




LABORATORY SAFETY GUIDELINE

Uranium Staining

Using Uranyl Acetate (CAS #6159-44-0), Uranyl Formate (CAS #16984-59-1), or Uranyl Nitrate (CAS# 13520-83-7)

Uranyl acetate, uranyl formate, and uranyl nitrate are water-soluble uranium compounds used as high-contrast stains in electron microscopy. Though the external radiological and chemical hazards of these compounds are relatively low, they are typically ordered as powders and reconstituted in lab, which increases the potential for exposure due to inhalation or ingestion.

HAZARDS

	Acutely toxic if swallowed or inhaled.
	May cause damage to organs through prolonged or repeated exposure.
	Toxic to aquatic life with long lasting effects.

Depending on the compound, uranium stains may also be used in conjunction with corrosives such as sodium hydroxide.

PRECAUTIONS

Before starting work:

- Review manufacturer's [Safety Data Sheet](#) and additional chemical information.
- Ensure that a written experimental protocol including safety information is available.
- Be familiar with general University emergency procedures in the [EHS Lab Emergency Response Guide](#).
- Identify the location of the nearest eyewash and shower and verify that they are accessible.
- Have a calibrated Geiger counter available for contamination checks. If contamination is found, follow the spill response procedures below.

During work:

- AVOID CONTACT! Wear appropriate PPE including:
 - Lab coat, long pants, closed toed shoes, and nitrile gloves.
 - Safety glasses are recommended.
- AVOID INHALATION! Perform aqueous solution preparation, especially the weighing of powders, in a certified chemical fume hood or in an enclosed balance. Work areas and all equipment should be labeled as radioactive.
- Always use non-reactive containers for uranium stains such as glass (Pyrex), stainless steel, or PTFE (Teflon) materials.

After completing work:

- Perform a post-experiment survey of the work bench, hands, and body using the Geiger counter after conducting the procedure.
- Stock radioactive material should be returned to their storage location in a secured lockbox.
- All materials that may have been contaminated with solid or aqueous uranium stains must be disposed of as radioactive waste.
- Due to toxic hazards, uranium stain liquid waste may not be poured down a sink for disposal (including those designated for radioactive sink disposal).

- Solid waste:
 - All solid waste including gloves, wipes, parafilm, etc. in contact with uranium stains must be discarded in a radioactive solid waste container with clear lining. The container must be labeled as radioactive and have a closed lid when not in use.
 - Waste should never be overflowing. Contact Harvard Radiation Safety Services for waste pickup.
- Liquid waste:
 - Liquids should be poured into radioactive liquid waste containers with absorbent.
 - Contact Harvard Radiation Safety Services for waste pickup.

EMERGENCY PROCEDURES

First Aid

SKIN CONTACT

- Flush skin with tepid water and soap for 15 minutes using the closest available sink, portable drench hose or safety shower.
- Call 911 on a landline phone for medical assistance (or provide location if calling on a mobile phone).

EYE CONTACT

- Using eyewash, flush eyes while hold eyelid open and away from exposed eye for 15 minutes.
- Call 911 on land line phone for medical assistance (or provide location if calling on a mobile phone).
- Continue flushing with water until emergency medical personnel arrive.

INHALATION

- If dust or vapors are inhaled, immediately move to get fresh air. If possible, force coughing and blowing of the nose.
- If respiratory irritation occurs call 911 on land line phone for medical assistance (or provide location if calling on a mobile phone).

INGESTION

- Rinse mouth with water.
- Call 911 on land line phone for medical assistance (or provide location if calling on a mobile phone).

Spill Response

For major spills or personnel contamination:

- Alert others and evacuate to a safe distance and prevent entry.
- Contact the University Operations Center at (617) 495-5560 [HMS/HSDM (617) 432-1901]
- Remain in a safe location until EH&S or other response personnel arrive.

For incidental powder spills:

- Cover the area with a moist paper towel to prevent dispersal of the powder.
- Wearing the proper PPE, sweep up the powder using paper towels or wipes and dispose of in the radioactive solid waste container.
- Survey the area with a Geiger counter and notify Harvard Radiation Safety Services if the count rate is significantly higher than background (617-496-3797 during business hours, 617-495-5560 outside of business hours).

For incidental liquid spills:

- Wearing the proper PPE, absorb the spill into the benchtop liner or other absorbent material and dispose of in the radioactive solid waste container.
- Foaming soap cleaners may be used to clean liquids that have dried onto a benchtop.
- Survey the area with a Geiger counter and notify Harvard Radiation Safety Services if the count rate is significantly higher than background (617-496-3797 during business hours, 617-495-5560 outside of business hours).