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Neutralization/Ionization of Si Scattered from Adsorbate Sites
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Riverside — In low energy ion scattering, ion-surface charge exchange strongly depends on the surface electronic structure and the ionization level of the projectile. Si has an ionization level that overlaps the center of the surface conduction band and is intermediate in energy to that of alkali ions and noble gas ions, which are the projectiles traditionally used. The scattering of Si thus provides new pathways for ion-surface charge exchange. A considerable fraction of the low energy Si^+ ions backscattered from submonolayers of Cs deposited onto Al(100) are found to be emitted as positive or negative ions. The negative ions result from simple resonant charge transfer (RCT) into the electron affinity level. The formation of Si^+ , however, is in contrast to the expected complete neutralization due to the overlap with the surface bands. It is proposed that valence electron RCT enhanced by the interaction of the Si ionization level with the Cs 5p level is responsible for the ion formation. Positive ions were also produced in Si scattered from I adatoms on Al(100), presumably by a similar mechanism. The ion fractions are smaller than those for scattering from Cs, which suggests that electron tunneling from the occupied I chemisorption states provides an additional neutralization channel.

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