Abstract Submitted
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Bimodal atomic force microscopy imaging of isolated antibodies in air and liquids JOSE R. LOZANO, ELENA T. HERRUZO, NICOLAS F. MARTINEZ, RICARDO GARCIA, Inst. Microelectronica Madrid -CSIC, FORCE-TOOL TEAM — We develop a dynamic atomic force microscopy (AFM) method based on the simultaneous excitation of the first two flexural modes of the cantilever. The instrument, called bimodal AFM, opens up additional channels (amplitude and phase of the 2^{nd} mode) which can be used for imaging with enhanced lateral resolution with respect to amplitude modulation AFM (AM-AFM). Bimodal AFM allows us to resolve the structural components of antibodies in both monomer and pentameric forms. The instrument operates in both high and low quality factor environments, i.e., air an liquids, so that the imaging of biomolecules can be carried out in their natural media. Bimodal AFM is studied in great detail by means of theoretical and numerical methods. Our model allows us to study the material contrast sensitivity of the two additional channels (amplitude and phase of the 2^{nd} mode) that can be used for imaging. The theoretical approach also allows us to estimate the forces applied on the sample during bimodal AFM operation. The calculated forces lie below 120 pN, an essential fact when imaging proteins. This is due to the enhanced sensitivity of 2^{nd} mode phase to detect changes while the cantilever is far away from the sample.

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