Abstract for an Invited Paper
for the GEC08 Meeting of
The American Physical Society

Neutralization dynamics of hydrogen anions near flat and vicinal surfaces[†1]

UWE THUMM, Kansas State University

I will scrutinize the role of intermediate electronic surface and image states on the charge-transfer dynamics during collisions of H^- anions with atomically flat Pd, Cu, and Ag surfaces of (100) and (111) symmetries using a wave-packet propagation approach [1]. For these surfaces I will show how differently located band gaps, surface -, and image states lead to easily visualized differences in the evolution of the active electron's probability density: i)Long-lived surface states of the (111) surfaces tend to localize electronic density near the surface and facilitate recapture by the projectile, while H^- is more efficiently neutralized near (100) surfaces whose surface state appears as a broad resonance embedded in the bulk valence band. ii) Image states that are degenerate with the metal conduction band favor, while image states that are degenerate with the band gap hinder recapture. In the second part of my talk I will discuss negative-ion interactions with stepped nano-structured surfaces based on effective potentials for the active electron's interaction with the surface that we derived within a Thomas-Fermi von Weizsaecker model [2]. For 50eV projectiles, we find an enhancement of electron loss near the steps due to the Smoluchowski effect. In consequence, negative-ion survival is more likely for projectiles that approach steps from above than from below [3]. † In collaboration with Himadri Chakraborty (Northwest Missouri State Univ.) and Boyan Obreshkov (Kansas State Univ.)

[1] H. Chakraborty, T. Niederhausen, and U. Thumm., Nucl. Instrum. Meth. B **241**, 43 (2005) ; Phys. Rev. A **70**, 052903 (2004).
[2] B. Obreshkov and U. Thumm, Phys. Rev. A **74**, 012901 (2006);
[3] B. Obreshkov and U. Thumm, Surf. Sci. **601**, 622 (2007).

[1]Supported by the NSF and U.S. DoE.