Identifying passivated dynamic force microscopy tips on H:Si(100)

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The Si(100)\textsuperscript{[1]} surface is a particularly attractive system for the study of single atom/molecule chemistry. When terminated with a passivating layer of hydrogen (Si(100):H), isolated chemically reactive sites can be fabricated by removing a single hydrogen atom allowing interactions to be studied within a unique environment. Particularly interesting information can be obtained via the technique of nc-AFM, which allows the forces and energy of interaction to be measured between molecules and surfaces. Although well studied in STM, thus far only a single nc-AFM image of the Si(100):H surface has been published\textsuperscript{[2]}. We will discuss a nc-AFM study of the Si(100):H surface\textsuperscript{[3]} which elucidates the different force interactions responsible for image contrast. In particular, we observe an inverted imaging contrast thought to originate from atomically repulsive force interactions. Force-distance spectroscopy will also be presented and compared with the results of density functional theory simulations. From these comparisons we provide key insights into the characterisation of the tip-sample system, which may have important consequences for molecular imaging as well as for the fabrication of single chemically reactive sites.

\textsuperscript{3} Sharp et al., \textit{Appl. Phys. Lett.} In submission (2012).