AVVISO DI SEMINARIO

Mercoledì 13 Gennaio 2010, Ore 14.00

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SCANNING PROBE MICROSCOPY WITH APPLICATIONS TO BIOLOGICAL OBJECTS

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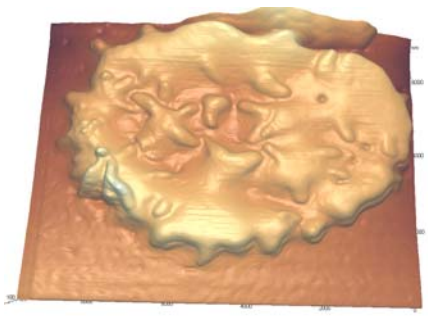
Scanning probe microscopy is now widely used for sophisticated collaborative study in biology and medicine. The modern multifunctional probe microscope provides splendid information about the morphology and surface properties of the sample. The amount of implemented in microscope modes and transferred experimental data may be extremely high. Also high may be the number of people involved in one experiment. All this inevitably leads to the necessity of the incorporation into probe microscope advanced communication facilities, efficient data protocols and file formats.

The review of scanning probe microscopy of proteins, DNA and RNA, viruses, bacterial and animal cells is presented.

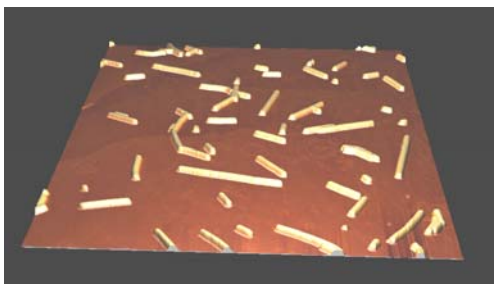
The use of scanning probe microscopy technique for the development of cantilever-based biosensor is discussed. Recently developed on the basis of atomic force microscope – atomic balance device – provides new possibilities for the measurements of the mass of ultra small objects – individual bacterial cells and biomacromolecules. The achieved sensitivity using commercially available cantilevers is up to 10^{-14} g. The potential sensitivity with cantilevers of specially optimized geometry is 10^{-19} g. The model sensor on horseradish peroxidase protein is described.

In our group we have performed the imaging of the following viruses: tobacco mosaic virus, poliomyelitis virus, potato virus X, and potato virus A. The results of the morphology study of 5 different plant viruses – tobacco mosaic virus, brome mosaic virus, poa semilatent virus, barley stripe mosaic virus, alfalfa mosaic virus – is presented.

Scanning probe microscopy has opened new opportunities for the study of viruses morphology. The following tasks may be performed using SPM technique - three dimensional visualization of virus morphology and the study of mechanical properties of individual virus particles. The visible contrast of the images is interpreted in terms of mechanical rigidity. The contribution of RNA and protein coating into the overall mechanical rigidity of viral particle is estimated.



AFM image of a red blood cell. Image size – 10x7 μm.



AFM image of tobacco mosaic virus deposited on graphite. Image size – 2x2 μm

Ref. Ettore Vittone