Lawrence Berkeley National Laboratory
Recent Work

Title
Effects of intense electronic excitation of surfaces by slow highly charged ions: Principles and applications

Permalink
https://escholarship.org/uc/item/30j0f9hf

Author
Schenkel, T.

Publication Date
2002-06-28
Effects of intense electronic excitation of surfaces by slow highly charged ions: principles and applications

T. Schenkel, E. O. Lawrence Berkeley National Laboratory, Berkeley, CA 94720

Slow (v<2E6 m/s), highly charged ions, such as Xe^{44+}, deposit their potential energy within ~10 fs when they impinge on solid surfaces. The intense, ultrafast electronic excitation of surfaces on a nanometer scale induces defects and results in secondary particle emission, distinct from effects induced by deposition of kinetic energy. Potential electron emission and secondary ion emission can be utilized for surface analysis, e.g. in time-of-flight secondary ion mass spectrometry and ion emission microscopy [1]. Secondary electron emission also enables efficient ion impact registration in single ion implantation experiments [2]. We will discuss mechanisms of intense, ultrafast electronic excitation by slow highly charged ions, and outline status and potential of applications in materials analysis and modification.

Acknowledgments
This work was supported by the National Security Agency and Advanced Research and Development Activity under Army Research Office contract number MOD707501, and by the U. S. Department of Energy under Contract No. DE-AC03-76SF00098.