On-line transactinide homolog chemistry

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1. Introduction

Chemical studies of the transactinide elements (Z > 103) can help assess the influence of relativistic effects within the heaviest elements. It is expected that relativistic effects will result in deviation of periodic group trends [1]. To determine the extent of deviation and where the deviation begins, the chemical behavior of the heaviest elements should be compared to that of their lighter homologs that reside in the same periodic group.

Currently there are 6 facilities in the world, located at the Gesellschaft für Schwerionenforschung in Darmstadt, Germany; The Japan Atomic Energy Research Institute in Tokai, Japan; The Joint Institute for Nuclear Research in Dubna, Russia; The University of Oslo in Oslo, Norway; Lawrence Berkeley National Laboratory in Berkley, California, USA; and at RIKEN in Wako, Sairama, Japan, that allow for the chemical study of transactinide elements and their short-lived accelerator produced homologs. With the exception of the University of Oslo and Japan Atomic Energy Research Institute these facilities perform gas phase chemistry. This presents a worldwide need, in the field of transactinide chemistry, for the development of an additional facility for liquid phase chemistry. Texas A&M University Cyclotron Institute is working to fulfill this need. Recently, a state-of the-art, custom modular radiochemical laboratory was built at the Cyclotron Institute.

2. Customization and Compliance of Laboratory

The modular laboratory is customized with the following: 1) chemically resistant walling, flooring and ceiling 2) non-slip flooring 3) GFI rated outlets, lights and switches 4) isolated waste system with high level alarm, sampling and neutralization capability 5) completely washable interior 6) chemically resistant sink, basin and laboratory benches 7) $HClO_4$/HF compatible radiological fume hood 8) 3 phase 120/220 V electrical panel and wiring 9) climate control 10) movable via overhead crane, forklift or wheeling 11) auditory and visual fire alarm compliant with the State of Texas building code 12) OSHA and State of Texas compliant safety shower and eyewash 13) OSHA and State of Texas building code stairs 14) NRC compliant. The laboratory is movable due to space constraints within the cyclotron and to allow for 18-wheeler access to the MARS cave and the K500 high-bay. The laboratory is in the process of being installed. A picture of the laboratory can be seen below in Fig. 1.

FIG. 1. A picture of the new, custom, state-of-the-art modular radiochemical laboratory at Texas A&M University Cyclotron Institute.

[1] V. Pershina, Chem. Rev. **96**, 1977 (1996).