



Natural and Depleted Uranium and Natural Thorium Compounds

Overview

Chemical compounds containing natural or depleted uranium and natural thorium compounds (e.g. uranyl acetate, uranyl nitrate, thorium acetate, thorium nitrate) are often unregulated and able to be purchased by researchers without licensing considerations. These water-soluble chemicals, while unregulated, must be used with respect to the unique hazards they bring to the laboratory.

Notice: Review of this guidance document is not a replacement of or substitution for the use of the safety data sheet which accompanies the specific chemical.

Guidelines

Hazard Identification

These chemical compounds containing natural or depleted uranium and natural thorium compounds are considered naturally occurring radiological material (NORM) and are generally not subject to the same regulations as other radioactive material used in a campus research lab. However, aside from being radiological, these chemicals are also classified as acute toxics, health hazards, and environmental hazards. They require handling, use, and disposal consistent with their possessed hazards.

Skin Contact Hazard

Chemical contact with the skin should be avoided due to the likelihood of irritation and the resulting increased risk of subsequent internal contamination through absorption, ingestion, and inhalation.

External Radiation Hazard

The external hazard due to penetrating radiation from the decay chain of the uranium and thorium presents a minimal hazard. The alpha and beta decays emit particles which weakly penetrate the human body. The amount of gamma radiation, while penetrating, is minimal.

Internal Radiation Hazard

The internal radiation hazard from these compounds represents the greatest risk when working with them. The decay chains include many energetic alpha and beta decays which, while nearly harmless when external to the body due to the protection afforded by the skin, can cause significant damage when internalized in close contact with bodily organs. The material can get inside the body through absorption, ingestion, inhalation, and injection. Therefore, it is critical to wear all required PPE when working with chemicals and radioactive material (gloves, lab coat, long pants, close toed shoes, and respirators if necessary).

Exposure Risk and Controls

As noted above the highest risk due to these chemicals is when they become internalized to the body. The following are procedural and administrative controls to reduce the chance of that from occurring.

- No food or drink should be stored or consumed within a laboratory.
- Respiratory protection should be considered when working with increased quantities of material on an open bench (greater than 10 grams). Information on Respiratory Protection found here: <https://www.uhs.wisc.edu/eoh/respirators/>
- PPE should be used at all times (gloves, lab coat, long pants, and close toed shoes).
- Spill liners, bench paper, and secondary containment should be considered to minimize spread of any spills.
- Cleanliness is the key to control and safety.
- A Geiger Müller probed detector is effective at detecting uranium and thorium compounds. A meter can be made available to users after taking training.

Storage

- Stock material should be labeled with a Caution Radioactive Material label (see ORS)
- Secondary containment should be used for liquid storage. This is especially important when storing on a porous or permeable surface like a wood shelf or the floor.
- As the external radiation hazard is minimal, lead shielding is not required.
- Secondary containment for stock containers of powdered chemical should also be used.
- The decay chain of uranium and thorium can result in the production of radioactive gases. Opening any containers which are extremely old and not frequently open should be done in a fume hood.

Disposal

- Chemical compounds containing uranium and thorium must be disposed of as radioactive waste.
- **Drain disposal is prohibited.**
- Wastes can be segregated by stock, liquids, and solids (including dry waste like pipettes, gloves, bench liners, containers, etc)
- Any stock containers of dry powders must be within secondary resealable plastic bag or similar.
- Label all containers with known chemical constituents.
- Requests for disposal can be submitted to RadiationSafety@wisc.edu.

Further Information

For further information on the radiological hazards of chemical compounds containing NORM please contact the Office of Radiation Safety (ORS) at RadiationSafety@wisc.edu.

Users are welcome to take the Radiation Safety 101: Radiation Safety for Radiation Workers if they would like further information and training on radioactive material even if this is the extent of the material used.

Please see the ORS website for more information.

<https://ehs.wisc.edu/labs-research/radiation-safety/>

For specific concerns about the chemical toxicology or chemical hazards please contact the Office of Chemical Safety at chemsafety@fpm.wisc.edu.