

Title of Project: **Enriched Stable Isotope Technical Services and Shipping**
Category: Project Highlights
Highlight: Ten shipments of 31 isotopes were completed in June. The totals for fiscal year (FY) 16 are 81 shipments of 219 isotopes. Ten technical services requests were completed in June for a FY total of 100. These included a Pt-198 foil (Fig. 1) and a Fe-54 disc (Fig. 2) and Fe-54, Fe-57, Cu-65 oxides that had been converted to metal.

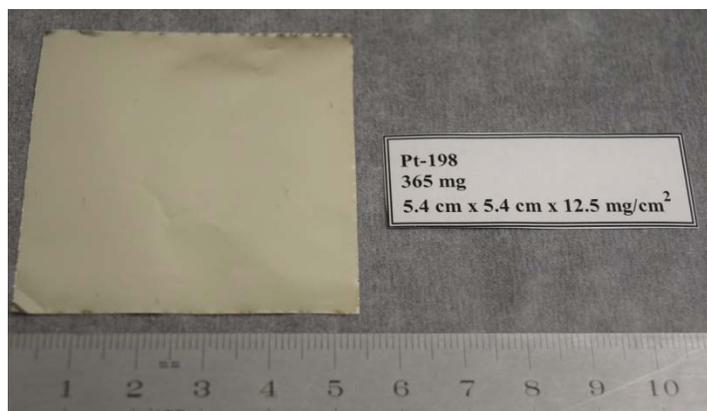


Fig. 1. Pt-198 foil, 5.4 cm x 5.4 cm x 12.5 mg/cm², for commercial resale.

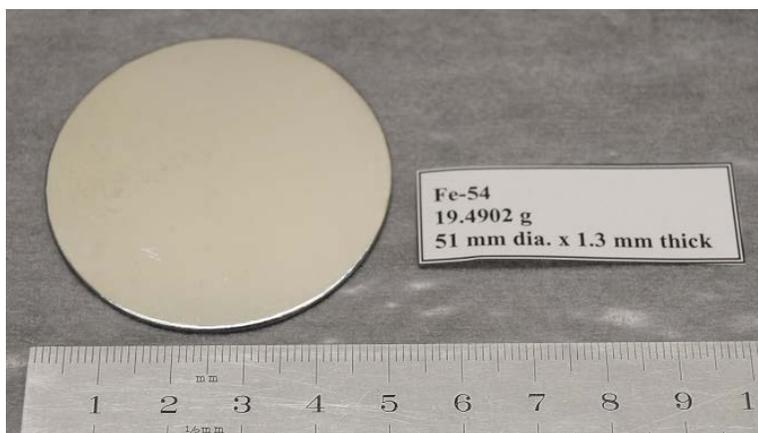


Fig. 2. Fe-54 disc, 51 mm diameter x 1.3 mm thick, for inelastic neutron scattering cross section measurements.

Sponsor: SC-NP Isotope Program Division/Program/Group: NSITD/ID
PI Name(s): Eva Hickman, Mike Zach, Clint Ausmus

Title of Project: **Enriched Stable Isotope Technical Service Requests**
 Category: Project Highlights
 Highlight: A total of sixteen technical service requests were received in June for preparation of the isotopes indicated in Table 1.

Table 1. Technical Service Requests for June 2016.

Isotope	Requested Form	Characteristics
Kr-78	Gas	1 L
Pd-102	Foil	1.5 cm x 1.5 cm x 1.5 mg/cm ²
Cd-108	Foil	1.5 cm x 1.5 cm x 1.5 mg/cm ²
Cd-110	Foil	1.5 cm x 1.5 cm x 1.5 mg/cm ²
La-139	Foil	1 cm x 1 cm x 10 mg/cm ²
Sr-86	Foil	1 cm x 1 cm x 10 mg/cm ²
Ir-193	Foil	1 cm x 1 cm x 10 mg/cm ²
Cu-65	Foil	1 cm x 1 cm x 10 mg/cm ²
Sb-123	Foil	1 cm x 1 cm x 10 mg/cm ²
Sr-87	Foil	1 cm x 1 cm x 10 mg/cm ²
Sr-88	Foil	1 cm x 1 cm x 10 mg/cm ²
Mg-26	Foil	2 cm x 2 cm x 500 ug/cm ²
Mo-100	Foil	50 mm x 50 mm x 0.1 mm
Ba-135	Chloride	
Ba-136	Chloride	
Ba-137	Chloride	

