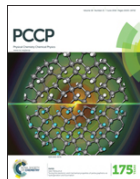


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Understanding the STM images of epitaxial graphene on a reconstructed 6H-SiC(0001) surface: the role of tip-induced mechanical distortion of graphene



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Abstract

Epitaxial graphene (EG) grown on an annealed 6H-SiC(0001) surface has been studied under ultra-high vacuum (UHV) conditions by using a combined dynamic-scanning tunneling microscope/frequency modulation-atomic force microscope (dynamic-STM/FM-AFM) platform based on a qPlus probe. STM and AFM images independently recorded present the same hexagonal lattice of bumps with a 1.9 nm lattice period, which agrees with density functional theory (DFT) calculations and experimental results previously reported, attributed to the (6×6) quasi-cell associated with the 6H-SiC(0001) $(6\sqrt{3} \times 6\sqrt{3})R30^\circ$ reconstruction. However, topographic bumps in AFM images and maxima in the simultaneously recorded mean-tunneling-current map do not overlap but appear to be spaced typically by about 1 nm along the [11] direction of the (6×6) quasi-cell. A similar shift is observed between the position of maxima in dynamic-STM images and those in the simultaneously recorded frequency shift map. The origin of these shifts is discussed in terms of electronic coupling variations between the local density of states (LDOS) of EG and the LDOS of the buffer layer amplified by mechanical distortions of EG induced by the STM or AFM tip. Therefore, a constant current STM image of EG on a reconstructed 6H-SiC(0001) surface does not reproduce its