

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 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 U^{238} in power 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 Uranium-238 is a lung carcinogen and irritant from Alpha decay, as well as toxic to kidneys and blood as a heavy metal.

EXPOSURE RISK AND CONTROLS

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

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



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- 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 should be stored or consumed in the laboratory.**

LABORATORY STORAGE

- **All stock solutions and powders 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. In order to reduce disposal costs to the laboratory, waste should be segregated:
- **Uranyl Acetate and Uranyl Nitrate wastes should be collected separately. The use of Uranyl Nitrate is discouraged because disposal costs \$2450.00 per 100mL of waste. The disposal of Uranyl Acetate costs \$1,000.00 per 100mL.**
- **The disposal of Uranyl compounds that are mixed with other hazardous materials such as solvents will be charged to the labs on a case-by-case basis.**
- **Investigators should consider the use of Uranium-free products such as [Uranyless](#) in their procedures to mitigate removal costs.**
- Refrain from mixing staining compounds, hazardous chemicals, or solvents with Uranyl Acetate or Uranyl Nitrate. Mixed liquid waste disposal is expensive, however if mixed liquid waste is necessary, segregate the mixed waste in separate containers, collect waste, write out chemical constituents on the hazardous waste label and place radioactive sticker on the hazardous waste label.
- **Disposal requests must be submitted via [Salute](#).**
- If using ethanol or methanol, the percentage must be <10% dilute. **Drain disposal is prohibited.**
- Dry solid waste such as paper towels, pipettes, gloves, bench liner and plastic ware can be disposed 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.

References

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