IMAGING, MANIPULATION AND CHEMICAL IDENTIFICATION OF INDIVIDUAL ATOMS WITH DYNAMIC FORCE MICROSCOPY: A THEORETICAL PERSPECTIVE.

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Dynamic Force Microscopy is a powerful tool for the characterization and manipulation of matter at the nanometer scale [1]. The most-extended operation mode (amplitude modulation, AM-AFM, also known as "tapping") allows the imaging with nanometer resolution of heterogeneous materials in their natural environment and state. Measuring the phase lag of the vibrating probe with respect to the external excitation, AM-AFM can map simultaneously the shape and the compositional variations of the surface and provide access to the dissipated energy [2].

In this talk, we focus on the frequency modulation mode (FM-AFM) that has fulfilled the long standing goal of achieving atomic resolution in all kind of surfaces. We'll show how the combination of force spectroscopy measurements with our large-scale first principles calculations, can be used to understand and extend the FM-AFM capabilities in key areas including single-atom manipulation [3,4] and chemical identification [5]. Tip-sample interactions are also relevant to the STM operation in the near-to-contact regime, where they can induce a substantial decrease of the current when approaching semiconductor surfaces under low bias conditions [6].

References:

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