Uranyl Acetate and Uranyl Nitrate Safety

Overview

Uranyl Acetate and Uranyl Nitrate are water-soluble Uranium compounds used for staining slides in electron microscopy. Laboratories can purchase Uranium and other staining compounds for the preparation of samples under a Nuclear Regulatory Commission (NRC) general license.

Although purchasing Uranium compounds is not regulated, **there are no exemptions regarding hazard labeling and waste disposal for Uranium compounds.** Investigators should be advised in advance that the cost to dispose of these materials can be very expensive and are advised whenever possible to consider alternatives such as Uranyless, which are Uranium-free products and can be collected and disposed of as non-hazardous waste.

Applicability

This applies to all research and clinical laboratories at WCM.

Responsibilities

- **Environmental Health and Safety (EHS)** provides technical assistance and guidance on the use of hazardous chemicals and radioactivity and inspects areas of use, storage, and disposal.
- **Principal Investigators** ensure that guidelines for Uranium compounds are followed in all research protocols.
- **WCMC Researchers and Students** follow the guidelines listed in this document when using Uranium compounds.

Guidelines and Procedures

HAZARD IDENTIFICATION

Uranyl Acetate and Uranyl Nitrate are naturally occurring radiological materials (NORM) that are water-soluble and generally used as stains in electron microscopy. NORM products are generally licensed, meaning there are no purchasing restrictions, but as radiological and toxicological substances they require safe handling, labeling, and regulated disposal.

EXTERNAL RADIATION HAZARD

Licensed Uranium compounds are not generally considered a significant external radiation hazard. They consist mostly of Uranium-238 (U^{238}) in powder form with a low specific activity (10,000 Bq per gram).

SKIN CONTACT HAZARD

Skin contact should be avoided due to the likelihood of dermal irritation, the increased risk of ingestion from contamination, and beta skin dose from Pa^{234} daughters.

INHALATION AND INGESTION HAZARD

Inhalation and ingestion are the primary radiological and chemical hazards. The inhalation of soluble U^{238} is a lung carcinogen and irritant from Alpha decay, as well as toxic to kidneys and blood as heavy metal.

EXPOSURE RISK AND CONTROLS

These compounds pose a high risk from internal radiochemical exposure due to ingestion and inhalation.

- **Nitrile gloves, a lab coat, and safety glasses should always be worn when handling or weighing product.**

Weill Cornell Medicine

Environmental Health and Safety
TEL 646-962-7233 WEB weill.cornell.edu/ehs EMAIL ehs@med.cornell.edu
Weill Cornell Medicine | 402 East 67th Street, Room LA-0020 | New York, NY 10065

Updated July 2022

T:\Documentation\EHS-Updates\UranylAcetate.docx

- Respiratory protection should be used when routinely handling more than 10 grams of powder.
- Use spill trays and bench liner for all bench work.
- **No food may be stored or consumed in the laboratory.**

LABORATORY STORAGE

- **All stock solutions and powers must be properly labeled with the radiation warning sign.**
- All chemical hazards must also be indicated.
- Secondary containment for liquids should be used for storage.
- Secondary containment for powders should be used for storage, such as a Ziploc bag.

DISPOSAL

Uranyl Acetate and Uranyl Nitrate waste disposal are regulated as radioactive waste. Refrain from mixing staining compounds or hazardous chemicals (oxidizers, corrosives, flammables, etc.) with Uranyl Acetate or Uranyl Nitrate whenever possible. The disposal of Uranyl compounds mixed with these other hazard classes ("mixed waste") is exceedingly expensive to dispose of. Disposal costs will be charged to the individual lab on a case-by-case basis. **In the past, these charges have exceeded $3000.00 for <500mL of mixed waste material**. If the production of mixed waste is unavoidable, segregate the mixed waste in separate containers, collect waste, write out the chemical constituents and place the radioactive sticker on the hazardous waste label. **Drain disposal is prohibited**.

In order to reduce disposal costs to the laboratory, the following points should be considered:

- **NEVER** combine radioactive wastes with waste materials from other protocols.
- **Uranyl Acetate and Uranyl Nitrate wastes should be collected separately. The use of Uranyl Nitrate is discouraged because disposal can cost $2450.00 per 100mL of waste. The disposal of Uranyl Acetate can cost $1,000.00 per 100mL.**
- Investigators should consider the use of Uranium-free products such as Uranyless in their procedures to mitigate removal costs.
- If possible, when using ethanol or methanol, consider using a <10% dilution.
- Dry solid waste such as paper towels, pipettes, gloves, bench liners, and plastic ware can be disposed of as ordinary waste unless it is heavily contaminated.
- Any product containers in powder form should be sealed in secondary containment, such as a Ziploc bag.

Disposal requests must be submitted via Salute as a chemical waste request.

References

- **USNRC §10 CFR Part 31** Types of General License Uses
- **NYDOH §175.03** Standards for Protection Against Radiation
- **Uranyless** https://uranyless.com/en/home-page-2/