Tip induced mechanical deformation of epitaxial graphene grown on reconstructed 6H–SiC(0001) surface during scanning tunneling and atomic force microscopy studies

Article · June 2015 *with* 107 Reads
DOI: 10.1088/0957-4484/26/25/255704 · Source: PubMed


1st José Antonio Morán Meza
11.74 · Atomic Energy and Alternative Energies Commission

2nd Christophe Lubin

3rd F. Thoyer
17.38 · Atomic Energy and Alternative Energies Commission

4th Jacques Cousty

Abstract

The structural and mechanical properties of an epitaxial graphene (EG) monolayer thermally grown on top of a 6H-SiC(0001) surface were studied by combined dynamic scanning tunneling microscopy (STM) and frequency modulation atomic force microscopy (FM-AFM). Experimental STM, dynamic STM and AFM images of EG on 6H-SiC(0001) show a lattice with a 1.9 nm period corresponding to the (6 × 6) quasi-cell of the SiC surface. The corrugation amplitude of this (6 × 6) quasi-cell, measured from AFM topographies, increases with the setpoint value of the frequency shift Δf (15-20 Hz, repulsive interaction). Excitation variations map obtained simultaneously with the AFM topography shows that larger dissipation values are measured in between the topographical bumps of the (6 × 6) quasi-cell. These results demonstrate that the AFM tip deforms the graphene monolayer. During recording in dynamic STM mode, a frequency shift (Δf) map is obtained in which Δf values range from 41 to 47 Hz (repulsive interaction). As a result, we deduced that the STM tip, also, provokes local mechanical distortions of the graphene monolayer. The origin of these tip-induced distortions is discussed in terms of electronic and mechanical properties of EG on 6H-SiC(0001).