



Research Reactor Center
University of Missouri-Columbia

1513 Research Park Drive
Columbia, MO 65211

PHONE (573) 882-4211

FAX (573) 882-6360

WEBSITE <http://web.missouri.edu/~murrwww>

May 31, 2012

Ms. Colleen Casey
Materials Licensing Branch
US Nuclear Regulatory Commission, Region III
2443 Warrensville Rd., Suite 210
Lisle, IL 60532-4352

Reference: License Number 24-00513-39
Docket Number 030-32695
Control Number 575633

Dear Ms Casey,

The following additional information is being provided at your request for our license amendment request dated February 20, 2012 and subsequent follow-up information dated April 27, 2012 to better answer the questions that have arisen during our request to add 0.5 g U-235 (1.07 μ Ci; Uranium enriched to < 20% U-235) for research and development purposes at the University of Missouri, Research Reactor. Please note that we are changing our original request to 0.5 grams of U-235 (Uranium enriched to <20% U-235) to allow Region III to handle this request in house.

Should you have any additional questions regarding this submittal, please do not hesitate to contact me.

Sincerely,

Ronald J. Dobey, Jr., CHP
Health Physics Manager/RSO
dobeyr@missouri.edu

Attachments

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Application for Amendment to Materials License
Amended Request 5/31/2012
License #24-00513-39
Docket No. 030-32695
Control No. 575633
University of Missouri
Research Reactor
(MURR)

Item 5: Radioactive Material

Request to add the following isotopes:

<u>Byproduct Material</u>	<u>Chemical/ Physical Form</u>	<u>Maximum Possession</u>
U-235 (1.07 μ Ci)	Any	0.5 grams

Uranium enriched to
< 20% U-235

Note: The radioactive material requested above does not exceed the quantities for emergency planning as listed in 10 CFR 30.72.

Additionally, we would like to ~~delete~~ line items **U & V** for Americium 241 as denoted on current Amendment 11. These items were added on 09-14-2006, Amendment No. 08 in anticipation of a transfer of sources from another licensee, a transfer that never materialized, thus we request the removal of these items. The University was never in possession of nor intends to be in the possession of these particular sources.

The information requested on financial security is not significantly different than provided in license renewal application dated June 30, 2003 or subsequent cost adjustments. The addition of the requested additional isotope will have an insignificant impact on the total cost estimate for the University of Missouri's decommissioning funding plan using the guidance available in NUREG Publication 1757, "Consolidated NMSS Decommissioning Guidance". In the 2009 amendment to our estimated decommissioning costs for the University of Missouri Research Reactor Facility, the total decommissioning cost estimate was approximately \$47.3 Million of which approximately \$2.4 Million was specifically allocated towards waste disposal. The disposal of 0.5 gram of U-235 would cost less than \$1000.

A requirement to provide assurance of funds for decommissioning was established for reactor licenses in 10 CFR 50.33 (k)(2). The University of Missouri submitted to the NRC a statement of intent that the University would request appropriation of funds for decommissioning of the

University of Missouri-Columbia Research Reactor (MURR) sufficiently in advance of decommissioning to prevent delay of required activities (letter dated June 29, 1990). As required by 10 CFR 50.75 (e)(2)(iv), a detailed cost estimate for decommissioning MURR was included with this statement of intent. In accordance with 10 CFR 50.33 (d), the letter also describes the means of adjusting the cost estimate and associated funding level periodically over the life of the facility. Since reactor licensed radioactive materials and materials licensed radioactive materials are accounted for separately but used in the same laboratory facilities, the detailed cost estimate for the MURR encompasses decommissioning of the entire facility irrespective of which license or registration authorizes the use of radioactive material. The most recent estimate for the cost of decommissioning of MURR was made in September 2009.

