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Analytical form for the tip-sample interaction in liquid for Atomic Force Microscopy FREDY ZYPMAN, Yeshiva University — Knowledge of the functional form of force-separation curves in Atomic Force Microscopy (AFM) is necessary to develop reconstruction algorithms to predict the morphology and chemical activity of the sample under study. In vacuum, the tip and the sample can be modeled as a collection of atoms. The tip-sample force can thus be evaluated from the appropriate atom-atom forces. These elemental forces have been modeled via Morse, 6-12 pair potentials, and more detailed quantum approaches with non pairwise forces. Nevertheless, a large section of the AFM community is interested in tip-sample interactions in the presence of fluids. The production of theoretical expressions for colloidal interactions relevant to AFM has been hampered by the fact that analytical solutions to the Poisson-Boltzmann equation (PBE) are restricted, thus far, to planar geometries. Numerical solutions for other geometries do exist, but they are computationally expensive. We present a simple theoretical expression for the interaction forces between the Atomic Force Microscope tip, and a sample immersed in an electrolytic solution. Our result is based on the Surface Element Integration of the Dejarguin-Landau-Verwey-Overbeek interaction between flat surfaces. We apply our results to the Van der Walls and to the electrostatic double layer cases. Finally, we use our expression to show how it simplifies the analysis of extant experimental data. Acknowledgment. Work supported by Research Corporation through grant CC5786.

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