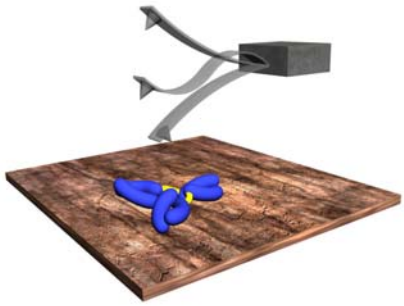
Atomic force microscopy for non-topographic properties measurement

A research group of CSIC has developed a method of using the atomic force microscope (AFM) by exciting at least two modes of a cantilever and modulating their response in frequency modulation. The main mode is used to map the topography while the second mode is used to map nanomechanical properties by means of fractional computing. Frequency displacement of excitation modes and excitation forces changes are used to measure nanomechanical properties of samples. The method can be applied to organic and inorganic materials, being the sample located in vacuum or immersed in a gaseous or liquid media.
Partners interested in a patent license are being sought.

Bimodal imaging for a deeper knowledge of soft-matter

Multifrequency force microscopy involves the excitation and/or detection of the deflection at two or more frequencies, and it has the potential to overcome limitations in the spatial resolution, quantitative mapping and acquisition times of conventional force microscopes.

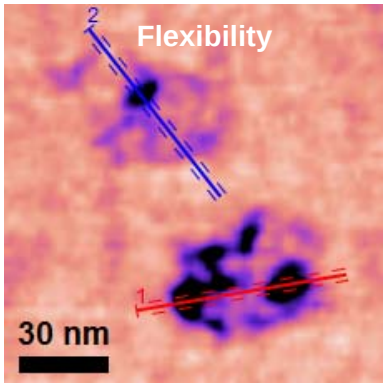
However, up to now, analytical relationship between the sample mechanical properties and real-time measurands for different interaction forces models were not available.



Scheme of bimodal AFM operation on antibodies.

Measuring nanomechanical properties while imaging

The developed technique is based on using a cantilever which interacts with the sample and has at least two vibration modes. A multiple feedback system combined with an excitation unit is used for acquiring the variations of the observables associated with the excited modes as a function of the position of the probe on the sample surface. A set of analytical formulae are applied to obtain transform the bimodal observables in terms of material properties such as the Young's modulus, the indentation, the peak force and the viscosity of the sample.



Map of the flexibility (Young modulus) on two antibodies deposited on a biodegradable substrate.

Main applications and advantages

- Simultaneous topography and quantitative mapping of nanomechanical properties with high resolution
- Real-time measurement
- Test samples in vacuum or immersed in gaseous or liquid media.

Patent Status

Spanish patent has been filed

For further information

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