Item 6: Purpose for Which Licensed Material Will Be Used

Material requested will be used for research and development as defined in 10 CFR 30.4 and 70.4. This particular use of material will be used in a project for a nuclear forensics research effort recently funded by the Defense Threat Reduction Agency and it is needed for demonstration experiments for the National Nuclear Forensics Summer School that will be held at MURR beginning June 11. This Summer School offers a unique learning experience for young radio-chemists, as the University of Missouri is one of the few places in the world that trains this type of student in radiochemistry. We do however wish to be allowed to use this requested material in such a manner that that allows for future research and development and that falls under the auspices of our broad scope license under the supervision and approval of the Radiation Safety Officer and Radiation Safety Committee of the University of Missouri Research Reactor. For the purposed of this particular experiment, the attached sheet (Attachment 1) shows the chemical procedure used to prepare this material for analysis in the Mass Spectrometer used to support the above noted Summer School in Nuclear Forensics.

Item 7: Individuals Responsible For Radiation Safety

There have been no significant changes in the RSO, management structure, reporting paths or flow of authority between executive management, the Radiation Safety Committee and the RSO since the last amendment; No. 11 dated July 6, 2011. The current RSO is Ronald J. Dobey, Jr., CHP.

Item 8: Training for Individuals Working in or Frequenting Restricted Areas

The information requested is not significantly different than provided in the license renewal application submitted June 30, 2003. All individuals working with radioactive material have been reviewed and approved by the Radiation Safety Officer and the Radiation Safety Committee.

Item 9: Facilities and Equipment

The radioactive material requested will be utilized in laboratory, hot cell and glove box facilities described in the license renewal application submitted June 30, 2003. The Radiation Safety Committee will review and approve any projects, facilities and equipment used with this material.

Item 10: Radiation Safety Program

The information requested and the use of radioactive materials is not significantly different than provided in the license renewal application submitted June 30, 2003. All use of radioactive material is performed under the guidance of the Radiation Safety Officer and as approved by the Radiation Safety Committee under the provisions of US NRC Materials License 24-00513-39 as authorized under 10 CFR 33.13 "Requirements for the issuance of a Type A specific license of broad scope."

Item 11: Waste Management

The information requested is not significantly different than provided in the license renewal application submitted June 30, 2003. Radioactive waste will be handled in accordance with procedures developed for waste processing and shipment to a licensed disposal site similar to other waste streams routinely processed and shipped from the University of Missouri Research Reactor.

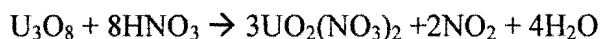
Attachment 1
NRC License 24-00513-39
Docket No. 030-32695
Control No. 575633

Procedure for the preparation of U-235 (<20% U-235 enriched) solution for use in Mass Spectrometer in support of Nuclear Forensics Summer School.

- **Dissolution of U₃O₈ in concentrated nitric acid**

Preparation of a 1000 µg/g stock solution of Uranium from U₃O₈

1. Weigh 0.118 g of U₃O₈ powder into a clean 100 mL polypropylene bottle.
2. Add 10 mL of concentrated nitric acid slowly. Place lid on bottle but do not tighten. Wait overnight for dissolution of U₃O₈ by the following reaction.



3. Dilute to a total of 100 mL with distilled, deionized water and record mass of solution. Label bottle 1000 µg/g U in 10% nitric acid

- **Preparation of a 10.00 ng/g solution of Uranium from a 1000 µg/g stock solution**

1. Weigh 0.100 g of U stock solution into a clean 100 mL polypropylene bottle
2. Dilute to 100 mL with 4% nitric acid and record mass of solution. Label bottle 1 µg/g U in 4% nitric acid
3. Weigh 0.1g of U stock solution into clean 10 mL polypropylene test tube.
4. Dilute to 10 mL with 4% nitric acid and record mass of solution. Label test tube, 10.00 ng/g U stock solution in 4% nitric acid. This test tube contains 100 ng or 1×10^{-7} g of uranium. This solution is ready to use for mass spectrometry experiments.

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COLLEEN CASEY
US NRC, REGION III
2443 WARRENVILLE RD STE 210
LISLE IL 60532
(630) 829-9841

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