Sponsor: SC-NP Isotope Program Division/Program/Group: NSITD/ID
 PI Name(s): Eva Hickman, Mike Zach, Clint Ausmus

Title of Project: **Cf-252 Program**
 Category: Project Highlights
 Highlight: Remote Hot-Cell Target Fabrication Equipment Upgrade Project: Progress is being made on the development of the equipment for powder blending/dispensing and pellet fabrication. The effort has transitioned from prototype to final design and procurement of selected equipment is in progress. Development and evaluation of options for an updated radiography system is underway and a visit to a radiography equipment vendor was conducted. The old transfer case that is used to move large equipment into and out of the Radiochemical Engineering Development Center (REDC) hot cells in building 7920 has been repaired and equipment removal from Cubicle 1 is scheduled to begin July 6.

As of June 24, 2016 the earned value for the project was at 23.6% with a goal of 50% by the end of September. A project simulation was created to identify the path forward to achieve the 50% Earned Value goal.

Sponsor: SC-NP Isotope Program Division/Program/Group: NSITD/NMP
PI Name(s): Julie Ezold, Robin Taylor

Title of Project: **Miscellaneous Isotope Program Activities**

Category: Project Highlights

Highlight: A cost proposal for the production of mega-curies of ^{51}Cr was reviewed and submitted to the Isotope Business Office.

Editing of the script and six videos associated with processing and purification of ^{249}Bk has been completed. These videos will serve as reference and training tools in future ^{249}Bk production operations. All videos will be completed before the end of this fiscal year.

An analysis of the fission products in the Mk18A targets that are presently stored at the Savannah River Site was conducted to help identify potential isotopes of interest.

Sponsor: SC-NP Isotope Program Division/Program/Group: NSITD/NMP
PI Name(s): Susan Hogle, Clarice Phelps

Title of Project: **Se-75 Program**

Category: Project Highlights

Highlight: A total of seven capsules have been transferred to the High Flux Isotope Reactor (HFIR) for irradiation during cycle 466.

Nuclear Science and Engineering Directorate level procedures (ORNL-SIC-PRO-01, ORNL-SIC-PRO-02) for standardization of the design and fabrication of irradiation capsules are under review. These procedures will help to standardize the acceptance criteria for irradiation capsule (rabbit) testing.

No shipments were made during June due to the long reactor maintenance outage.

Sponsor: SC-NP Isotope Program Division/Group: NSITD/NMP RNSD/RHIE
PI Name(s): Clarice Phelps, Jay Kehn, Susan Hogle, Richard Howard

Title of Project: **C-14 Production Research**

Category: Project Highlights

Highlight: Cold testing and set-up of the equipment for the processing an irradiated Aluminum Nitride (AlN) pellet is nearing completion (Fig 3). This work will inform the feasibility and business case for the production of C-14. The furnace has been programmed and tuned and the gas lines and cylinder have been configured. Two test runs of the complete heating sequence have been accomplished using unirradiated AlN material. The unirradiated AlN was heated in a quartz tube and began to roast and char in places after heating at 1100°C, and shown in Fig. 4.



Fig. 3 System set-up for AlN pellet



Fig. 4 Crushed AlN in quartz tube after heating.

An unirradiated pellet was received from the manufacturer for crush testing (Fig. 5). It was determined that the best crushing result came from using tubing, a punch, and hammer (Fig.6). Also, crushing could be enhanced by soaking the pellet in liquid nitrogen (LN₂).



Fig. 5 AlN test pellet.



Fig. 6 AlN pellet crushing test.

An investigation of an alternate wet processing method was conducted to determine opportunities for improvement of the dissolution process. In addition, a wet method may provide a better means to quantify yields.

