Atomic resolution on the surface of LiF(100) by atomic force microscopy

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Atomic force microscopy (AFM) has already demonstrated its usefulness on a nanometer scale surpassing the resolution of conventional profilometers and probing different interactions such as repulsive contact, electrostatic, and magnetic forces. On an atomic scale the fundamental contrast mechanisms are still under investigation. The atomic resolution on layered materials such as graphite, boron nitride, transition metal dichalcogenides, and MnPS3 shows the great potential of this technique. Several experimental and theoretical investigations on these lavered materials have shown that the presence of the AFM tip can lead to a significant distortion of the electronic and atomic structure. For small loadings (less-than-or-equal-to 10(-8) N) the tip causes long-range elastic deformations while for higher loadings a sharp tip can puncture the sample. To explain the atomic scale features being measured with higher loadings, different mechanisms such as the dragging of flakes or shearing of layers have been suggested. The application of AFM to nonlayered structures gives the opportunity to exclude several of these influences. Here we present atomically resolved images of LiF(100). The measurements are compared to results from different surface sensitive techniques such as helium scattering and low energy electron diffraction (LEED). The contrast mechanisms of AFM are discussed in relation to these experiments.

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