



Nanotechnology at High School: studying Physics through Nano Materials

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Nanostructured surfaces: evaluating hydrophobicity

Surfaces can be structured at the nanoscale to create Lotus effect and manufacture superhydrophobic materials used in textiles, nano and microfluidics, selfcleaning surfaces, etc. Hydrophobicity can be easily evaluated measuring contact angle and rolling one.



„There's plenty of Physics at the Bottom“

Nanosciences and nanotechnologies are an ideal playground to introduce the concepts of Modern Physics at high school with a practical hands on approach. Students' interest in science is enhanced through the innovative and exciting technological applications. Pupils worked on new materials predicting, testing, analyzing data, and studying their possible applications. Results often challenged their „school“ Physics knowledge and introduced new perspectives.

Bringing together Education, Research & Enterprise

- The initial input of an **European Project** www.nanoyou.eu
- **High School Teachers** and **Students** taking up the challenge to explore cutting edge science and integrate it in the curricula
- **Firms** betting on youth education and donating samples
- A **University** and a **Research Centre** providing long standing expertise, support in implementing educational activities and carrying out further dissemination



Autumn 2011 -
1st Professional Development Course on Nanoscience and Nanotechnologies for High School Teachers
 Modality: Seminars + lab sessions
 Physics Department
 University of Modena and Reggio E.
 Via Campi 213/a
 41100 Modena (IT)

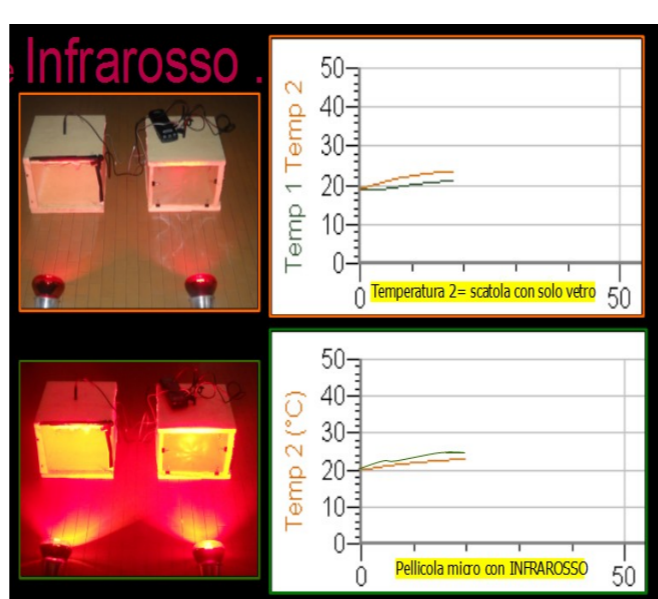
Programmed: 2nd edition autumn 2012
 Want to know more? www.nanolab.unimore.it
 See contact (right bottom corner)

Controlling Green House Effect

The problem : a school with lots of glass panes, overheated classrooms throughout the year and incredible energy waste.

Looking for a sustainable solution : studying electromagnetic radiation transmission through nanocoated glasses and polymeric thin films against green house effect

-Studying heat and heat transfer, testing with small scale models and progressively scaling to bigger ones.



As light as air

Composed of up to 99.98 % air, aerogel is the lightest solid material on earth with incredible strength and thermal insulator properties

