1999 Laboratory Report to SNEAP for the Surface Modification and Characterization Research Center at Oak Ridge National Laboratory

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Introduction:

The Surface Modification and Characterization Research Center is a unique facility for the alteration and characterization of the near-surface properties of materials. It is operated by the Solid State Division at Oak Ridge National Laboratory and is available to scientists from university, industry, government, and other laboratories for basic and applied materials research. The facility is a User Facility with an average of about 94 users a year.

Facility:

The Center features four ion accelerators, a 2.5 MV Van de Graaff, a 160 kV Extrion Implanter, a 1 MV Eaton Implanter, and a 1.7 MV Tandetron. They provide a wide range of implantation and ion scattering capabilities. These accelerators are integrated with computer-monitored beam lines, experimental chambers, and data acquisition electronics. Additional capabilities include annealing, thin-film evaporation, optical microscopy, and nanoindentation hardness. Surface analytical equipment, including Auger electron spectroscopy and low-energy electron diffraction is available on one experimental chamber.

Report:

To improve performance and reduce downtime of our accelerators, a new lab wide vacuum system was designed and implemented in phases. This oil free system uses turbomolecular drag pumps with a mechanical scroll on the forelines and for roughing. All three systems have a ballast tank and a manifold for the foreline and a controller that mediates between the rough and the foreline manifolds. The first phase was completed in December 1996 and was reported on at the last SNEAP meeting. It now has ~340 hours on the scroll pump timer. The second phase was completed in December 1997 and now has ~420 hours. A third phase, which isolates the tandem source area from the rest of the lab, was installed in October 1998, it now has ~565 hours. The first year pump has lower hours because the ballast is larger. The scroll pump requires a rebuild around 6000 hours, at ~500 hours a year that is 12 years before a rebuild is needed. Also during last October on the tandem, the old gridded einzel lens was replaced with an NEC gridless lens. This coming year we hope to upgrade our Tandem accelerator with a solid state driver, replacing the RF tubes. The Alphatross source now has ~11400 hours, with no major problems to report. The SNICS source had no major problems to report.

One major upgrade was done on the Extrion this past year. The old vacuum manifold had welded joints for the valves, which made it difficult to change out the values. So Vacuum Technology Inc. (VTI) made a new manifold with quick flanges. The new system is working great. There is still a problem with the roughing/foreline pump taking in a lot of source materials and causing damage to the pump. The pump is replaced a couple of times a year. A new telemetry system is in the works in the near future, the system is by Group 3.

The Van de Graaff is temporary shut down until users have a need for it. That means no safety interlock checks is being preformed. Most users prefer to use the tandem accelerator to do their material analysis. A new electron suppression tube from HVEE is ready to be installed, if interest in the accelerator ever arises.

FY99 Accelerator Usage

Accelerator	Hours	Equivalent 8 hour days	Actual days
Van de Graaff	0	0	0
Extrion	1232	154	149
Tandem	3969	496	267
Nova	1030	128	118

FY 1999 SMAC USER FACILITY AND USER RESOURCE PARTICIPATION

	Number of Experimenter Personnel	User Days	Percent Use
Domestic			
University	47	658	23.1
Industry	11	172	6.0
GOV Labs (non-ORNL)	2	7	0.2
ORNL	32	1977	69.3
Domestic Total	92	2814	98.6
Foreign	2	39	1.4
TOTAL	94	2853	100.0%

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