

Exploiting Resonance Effects on Bi(111)

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The Surfaces of Bismuth exhibit unexpected electronic and vibrational properties. Being a semimetal with metallic surface-behavior, the strong corrugation found by Tamtögl et al. [1] was rather unexpected but enabled the investigation of elastic surface resonances and thus the measurement of the He-Bi(111) interaction potential. Using the signal enhancement and suppression caused by the bound-state- and threshold-resonance effects, phonon states located in the bulk can be identified that would otherwise be inaccessible by helium atom scattering.

On the other hand, the enhancement of previously identified surface-phonon modes can improve the accuracy of the information about the bound-state energy in the interaction potential and thus enable far more detailed insights into the interaction potential between the probe atom and the surface under investigation.

Therefore, several elastic and inelastic helium atom scattering measurements were performed on the Bi(111) surface. Besides the usual angular distribution and time-of-flight measurements, also the temperature-dependence of the elastic specular peak intensity was measured and compared to predictions for the resonant energies.

[1] A. Tamtögl, JPCM **22**, (2010) 304019