out of the material and improving the rate of effusion through the target matrix. The second is the development of a negative-surface-ionization source for production of group VII elements, in particular the bromine isotopes, in an effort to increase the available beam intensity.

ACCELERATOR OPERATION:

During FY 2000, the 25URC has operated for over 3100 hours and provided approximately 2600 hours of beam on target for the experimental program and RIB development. Several new radioactive beams were accelerated for the first time: ^{18}F, ^{117}Ag, ^{118}Ag, ^{126}Sn, and ^{134}Te. Operation for the experimental program was at terminal potentials from 2.55 to 22.9 MV. Seven tank openings were required during the year, two scheduled for general maintenance and five unscheduled. One unscheduled opening was needed to remove a titanium flake (from the sublimation pumps), which had fallen into the beam path just after a scheduled opening in which maintenance had been done on the sublimation pumps. Two openings were to repair an electronic steerer controller after sparks in the 22-23 MV range. This controller had been altered earlier and evidently was more susceptible to sparks so we added more spark protection after the second failure. Broken shorting rod strings caused the other two unscheduled openings. A broken shorting rod contact at the first casting broke a nylon rod in the first opening and a nylon stud breaking off in a steel rod caused the second opening. The nylon studs have been replaced with ones made from fiberglass.

A second attempt to install a recirculating stripper was abandoned due to failure of the epoxied roughing port on the Leybold turbo pump purchased through NEC. This is the second time this seal has failed and we are planning to either modify the pump we have, to provide a better roughing port seal, or to purchase another pump with a more robust roughing port connection. Leybold is supposed to start selling these pumps with either welded or threaded ports, but we have not been able to purchase one to this date.

The SF_6 vaporizer in our gas handling system was replaced this year without any impact on accelerator operation. The old vaporizer had been leaking for many years around the large top and bottom gaskets. After removal, it was found that the only problem was the deterioration of the gaskets so we refurbished the old vaporizer to keep as a spare. In the next few years we plan to replace or upgrade many of our gas-handling components that are showing their age of more than twenty years.

FUTURE PLANS:

As soon as we get a viable turbo pump, we plan to finish installation of a recirculating stripper. If we finally get it in and it works properly, we may remove our titanium sublimation pumps. The tandem control system was changed from VISTA to EPICS at the end of FY 1999 and we have been very pleased with the EPICS system. We are in the process of converting all beam lines, the RIB injector and ORIC to this system also. AIP money is available and work will be started to improve terminal potential stability.

A new oxygen monitoring system by Alpha Omega Instruments Corp. has been purchased and will be installed shortly. The new oxygen monitors should not need the excessive amount of maintenance required by the old Beckman monitors. The new system does not require any maintenance on the sensors and they are said to last between two and four years in an ambient atmosphere.

OAK RIDGE 25URC TANDEM ACCELERATOR*
2000 SNEAP LAB REPORT

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RADIOACTIVE ION BEAMS:

During the first half of FY 2000, about 900 hours of ^{17}F beam were produced for the experimental program. This beam was produced by an incident beam of 44.5 MeV deuterons on an improved target of HfO_2 surrounded by a liner of Al_2O_3 felt. This new configuration allowed provision of an accelerated beam of over 10^6 ^{17}F ions/s on target, which is about a factor of two greater than what was provided before. This same target was then used with an incident beam of 85 MeV ^4He to produce ^{18}F for approximately two weeks. Thus concluded a remarkably successful yearlong campaign of $^{17,18}F$ experiments, which were primarily done by the astrophysics program.

After removal of the negative ion source, which provided the fluorine beams, the injector was upgraded to accommodate a uranium carbide target used to produce various proton-induced fission, neutron-rich beams. These beams are produced by high-intensity proton bombardment of the target, which is coupled to an electron beam plasma (positive-ion) source followed by a recirculating charge-exchange cell. Development of neutron-rich beams was started on August 23 and on August 25, 2000, the first neutron-rich beam was provided on target at the recoil mass separator. Double stripping in the tandem accelerator was used to provide ^{117}Ag at an energy of ~4 MeV per nucleon at an intensity of ~1.2 x 10^6 ions/s. The mass 117 beam was almost pure silver, but many of the neutron-rich beams of other masses from the same source are expected to be strongly mixed isobarically. Measurements made of many of the fission-fragment beams produced are tabulated at www.phy.ornl.gov/hribf/users/beams/nrich_tab.html. The uranium carbide source was originally installed for testing purposes only but was used to provide beam to an experimental target.

The next ion source that will be installed on the radioactive ion beam (RIB) injector is a multi-sample sputter source containing eight targets which can be bombarded with Oak Ridge Isochronous Cyclotron (ORIC) beam, then rotated to a position where the activity can be exposed to a sputter beam for production of a long-lived, negative-ion beam for injection into the tandem accelerator. This source will be used initially to produce ^{18}F and ^{11}C beams, and will later be used to produce ^{56}Ni beams. The installation of this source is presently scheduled for mid-October.

Ion source and target development continues both at the UNISOR facility and the two ion source test stands. Some of the initial tests that need to be done with any proposed target material are a high temperature test (does the material sinter or decompose?) and an ion source test (does the material have high vapor pressure or does it interact with and destroy the ion source?). New materials being investigated are powders of cerium sulfide for beams of $^{33,34}Cl$ and silicon carbide for ^{25}Al. There is also ongoing development work for producing RIBs of As, Ga, and Se. Development activities concerning neutron-rich beams focus on two aspects: The first is the development of a new-design uranium carbide target that is built on a highly-conductive graphite foam matrix. It is believed that the excellent conductivity of this target will allow the temperature to be more uniform which should help to increase the yield extracted from the source by enhancing diffusion

*Oak Ridge National Laboratory, operated by UT-Battelle, LLC, for the U.S. Department of Energy under contract number DE-AC05-00OR22725.