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Measurement of kinetic and potential energy deposition in highly charged ion collisions with surfaces R.E. LAKE, NIST and Clemson University, J.M. POMEROY, NIST, C.E. SOSOLIK, Clemson University — We measure craters in thin dielectric films formed by highly charged Xe^{Q+} ($26 \leq Q \leq 44$) projectiles [1]. Tunnel junction devices with ion-irradiated barriers were used to amplify the effect of charge-dependent cratering through the exponential dependence of tunneling conductance on barrier thickness. Electrical conductance of a crater $\sigma_c(Q)$ increased by 4 orders of magnitude (7.9×10^{-4} μS to
6.1 μS) as Q increased, corresponding to crater depths ranging from 2 to 11 Å. By employing a heated spike model, we determine that the energy required to produce the craters spans from 8 to 25 keV over the investigated charge states where kinetic energies were $(8 \times Q)$ keV. We partition crater formation energy into potential and kinetic contributions to find that at least (27 ± 2) % of the available ion potential energy is required. Decreasing projectile kinetic energy at constant Q, provides a new test for charge-dependent kinetic energy loss theory.

[1] R.E. Lake, J.M. Pomeroy, H. Grube, C.E. Sosolik, Phys. Rev. Lett. **107**, 063202 (2011)

R. E. Lake
NIST and Clemson University

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