MICHIGAN ION BEAM LABORATORY
LAB REPORT

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Tandem Accelerator

Operation :
The 1.7 MV Tandetron Accelerator has been operating pretty smoothly until recently. We were able to have in excess of 2300 h of beam time in 2005 (H – most part, He, D and Ni) and with energies between 1 MV and 3.2 MV. The H ion source (Torvis – NEC) has been performing excellent allowing us long proton irradiations (sometimes more than 240 h continuously) providing a steady and reliable beam. We have two ion sources mounted symmetrically – the Torvis and a 358 Duoplasmatron. When needed, the duoplasmatron can be easily interchanged with a sputtering source (in about ½ day).

Experiments:
About 75% of the run time is dedicated to proton irradiations in the study of stress corrosion cracking of irradiated austenitic alloys in supercritical water. Other experiments included He irradiations, RBS, NRA and channeling.

Accelerator problems:
The main problem we have experienced recently is related with the stability of the ion beam at the HE end of the accelerator. With beam increasing (above 20 uA of protons) we experience an increase in the number of sudden beam drops. The frequency of these drops increases with the increase of the current. The accelerator power supply is stable and no unusual activity is noticed in its parameters. No arcing is caught by the photomultiplier. Tank was opened and the condition of the diode stacks and of the resistors was good. We are currently trying to narrow the problem either to somewhere inside the accelerator tube or in the quadrupole region.

Accelerator controls:
Progress has been made to modernize and remotize the controls of the accelerator. Many power supplies are old and don't allow for remote control, so we started a process to slowly replace them. Being older than 20 years, is not a question if they are going to fail but when, and support for those dinosaurs is fading away. We introduced a lot of computer controls that could be accessed via a web page allowing remote monitoring and control of the irradiation parameters.

Transition from the 200 KV Varian Ion Implanter to the 400 KV NEC Ion Implanter

Our old 200 KV Varian implanter is out of the lab as of September 2006, and it found a new home. Good luck to the new owners! During the last year it worked intermittently provided limited availability of noble gases beams, but in general proved to be a very problematic machine. We look forward to receiving (towards the end of this year) a new 400 KV ion implanter form NEC. It will be a hybrid instrument, being built by NEC, with a source from Danfysik (the versatile 921) and with an end stage from HVEE. Theoretically the new source should be capable of producing beams from any element. The implantation stage allows for 4 and 6 inch wafer irradiations (5 and respectively 4 loaded simultaneously) and with the capability of LN temperatures and up to 800^0 C irradiations.

Ion Beam Assisted Deposition (IBAD) system

The instrument performed well in 2006, giving us a few 100s of hours of deposition, some only PVD and some ion assisted (3 cm 1.2 KV Kaufman ion gun). Most of the depositions were optical film coatings (SiO_2 and TiO_2) used in the design of optical filters, but we also had some pure metals (Au, Ti, Ni) films done.