NATIONAL ISOTOPE DEVELOPMENT CENTER

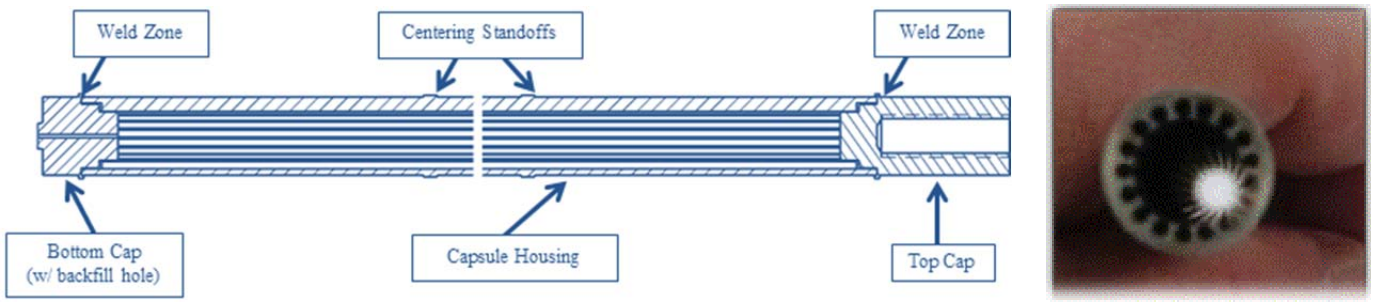
Managed by the US Department of Energy's Office of Nuclear Physics

Irradiation Target Redesign to Support DOE Resumption of United States High Specific Activity Cobalt-60 Production

The DOE Isotope Program (DOE IP) supported a team of engineers from Idaho National Laboratory (INL) and Oak Ridge National Laboratory (ORNL) in redesigning the high-specific-activity cobalt-60 (Co-60) production target. The production target is the capsule used to contain material during reactor irradiation. A 2012 failure of a production target at INL's Advanced Test Reactor (ATR) prompted DOE IP to pursue a more robust target design. The team consulted with representatives from the commercial sector, International Isotopes Idaho, Inc. (INIS) and GE Power and Water (GE) to optimize the design. INIS and GE provided valuable feedback on prototype targets and their recommendations were applied in the final design.

The new target design is assembled and back-filled with helium gas, which facilitates a more accurate helium leak check after welding. In addition, identification marking is now performed on the solid end cap and not the target body. This will prevent potential thinning of the target wall.

The first set of these new targets began irradiation in ATR in February, a significant milestone in reestablishing domestic production of high-specific-activity Co-60. This achievement was the result of a high level of effort and teamwork on the part of INL, ORNL, INIS, and GE.

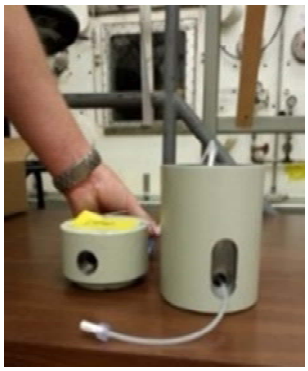


New high-specific activity Co-60 target axial cross-section (left)); top view (right) showing multi-channel loading feature that enables increased production.

Radium-224/Lead-212 Generators Now Available

Radium-224/lead-212 generators are now available from DOE Isotope Program (DOE IP). Lead-212 (10.6 hour half-life) and its daughter bismuth-212 (60.6 minute half-life) are of interest in targeted alpha-particle therapies for several types of cancer, including breast and ovarian cancers and melanoma. Research in progress is demonstrating the effectiveness of these isotopes in destroying cancer cells while limiting damage to healthy cells as a result of specific biological targeting of the isotopes to cancer cells and the short range of alpha particles in tissue.

