Abstract Submitted
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Bimodal AFM imaging of individual protein molecules with sub-pico Newton force sensitivity.[1] NICOLAS F. MARTINEZ, SHIVA PATIL, JOSE R. LOZANO, RICARDO GARCIA, Instituto de Microelectronica de Madrid, CSIC — The capability of atomic force microscopes (AFM) to generate atomic or nanoscale resolution images of surfaces has deeply transformed the study of materials. However, high resolution imaging of biological systems has proved more difficult than obtaining atomic resolution images of crystalline surfaces. In many cases, the forces exerted by the tip on the molecules (1-10 nN) either displace them laterally or break the noncovalent bonds that hold the biomolecules together. Here, we apply a force microscope concept based on the simultaneous excitation of the first two flexural modes of the cantilever (bimodal excitation). The coupling of the modes generated by the tip-molecule forces enables imaging under the application of forces (around 35 pN) which are smaller than those needed to break non-covalent bonds. With this instrument we have resolved the intramolecular structure of antibodies in monomer and pentameric forms. Furthermore, the instrument has a force sensitivity of 0.2 pN which enables the identification of compositional changes along the protein fragments.

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