

# 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 ( $v < 2 \times 10^6$  m/s), highly charged ions, such as  $\text{Xe}^{44+}$ , deposit their potential energy within  $\sim 10$  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.

[1] T. Schenkel, A. V. Hamza, A. V. D. H. Schneider, Prog. Surf. Sci. 61, 23 (1999)

[2] T. Schenkel et al, Proceedings of SPIE Vol. 4656, 10 (2002); cond-mat/0201549