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Abstract

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Surface vibrations on clean and hydrogen saturated W (100)

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Abstract

Electron energy loss Spectroscopy (EELS) and lattice dynamical calculations are used to investigate the vibrational properties of surface phonons and adsorbate phonons on clean and hydrogen-saturated W(100). Two distinct intrinsic surface vibrations are observed in specular scattering geometry. One of the surface modes is attributed to a surface resonance of a bulk longitudinal phonon at the hydrogen-stabilized (1×1) surface. The second surface mode occurs only on the low-temperature-stabilized c(2×2) [011] displacement surface. Detailed experimental studies and lattice dynamical analysis of the hydrogen-saturated W(100) surface account for a new hydrogen-derived loss peak at 118 meV in terms of an optic mode of the adsorbed layer. Experimental evidence of impact scattering resonances under certain kinematic conditions are observed.

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