

Essential Information on Uranyl Acetate

Summary:

- The use of uranium (U) and thorium (Th) compounds does not require the same level of control required for most radioisotopes, but there are strict limits on quantities which can be owned institutionally.
- U and Th waste, including empty manufacturer's containers, must be disposed of as radioactive waste.
- Use standard precautions to limit exposure to both chemical and radiological hazards.
- Manufacturer's containers must have a "caution radioactive material" sticker and be stored in secondary containment. Shielding is recommended.

Hazard Overview:

Naturally occurring radioisotopes such as uranium and thorium are not only radioactive but toxic by inhalation, ingestion and absorption as well. Uranium salts are corrosive and irritating to skin, eyes and mucous membranes. Uranyl nitrate and thorium nitrate are powerful oxidizers. Uranium compounds are used in staining techniques for electron microscopy; they provide the contrast needed to differentiate the cellular features in the biological samples. Uranyl acetate is the most commonly used compound.

Regulation:

The use of uranium (U) and thorium (Th) compounds does not require the same level of control required for most radioisotopes.

Under Nuclear Regulatory Commission (NRC) and MA regulations, uranium and thorium are defined to be "Source Material." Typically an institution must have a source material license to possess these compounds. UMass Amherst does have a source material license.

However, the University's use of uranium is permitted under federal regulations, which establish a general license for educational institutions to possess and use source material provided that the institution possesses the material below the threshold of no more than 3.3 pounds. As such, it is especially important for the University to inventory and track the amount of U and Th on campus.

The NRC has determined that the hazard associated with the use of these U and Th compounds is small enough that the material can be sold without special controls on who may buy these compounds and without special requirements and precautions for using these materials.

But there are some limited hazards associated with using these materials, and you should be aware of these hazards.

It is very important to keep in mind that even though you can easily buy and use these U and Th compounds, the wastes **must** be disposed of as radioactive waste.

Purchase and Controlling Uranium and Thorium

Vendors are not permitted to sell most radioisotopes directly to researchers; the vendor must receive a copy of the University's radioactive materials license before selling the material.

But vendors can sell certain U and Th- containing compounds such as uranyl acetate, uranyl nitrate, etc. to you directly.

Use

If you only work with dilute solutions of U and Th compounds or small gram quantities, there is no reason to be concerned about limiting your radiation exposure.

The only concern is limiting exposure from the main stock of uranium or thorium in the bottles supplied by the vendor. Although the dose rates from these bottles are not directly hazardous, it is health physics practice to minimize radiation exposure whenever practicable.

You should use standard precautions when working with these compounds. The normal precautions taken to prevent uptake of chemicals is sufficient to address both the chemical and radiological hazards:

- Exercise good contamination control
- If you are working with dry/powder form, take care to prevent inhalation. Perform work in a chemical fume hood.
- Prevent ingestion by practicing good hygiene.
- Wear disposable gloves, a lab coat and safety glasses.

External Radiation Hazard

The doses you will experience during routine use of U and Th compounds will be very low, especially since most of your work will involve dilute solutions of uranium and thorium, and it is not necessary to regularly or extensively handle vendor bottles of U or Th.

It should also be noted that the external radiation is not sufficiently penetrating to present a hazard for pregnant women.

Storage

A “caution radioactive material” sticker must be affixed to the container. The manufacture should have these labels on the bottle.

All containers must be stored in secondary containment such as a tray, plastic bag or other container to prevent the spread of contamination.

It may be useful to store the bottles in a closed metal cabinet since metal will provide some shielding.

Waste Disposal

Vendor bottles of uranium and thorium compounds must be disposed of as radioactive waste. When offering for waste disposal make sure you indicate it on the hazardous waste label and CEMS waste pick up request form.

The nitrate forms of uranium and thorium present special disposal problems because they are strong oxidizers. You are strongly encouraged not to use uranyl or thorium nitrate. If you plan to use them, please notify EH&S.

If you have any questions please don't hesitate to contact Environmental Health and Safety, Radiation Safety Services at askehs@umass.edu.