MAR05-2004-004487

Abstract for an Invited Paper
for the MAR05 Meeting of
the American Physical Society

Davisson-Germer Award Talk: Surface Electron Microscopy with Slow Electrons[1]

ERNST BAUER[2], Arizona State University

Nearly 80 years ago Davisson and Germer demonstrated the diffraction of slow electrons from surfaces but it is only about 20 years that these electrons have been used for imaging of surfaces and thin films in the Low Energy Electron Microscope (LEEM). Since then several other surface imaging methods with slow electrons have emerged, in particular synchrotron radiation excited photo emission electron microscopy (XPEEM). In LEEM the high intensity of the diffracted slow electrons allows fast image acquisition. Therefore it is tempting to combine it with the other, slower complementary methods. This has been accomplished in the Spectroscopic Photo Emission and Low Energy Electron Microscope (SPELEEM) by adding an energy filter. Today the SPELEEM allows comprehensive structural, chemical, magnetic, electronic characterization of surfaces and thin films by imaging with 10 nm lateral resolution and atomic depth resolution, diffraction and spectroscopy. Recent developments are expected to push the resolution limit into the 1 nm range by aberration correction and the time resolution into and below the picosecond range by pulsed illumination and time-delayed triggered detection. The talk will first describe the general imaging principles and then illustrate with a number of examples the possibilities and limitations of some of the methods, LEEM, Spin-Polarized LEEM (SPLEEM) and X- ray Magnetic Dichroism PEEM (XMCDPEEM). A brief outlook will conclude the presentation.

[1]Work supported by NSF under contract # MPS0315412, DMR9818296 and ONR under contract # N00014-1-0922
[2]Davisson-Germer Prize