Sponsor: SC-NP Isotope Program Division/Program/Group: NSITD/NMP
PI Name(s): Susan Hogle, Riley Hunley

Title of Project: **Ni-63 Program**

Category: Project Highlights

Highlight: The two Ni-63 production rabbits that are currently being irradiated in HFIR will remain in the flux trap for an additional two reactor cycles; for a total of 14 cycles versus the originally planned 12 cycles. The additional irradiation cycles will ensure that the required specific activity will be achieved.

The H8-2 material from the last full-size Ni-62 production target has been completely processed and the activity independently verified by staff in buildings 4501 and 7920. The specific activity is 14 Ci/g, and a total of 157 Ci of Ni-63 in 165 ml of 0.1 M HCl has been purified. Two requests for 25 Ci of Ni-63 as a dried chloride salt and an additional request for 10 Ci as a chloride solution were received. The expected shipping date for these orders is June 27, 2016. The H8-1 target segment and pellets are presently waiting processing in the 4501 hot cells.

Sponsor: SC-NP Isotope Program Division/Program/Group: NSITD/NMP/ID
PI Name(s): Julie Ezold, Clarice Phelps, Roy Copping

Title of Project: **REDC Tungsten Shield**

Category: Project Highlights

Highlight: Validation and review of the operating procedure for the new REDC Tungsten Shield for the on-site transport of irradiated materials is underway. During the first walk-through of the procedure, an issue with the bottom sliding drawer was discovered. The drawer operated smoothly but did not reach the fully open position due to an issue with the actuator bolt. A replacement bolt is currently being fabricated and validation of the procedure will continue after repairs are completed.

Sponsor: SC-NP Isotope Program Division/Program/Group: NSITD/NMP
PI Name(s): R. S. Owens

Title of Project: **REDC Building 7930 Inventory Database**

Category: Project Highlights

Highlight: An effort is underway to update the nuclear material inventory tracking system for the Cf inventory processed and stored in REDC building 7930. The current inventory tracking system is based on obsolete software that can no longer be maintained. Four database modules used to determine the masses of Cf-252 in categories of liquid, wire, standards, and sources have been completed. These have been informally tested to assure their functionality, but not yet to the level of satisfying software quality assurance requirements. The Cf-252 inventory for building 7930 will be developed next, although much of this work is already included in the current REDC Inventory database.

Sponsor: SC-NP Isotope Program **Division/Program/Group:** NSITD/NMP
PI Name(s): Gary West

Title of Project: **Ac-225 Production**
Category: Project Highlights
Highlight: A total of 25.0 mCi Ac-225 was shipped in ten shipments to one internal and six external customers in June (Table 2). The total activity of Ac-225 shipped for Calendar Year (CY) 2016 is 222 mCi in 57 shipments.

The “ABD” cows were processed on June 20, at REDC in Cave A as part of Campaign 126.

Table 2. Ac-255 Production

Month: June		2016	
No.	Shipment	Ac-225 (mCi)	Shipping Date
1	160509-D1	5.4	6/6/2016
2	160509-D2	2.1	6/6/2016
3	160509-D3	1.1	6/6/2016
4	160509-E1	1.1	6/13/2016
5	160509-E2	2.1	6/13/2016
6	160509-F1	5.4	6/20/2016
7	160509-F2	3.8	6/20/2016
8	160509-F3	0.5	6/20/2016
9	160620-A1	2.4	6/27/2016
10	160620-A2	1.1	6/27/2016
total		25.0	

Sponsor: SC-NP Isotope Program **Division/Program/Group:** NSITD/NMP/IDG
PI Name(s): Saed Mirzadeh, Rose Boll

Title of Project:

Radioisotope Quotes and Dispensing

Category:

Project Highlight

Highlight:

Five quotes for dispensing of radioisotopes were prepared in June (Table 3), bringing the total number of quotes for CY 2016 to 18 (Table 4). A total of nine radioisotope dispensings have been prepared and/or shipped this CY (Table 5).

