

Trans-uranic Safety Requirements

The NSLS does not have dedicated beam lines and hutches that have been constructed with trans-uranic (TRU) radionuclides (e.g. Np-237, Pu-239, Am-241) use in mind. Such facilities would normally feature containment structures around the apparatus used in the TRU experiments, and continuous air monitors to sample room air inside and outside the hutch. As a result, conservative requirements are needed to ensure that accident conditions would not produce high doses to personnel or result in severe programmatic impact to the facility.

Requirements

1. Each TRU sample shall be limited to a maximum of 100 μCi . The quantity should be maintained as low as practical consistent with the requirements of the experiment.
2. TRU samples shall be non-volatile stable solids at all anticipated operating conditions.
3. TRU samples shall have 3 containment barriers between the sample and the room air.
4. Sample holders should be non-combustible and shall not include easily ignited materials.
5. TRU samples should be used at ambient operating conditions.
6. For experiments involving non-ambient conditions, (e.g., elevated temperatures, pressures, cryogenic temperatures, vacuum), a failure analysis shall be performed to determine if accident scenarios result in a failure of multiple containment barriers.
7. Operating parameters with a significant link to sample containment (e.g. temperature, pressure) will require monitoring and may require interlocking to equipment or beam line operation.
8. TRU samples shall be brought to the NSLS ready for use. No TRU chemistry or sample prep or containment manipulation is permitted at the NSLS.
9. The experiment should be designed to minimize manipulation of samples and their movement from place to place. TRU samples not in use at the beam line shall be stored in fire-resistant containers and kept locked. If possible, this storage should be near the in-beam location to facilitate sample changes and localize contamination in the event of containment failure.
10. The potential for fire in the hutch where the sample is used shall be reduced by:
 - Elimination of all combustibles where practical.
 - Removal of electrical and other ignition sources where practical.
 - Inspection of the remaining electrical apparatus and hutch conditions by NSLS ESH personnel.
 - Researchers shall be shown the location of the nearest fire extinguisher and fire alarm pull station. The extinguisher should only be used for small fires not involving the TRU samples.
11. TRU sample containers shall be smeared for contamination by a Radiological Control Division (RCD) technician upon removal from the shipping container and prior to packaging for return to the responsible institution.

12. TRU samples may require attended operation during use in the synchrotron beam or when power to electronics or sample containment is energized.
13. All personnel attending a sample in use shall be knowledgeable of the operating requirements and shall have BNL radiological training appropriate to handle the TRU materials. RCD personnel shall determine if a Radiation Work Permit is required.
14. Gloves (e.g. vinyl, Latex, nitrile) shall be worn by any personnel handling sample containers. After each separate use, gloves shall be collected in a plastic bag. When all smearing has been completed (see #11 above) and no contamination has been found, the gloves may be discarded. If contamination is found, the gloves must be disposed of as rad waste.
15. No work with sharp objects is permitted around windows or other potentially fragile portions of a TRU sample container.
16. A sample container that has been dropped or otherwise subject to impact shall be physically inspected and may require smearing for contamination by an RCD technician prior to use in a beam line. Any signs of containment failure or degradation shall preclude use of that sample.
17. The responsible experimenters should assist in the preparation of a contingency plan for the coordination of response to credible accidents. This plan shall be in place before the samples are unpacked at the NSLS.
18. Shipping TRU-containing samples to the NSLS and back to the home institution shall be coordinated through the BNL Isotope & Special Materials Group, (631) 344-5233.