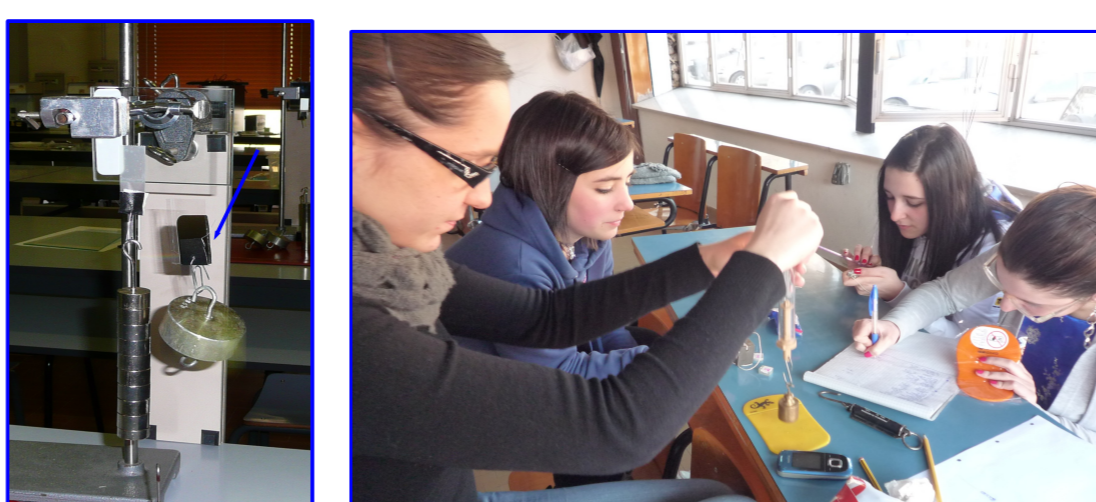
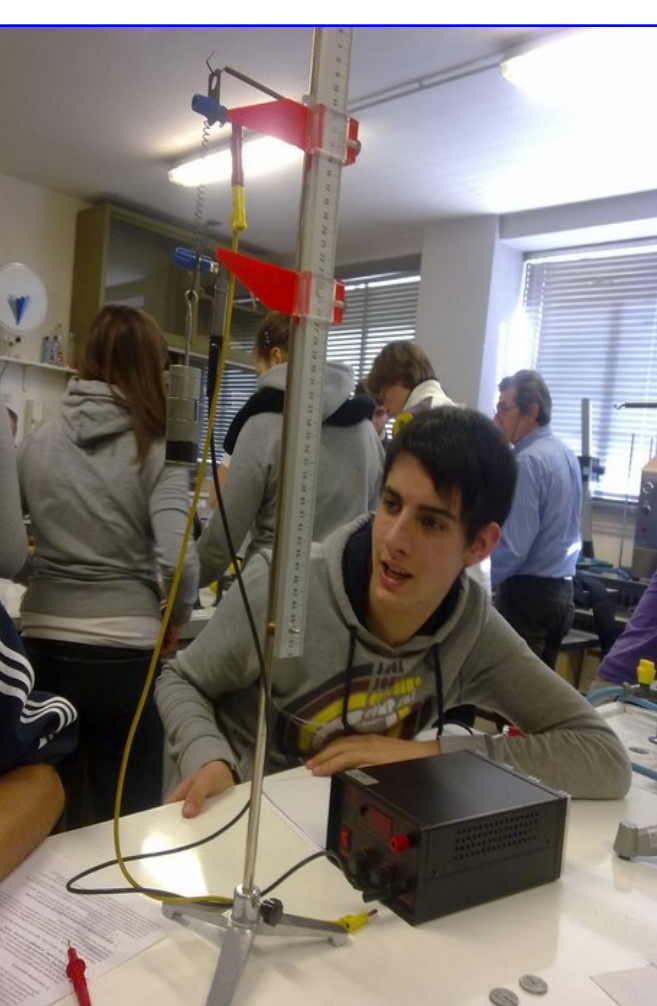
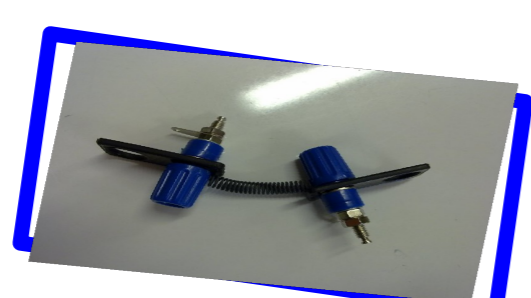
Aeroclay is incredibly lightweight. Obtained by dry freezing turned out to be extremely good for oil spilling containment due to its high porosity.

- Testing thermal insulation properties
- Measuring and comparing density
- Calculating absorbing rate

Smart Alloys

Metals dilatation due to heating and the counterintuitive behaviour of smart alloys due to atomic dislocation

