**TITLE: Characterization of Radionuclides in Analytical Equipment**

# POLICY

Radioactive materials may be characterized in non-radioactive facilities and in non-radioactive labeled equipment when they meet the guidelines set forth in this procedure. Characterization of radioactive material outside the guidelines in this procedure may still be analyzed by the analytical equipment, but will require additional permission from the Radiation Safety Office (RSO).

# PURPOSE

This procedure provides criteria and specific instructions for the characterization of radionuclides in analytical equipment including electron microscopes; Brunauer–Emmett–Teller particle analyzers, optical, UV-VIS, and IR spectrophotometers; particle and single crystal X-ray diffractometers; X-ray photoelectron spectrometers; nuclear magnetic resonance spectrometers; and mass spectrometers.

# DEFINITIONS

1. Conveyance: Moving or relocating material from one location to another by physically carrying or using a cart or other non-motorized means.
2. Transportation: Moving or relocating material from one location to another through motorized means.

# RESPONSIBILITIES

## Responsible User:

## The Responsible User must ensure that:

### All procedures outlined in RPR 11: Radioisotope Laboratory Safety Procedures are followed by all personnel handling the radionuclides.

### Only radioactive materials that are below the quantity of licensed material requiring labeling (as outlined in NRC Regulations 10 CFR Part 20 – Appendix C) are characterized on the analytical equipment. [Table 1](#Table1) of this document includes the limits of common research radionuclides that can be characterized in non-radiological laboratories on analytical equipment.

### The integrity of sealed sources shall not be compromised.

### The analytical equipment owner understands and agrees to the risks and conditions of allowing radionuclides to be characterized on the equipment.

* 1. Analytical Equipment Owner:

## The Analytical Equipment Owner must ensure that:

### No personnel (staff, technicians, etc.) are allowed to handle the radioactive materials unless they are fully authorized by the Radiation Safety Office.

### If a spill or contamination of the equipment were to occur in which reasonable decontamination efforts are not successful, then the analytical equipment would be labeled as radioactive when the radioactivity exceeded the levels set forth in RPR 10: Radionuclide Data – Table 11.

### If the equipment operates under vacuum, then periodic maintenance consisting of replacing the tip seals associated with the scroll type pumps, and replacing the oil in the rotary vane pumps must be completed by a trained radioactive materials user. Both disposal items (tip seal or waste oil) must be checked for radiation levels. If measured levels are not higher than the background levels of the meter, then they may be disposed of normally. If measured levels of the waste material are above normal background levels, the Radiation Safety Office must be contacted for proper disposal.

* 1. Researcher:

## The Researcher characterizing the radioactive materials on the analytical equipment must ensure that:

### They have acquired and will maintain full authorization to perform work related to radioactive materials from the Radiation Safety Office.

### Conveyance of the radioactive material from the radiation laboratory to the analytical equipment then back to the radiological laboratory immediately following completion of analysis shall be done in accordance with the Work Instructions detailed in this document.

### The amount of radiation analyzed is lower than the quantity of licensed material requiring labeling (NRC Regulations [10 CFR Part 20 – Appendix C](https://www.nrc.gov/reading-rm/doc-collections/cfr/part020/part020-appc.html)).

### Appropriate contamination surveys of equipment will be performed before and after sample characterization to ensure that no contamination remains.

### Decontamination of equipment will be performed if surveys indicate radioactive contamination exists.

### The results of all radiation surveys shall be promptly, completely, and accurately documented.

### Radioactive samples in the radiological laboratory shall be disposed as directed by RPR 13: Radioactive Isotope Acquisition and Disposition.

### Notifying the Radiation Safety Office and other necessary persons/entities if conditions exist that warrant notification.

# WORK INSTRUCTIONS

1. Conveyance of Samples for Analysis on Analytical Equipment

## Samples must be carried by the researcher who will be characterizing the materials on the analytical equipment. Samples must be contained in sealed glass or plastic vials and packed within small reusable containers filled with shock absorbing bubble wrap. If the distance between the radiological laboratory and the analytical equipment is too great to walk, then the researcher must consult with the Radiation Safety Office regarding transportation of the radiological materials.

1. Allowable Quantities in Non-Radiological Laboratories

Only quantities of material that are less than the quantities requiring labeling by the NRC: 10 CFR Part 20 may be characterized on the analytical equipment. Larger quantities may also be characterized on the analytical equipment if the material is characterized in an inert sample holder or non-dispersible form (i.e. epoxy mount) and with permission from the Radiation Safety Office. Common materials analyzed on analytical equipment at the University of Utah are listed in [Table 1](#Table1).

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| --- | --- |
| **Table 1:** Maximum limit of common research radionuclides that can be characterized in non-radiological laboratories on analytical equipment. These values are from NRC: 10 CFR Part 20. For quantities of radionuclides not on the list, please contact the Radiation Safety Office. | |
| **Radionuclides** | **Maximum Quantity (μCi)** |
| 232Th | 100 |
| 233U | 0.001 |
| 235U | 0.001 |
| 238U | 100 |
| Natural Uranium | 100 |
| 238Pu | 0.001 |
| 239Pu | 0.001 |
| 240Pu | 0.001 |

# SUPPORT DOCUMENTS

|  |  |
| --- | --- |
| **Job Aids** | |
| **Job Aid Number** | **Job Aid Title** |
| N/A | N/A |
| **Forms** | |
| **Form Number** | **Form Title** |
| N/A | N/A |

# REFERENCES

1. NRC Regulations [10 CFR Part 20 – Appendix C](https://www.nrc.gov/reading-rm/doc-collections/cfr/part020/part020-appc.html) – Quantities of Licensed Material Requiring Labeling
2. RPR 10: Radionuclide Data – Table 11
3. RPR 13: Radioactive Isotope Acquisition and Disposition

# REVISION HISTORY

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| --- | --- | --- |
| **Rev. #** | **Revision Date** | **Changes from previous revision**  ***(Description/explanation required, even if no revision made)*** |
| 0 | 9/13/2018 | Original procedure. |

# APPROVAL

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