

DOE/ER/45527-1

**DEVELOPMENT OF INSTRUMENTATION
FOR
SURFACE, INTERFACE AND THIN FILM SCIENCE
AT
THE ADVANCED PHOTON SOURCE**

Final Technical Report

For Period September 15, 1994 - September 14, 2000

Michael J. Bedzyk

Northwestern University
Department of Materials Science and Engineering
Evanston, Illinois 60208

September 2000

Prepared for

THE U. S. DEPARTMENT OF ENERGY
AWARD NO. DE - FE - FG02 - 94ER45527

DOE Patent Clearance Granted
MDvorscak
Mark P Dvorscak
(630) 252-2393
E-mail: mark.dvorscak@ch.doe.gov
Office of Intellectual Property Law
DOE Chicago Operations Office
May 16, 2001
Date

DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency Thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

DISCLAIMER

Portions of this document may be illegible in electronic image products. Images are produced from the best available original document.

"Development of Instrumentation for Surface, Interface and Thin Film Science at the Advanced Photon Source"

M. J. Bedzyk

Abstract:

The P.I. and his research team successfully used the funds from the DOE Instrumentation grant entitled "Development of Instrumentation for Surface, Interface and Thin Film Science at the Advanced Photon Source", to design, build, test, and commission a customized surface science x-ray scattering / spectroscopy chamber. This instrumentation, which is presently in use at an APS x-ray undulator beam line operated by the DuPont-Northwestern-Dow Collaborative Access Team, is used for x-ray measurements of surface, interface, thin film and nano- structures.

NOTICE

This report was prepared as an account of work sponsored by the United States Government. Neither the United States nor the United States Department of Energy, nor any of their employees, nor any of their contractors, subcontractors, or their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product or process disclosed or represents that its use would not infringe privately-owned rights.

Work Performed:

In the six years of the contract DE - FE - FG02 - 94ER45527, the PI's research team at Northwestern University has achieved the project goals. These were to support the construction of a versatile ultrahigh vacuum (UHV) x-ray endstation that is now used at the Advanced Photon Source (APS) x-ray beam lines operated by the DuPont-Northwestern-Dow Collaborative Access Team (DND-CAT) for studies of surface, interface and thin film structures. Capital funds from this grant were used to underwrite a large fraction of the cost of the x-ray diffractometer and surface science equipment. Other equipment for this project has been purchased with funds from other sources (the DOE instrumentation grant DE-FG02-96ER45588, funds from the NSF-funded Materials Research Center at NU, and funds from the NSF/DOE-funded Institute of Environmental Catalysis at NU). The entire instrumentation package (chamber, diffractometer, detectors and post-monochromator optics) is used for various types of x-ray scattering and spectroscopy measurements of surface, interface, thin film, and nano- structures. A more detailed description of the instrumentation and the initial science projects can be found in the Final Technical Report for DE-FG02-96ER45588 that has been co-submitted with this abbreviated report. Also see the attached publications.