

ADHESION AND DISSIPATION IN PHASE IMAGING IN FORCE MICROSCOPY: THEORETICAL APPROACH

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Abstract

It is widely accepted that phase shift in force microscopy is related to energy dissipation. Several models and studies have been published but probably the most relevant is the one by Anczykowski [1]. Based on the hypothesis of a harmonic displacement of the tip it provides an easy-to-use result. However this model doesn't take into account the different dissipation sources that can affect the experiment. And to localize these dissipation sources is not an easy task.

In the same spirit of simplicity we propose that in some experiments, dissipation can be associated mainly to adhesion due to water. The paradigmatic experiment corresponds to the use of biological substrates in air.

Although both adhesion force and energy are two well known magnitudes in static modes, it is to be understood its effect in dynamic modes (tapping mode). A theoretical study has been done in order to understand the effect of adhesion due to water and its effect in the power dissipated.

[1] Anczykowski, Cleveland and Elings, Applied Surface Science, 140 (1999) 376-382