

RADIONUCLIDE SAFETY DATA SHEET

NUCLIDE: U-NAT

FORMS: SOLUBLE

PHYSICAL CHARACTERISTICS:

HALF-LIFE: 4.5×10^9 y

TYPE DECAY: alpha, beta⁻
betas, principally from daughters Th-234 (0.191 MeV) and
Pa-234m (2.29 MeV) Definition: 1 Curie = 6615 lb.

Hazard category: C-level (low hazard) : 100 μ Ci to 10 mCi
B-level (Moderate hazard) : > 10 mCi to 1 Ci
A-level (High hazard) : greater than 1 Ci

EXTERNAL RADIATION HAZARDS AND SHIELDING:

Surface beta dose rate is 111 mrad/hr
Maximum range of beta radiation, glass 0.25 inches
plastic 0.4 inches (1 cm)

There also is some gamma radiation associated with Uranium, but, if
chemical purification has removed the radium, the exposure rate will be quite low.

HAZARDS IF INTERNALLY DEPOSITED:

In general, uranyl nitrate or uranyl acetate are considered to be more chemically toxic as
a heavy metal (like lead or bismuth) than as a radiotoxic element and care should be
taken to prevent ingestion by following good hygiene: wearing disposable gloves (this will
also minimize beta exposure) and washing up after use.

Dusty, or vapor or aerosol-producing operations must be contained in fume hoods or
glove boxes since deposition in the lungs is more hazardous.

The Stanford ALARA Annual Limit of Intake (amount which will deliver 10% of the legal limit,
i.e. 5 rem to the bone surfaces) is 1 microcurie (oral) or 0.1 microcurie (inhaled).

DOSIMETRY AND BIOASSAY REQUIREMENTS:

Generally dosimeters are not required unless one is handling, i.e. in contact with,
uranium samples for more than one hour/week without any absorber between one's skin
and the samples. Usually, it is only appropriate to measure finger doses using TLDs.

SPECIAL PROBLEMS AND PRECAUTIONS:

1. Always wear protective gloves to keep contamination from skin. Change gloves often.
2. G.M. survey meters are efficient for measuring uranium contamination. Smear surveys
required for unrestricted areas, e.g. floors.
3. Survey waste in a uranium work area to assess contamination. Please call Health
Physics (4-1408) for information on waste disposal.
4. Limit of soluble waste to sewer to 1 microcuries (1.48 g)/ day per lab.

HAZARDS OF HANDLING URANIUM and URANIUM SALTS

There are some health related concerns associated with the handling and use of uranium and its salts which are employed in preparation of certain specimens for electron microscopy, or standards for phosphorimeters and spectrometers, or other physical and chemical uses.

All uranium is radioactive, U-238 decays with a half-life of about 4.5 billion years. Other isotopes have the following half-lives:

U232	72 years (high specific activity – more hazardous)
U235	7.1×10^8 years
U233	1.6×10^5 years
U236	2.4×10^6 years

Samples of unrefined uranium also contain radioactive daughter products including Th-234 and Pa-234m and other elements which will usually be in equilibrium with the parent. Refined uranium, such as enriched or depleted uranium or specific single isotopic sources, does not contain the long half-lived daughter products but will have Th and Pa and other heavy element isotopes.

Most uranium atoms decay by emission of alpha particles accompanied by low intensity gamma and X-ray radiations. The daughters emit beta, alpha, gamma and X-ray radiations. All these radiations can be detected with a survey meter with thin window Geiger-Mueller type detectors. (The beta and alpha radiations are stopped [shielded] by the glass bottles).

In general, uranyl nitrate or uranyl acetate are considered to be more chemically toxic as a heavy metal (like lead or bismuth) than as a radiotoxic element. Care should be taken to prevent ingestion by following good hygiene: wearing disposable gloves (this will also minimize beta exposure) and washing up after use. It is also a good idea to keep work areas cleaned to minimize skin exposure and contamination.

The most significant hazards are inhalation of dusts which may be deposited in the lungs. Open fine mesh powders or dusty materials in a fume hood or glove box. Maintain clean work areas to minimize production of airborne dusts which can be a *much more serious health hazard*.

Use disposable coverings (e.g. diaper pads or "Chux") in a work area during handling and promptly remove and dispose of these coverings after use.

Anyone who is working with Uranium in such a manner likely to produce airborne dusts or aerosols should consult with Health Physics (723-3201) for assistance, since, as noted above, Uranium deposition in the lungs is a much more serious hazard.

Disposal of Uranium salts must be done through Health Physics. These materials must be segregated from other wastes. Please call Health Physics (725-1408) for instructions on disposal of the stock or waste materials. Mixing of these isotopes with hazardous wastes (reactives, toxics, flammables, organic solvents) must be approved specifically by the cognizant Radiation Safety Committee.