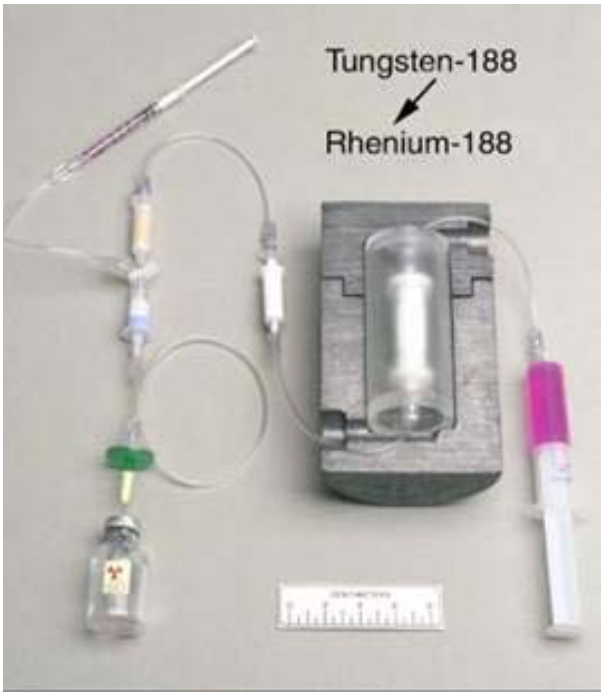
These generators were formerly produced by a private initiative attempting to commercialize generator production. When they became unavailable from the private vendor, DOE IP moved to establish a production capability at Oak Ridge National Laboratory (ORNL) through the recovery of thorium-228 from uranium-232. Thorium-228 (1.9 year half-life) serves as a cow for the provision of its decay product radium-224 (3.7 day half-life). Radium-224 is loaded onto a generator from which either lead-212 or bismuth-212 can be eluted. The radium-224 generator, which uses the same design as the ORNL actinium-225/bismuth-213 generator, has been tested by two researchers with extensive experience in lead-212/bismuth-212 targeted therapy. It was found to perform exceptionally well. The generator (see the photos) is now routinely available for ordering through the National Isotope Development Center catalog at www.isotopes.gov. Generators are shipped with instructions for eluting lead-212 and bismuth-212.



Radium-224/lead-212 generator as shipped in lead shield (left) and with the shield cap removed to show the tubing connections to the column (right).

DOE Isotope Program Announces Tungsten-188 (W-188) is Now Available!

The DOE Isotope Program once again has tungsten-188 in solution and as a generator readily available. The generator is an alumina-based adsorbent-type tungsten-188/rhenium-188 system. Oak Ridge National Laboratory developed and patented improved methods for concentrating rhenium-188 bolus solutions to very high specific volumes. Because of the long physical half-life of the tungsten-188 parent (69 days) and the long useful generator shelf-life of several months with consistently high rhenium-188 yields, this generator system holds great promise in providing the cost-effective rhenium-188 radioisotope for routine use for a variety of therapeutic applications. An important aspect of rhenium-188 for many applications, in contrast to other therapeutic radioisotopes, is the anticipated very low costs per unit-dose. The low cost will contribute to reducing health care costs. The tungsten-188/rhenium-188 generator is a major medical radioisotope distributed for routine sale through the National Isotope Development Center at www.isotopes.gov.



The W-188/Re-188 generator system

The NIDC Says Goodbye to Jeff Shelton and Hello to Kevin Felker

Jeff Shelton, former National Isotope Development Center Technical and Transportation Manager, has taken another position at Oak Ridge National Laboratory. He has been named the new Director of the Transportation and Waste Management Division at the Laboratory.

Jeff's transition into his new role became effective on December 1, 2014.

Note from Jeff: "I have truly enjoyed working with each of you and wish you the very best in the future."

Kevin Felker has joined the Isotope Business Office as the new Technical Manager and will assume the role of Transportation Manager for the National Isotope Development Center. Kevin's experience and understanding in the areas of isotope production and processing, hazardous material packaging and transportation, and nuclear material accountability, will be a valuable asset to the Isotope Business Office and the National Isotope Development Center.