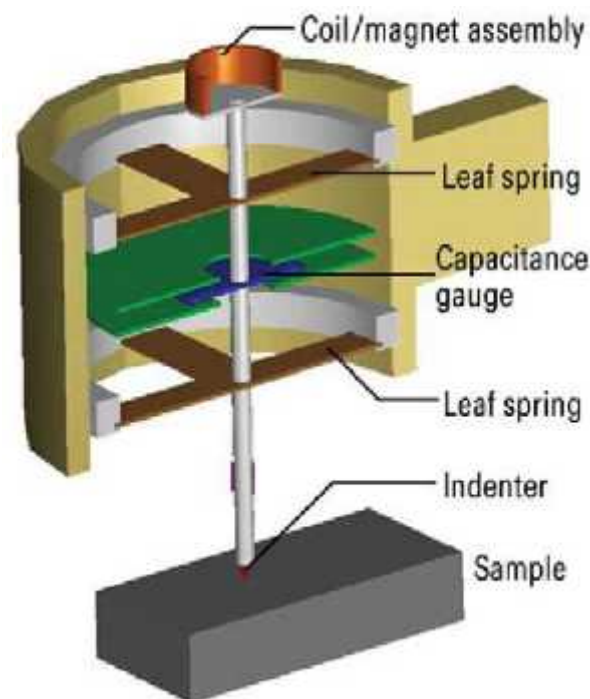
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The Equipment

2. Nano-indenter

- What can be measured:
 - Hardness
 - Elastic modulus
 - Peak force
 - Peak displacement
 - Work of indentation for each test
 - Wear testing
 - Ramped scratch testing for critical loads
- Standard head for a wide variety of application:
 - Displacement resolution <0.01 nm
 - Total indenter travel 1.5 mm
 - Maximum indentation depth >500 μm
- Loading capability:
 - Maximum load (standard) 500 mN
 - Load resolution 40 nN
 - Contact force <1.0 μN
 - Load frame stiffness $\sim 5 \times 10^6$ N/m



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Thank You for Your attention

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