

Abstract Submitted  
for the MAR11 Meeting of  
The American Physical Society

**Electronic response of dielectric covered metal surfaces to highly charged ions**<sup>1</sup> R.E. LAKE, Clemson University, J.M. POMEROY, National Institute of Standards and Technology, C.E. SOSOLIK, Clemson University — The strong Coulombic perturbation on a solid target from a highly charged ion (HCI) initiates a complex many-body response from target electrons that can produce novel effects such as potential energy sputtering, nanofeature formation and huge secondary electron yields. Far above the surface, HCIs reach a critical electron capture distance and neutralization proceeds via resonant charge transfer over the vacuum barrier [1]. Motivated by recent experiments [2], we detail the onset of charge transfer between a HCI and a metal covered with a dielectric thin film (Co with 1.5 nm Al<sub>2</sub>O<sub>3</sub>) to determine the film's effect on the critical distance. Surprisingly, we find that the first captured electrons are pulled through the exposed dielectric and come from the underlying metal. Additionally, the Al<sub>2</sub>O<sub>3</sub> film lowers the effective work function of the target and extends the critical distance compared to a clean metal. I will discuss how the experimental parameters (thin film material/thickness and ion charge state/velocity) can be tuned to allow the ion to interact with electrons in either the metal or thin film.

[1] Phys. Rev. A **44**, 5674 (1991).

[2] J. Phys.: Condens. Matter **22**, 084008 (2010).

<sup>1</sup>We acknowledge support from NIST and NSF-CHE-0548111.

Russell Lake  
Clemson University

Date submitted: 03 Jan 2011

Electronic form version 1.4