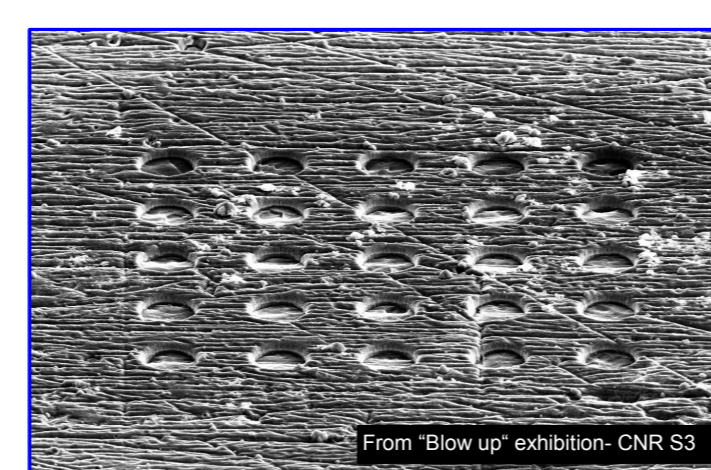
Smart alloys such as NiTiInol contract once heated and relax as they cool down. Able to „remember“ their original shape they are excellent candidates in manufacturing electrically driven artificial muscle fibres..



Forces of the Nano World

At the nanoscale gravity is not as dominant as electrostatic and inter molecular forces and Nanotribology has laws of its own.

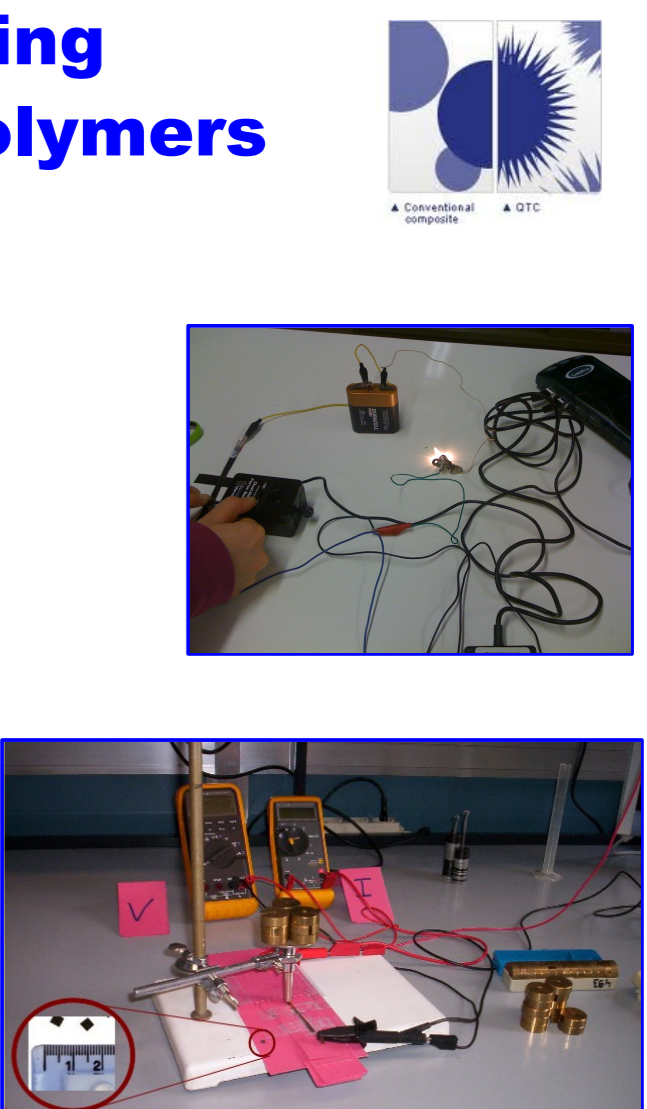
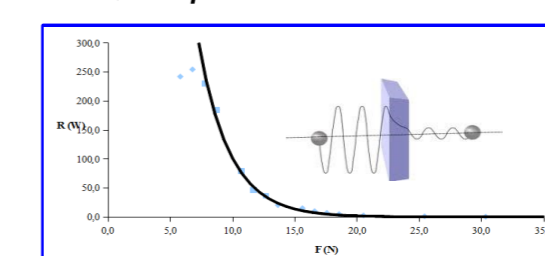
- Measuring forces: friction, adhesion and van der Waals
- Mimicking Gecko effect to create new superadhesives



Quantum tunneling in conductive polymers

QTCs have the unique capability of transformation from a virtually perfect insulator to metal like conductor when deformed. The transition follows a smooth and repeatable curve, with the resistance dropping exponentially owing to quantum tunnelin rather than percolation. Suitable for pressure sensors such as in robotic hands.

- Tuning electrical resistance in QTC pills.



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