Local Elastic Measurement in Nanostructured Materials via Atomic Force Acoustic Microscopy Technique

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Atomic Force Acoustic Microscopy (AFAM) [1] is an emerging AFM based dynamical technique that allows one to acquire simultaneously images reflecting samples morphological and mechanical characteristics with nanometrical resolution, and to quantitatively evaluate sample local Young modulus. The AFM system must be equipped with a suitable piezoelectric transducer exciting longitudinal oscillations at ultrasonic frequencies in the sample under investigation. Measured resonance frequencies of cantilever contacting sample surface allows to calculate the value of contact stiffness, i.e. the value of the elastic constant of the spring representing tip-sample contact in a linear model.

From contact stiffness values, sample local Young modulus value can be calculated. In case of monocrystalline samples (Si, GaAs and InP), the local Young modulus is found to be in good agreement, within the experimental error, with data reported in literature. On the basis of these results, we are investigating the AFAM capability of determining the local Young modulus on nanostructured materials. In particular, we report about the first experimental results regarding hybrid materials containing Single Wall Carbon Nanotubes (SWCN).

[1] Rabe U., Amelio S., Kester E., Scherer V., Hirsekorn S., Arnold W., *Ultrasonics*, 2000, **38**, 430.

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