Table 3. Quotes and Radioisotope Dispensings for June 2016

Quote No.	Isotope Requested	Amount	Chemical Form
1	Cf-252	2.5 µg	Electroplated
2	U-234	10 mg	Oxide
3	Cm-248	9 mg	Nitrate
4	Cm-248	500 µg	Nitrate
	Pu-239	100 mg	Oxide
	Bk-249	100 µg	Nitrate
5	Cf-252	1 Ci	Electrodeposited

Table 4. Radioisotope Quotes for CY 2016 through June

Month	Number of quotes	Isotopes
January	4	Am-243, U-234, U-235
February	2	Pu-239, Po-209
March	4	Cm-244, Pu-242, Pa-231, Pu-240
April	2	Pu-239, Pu-242, Cm-248
May	1	Cf-249
June	4	Cf-252, U-234, Cm-248, Pu-239, Bk-249
June	1	CARIBU 1 Ci Cf-252
TOTAL	18	

Table 5. Radioisotope Dispensings for CY 2016 through June

Isotope	Amount	Form	Date shipped	REDC No.
Cm-248	100 µg	dried	January 2016	2469
Ac-227	2 µg	dried	2/24/16	2472
Th-227	2.1 mCi	dried	2/25/16	2473
Pu-242	1000 mg	oxide	Pending shipment June 2016	2475
Cm-244	39 µg	Nitrate solid	Pending shipment June 2016	2476
Cf-252	1 µCi	solid	5/19/16	n/a
Am-243	20 mg	Nitrate solid	Pending shipment	
Am-243	50 mg	Oxide solid	Pending shipment	
Np-237	40 mg	Oxide solid	June	

The 20 mg Am-243 sample listed in Table 5 was converted from oxide to nitrate prior to packaging (Figs. 7 and 8). Both the 20 and 50 mg Am-243 dispensings have been packaged and the shipping documentation completed.



Fig. 7. Americium (IV) oxide (black) being dissolved in nitric acid solution.



Fig. 8. Americium (III) nitrate evaporated and packaged for shipment.

Sponsor: SC-NP Isotope Program Division/Program/Group: NSITD/NMP
 PI Name(s): Rose Boll, Shelley Van Cleve, Nate Sims

Title of Project: **Source Characterization Measurement Project**
 Category: Project Highlights
 Highlight: The Source Characterization Measurement Project represents a potential new approach for nondestructive measurement of the amount of Cf-252 deposited

on a surface. The method measures the intensity of light emissions from fluorescent discharges. A proof of concept experiment is underway using small amounts of Cf-252.

During June, the vacuum system was modified to enable the reduction of the pressure in the small chamber to 30 mTorr. The modifications included adding a metal O ring with metal fittings to the small vacuum chamber attached to the vacuum pump and argon gas supply. As an improvement, a filter was added between the chamber and the vacuum pump. Leak testing of the chamber is in progress (Figs. 9 and 10).



Fig. 9. Small vacuum chamber for sample location.



Fig. 10. Vacuum apparatus showing piping, valves, small vacuum sample chamber (middle bottom), and the mTorr gauge (left bottom).

Sponsor: SC-NP Isotope Program Division/Program/Group: NSITD/NMP
PI Name(s): Shelley Van Cleve and Rose Boll

Title of Project: **Purification of Uranium-234**

Category: Project Highlights

Highlight: Efforts to recover and purify uranium-234 obtained from old PuBe sources were continued. A test was performed with DGA resin for removing trace amounts of Pu from the solution. The analytical results showed that the DGA resin did not perform well, presumably because of the difficulty keeping the plutonium in a +4 valence in low acid concentration, which is necessary for DGA resin to not extract uranium. The four batches were reprocessed with MP-1M anion exchange resin (Fig. 11). The analytical results received on three of the four batches indicate progress in separating the Pu from the uranium.



Fig. 11. Batches of U-234 solution following additional separation of Pu.

Sponsor: SC-NP Isotope Program Division/Program/Group: NSITD/NMP
PI Name(s): Tom Hylton, Miting Du