

Non-Linear Interaction Imaging and Spectroscopy for Atomic Force Microscopy

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Technology Summary

Non-linear interaction imaging and spectroscopy (NIIS) for scanning probe microscopy is a fast technique for retrieving both the linear and non-linear components of the interactions between the probe tip and the surface under study and thereby enabling the extraction local potential energy vs. distance curves (potential wells) over an array of points across the surface. It is within these non-linear interactions that some of the most important information about the surface is contained, and which for the most part, has been ignored in most microscopy techniques to date. For instance, the local chemical identity of the surface has a strong influence on the tip-trajectory in the region of closest approach between the tip and the surface. NIIS is capable of extracting this non-linearity and reconstructing the local potential energy profile thus enabling the differentiation of chemical species on the nanoscale. Reconstruction of the potential wells also lends insight into other short-range interactions related to, for instance, nano-indentation, yielding information about elastic and visco-elastic properties as well as long-range tip-surface interactions related to electric and magnetic fields. Furthermore, the information gathered using NIIS can be used as feedback signals, thus allowing the microscope to seek-out and track particular optimal operating conditions for the extraction of relevant information.

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