



HAZARDOUS SUBSTANCE FACT SHEET

Common Name: **THORIUM DIOXIDE**

CAS Number: 1314-20-1

DOT Number: UN 2909

DOT Hazard Class: 7 (Radioactive)

RTK Substance number: 1856

Date: May 1998

Revision: May 2007

HAZARD SUMMARY

- * **Thorium Dioxide** can affect you when breathed in and may be absorbed through the skin.
- * **Thorium Dioxide** is a CARCINOGEN--HANDLE WITH EXTREME CAUTION.
- * **Thorium Dioxide** is broken down in the body into radioactive substances.
- * **Thorium Dioxide** may be contaminated with radioactive *Thorium*. This could contaminate work surfaces and provide an ongoing radiation hazard and increasing future risk of cancer.
- * Exposure can reduce the ability of the bone marrow to make white blood cells.
- * Low repeated exposures may scar the lungs.
- * Exposure may damage the liver and kidneys.
- * After exposure, some **Thorium Dioxide** is retained in the bones and other body organs for many years.

IDENTIFICATION

Thorium Dioxide is a heavy, white, crystalline (sand-like) powder. It is used in ceramics, in nuclear fuels, as a catalyst, and in electrodes for arc welding.

REASON FOR CITATION

- * **Thorium Dioxide** is on the Hazardous Substance List because it is cited by DOT, NTP, DEP, IARC and EPA.
- * This chemical is on the Special Health Hazard Substance List because it is a **CARCINOGEN**.
- * Definitions are provided on page 5.

HOW TO DETERMINE IF YOU ARE BEING EXPOSED

The New Jersey Right to Know Act requires most employers to label chemicals in the workplace and requires public employers to provide their employees with information and training concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard (29 CFR 1910.1200) requires private employers to provide similar training and information to their employees.

- * Exposure to hazardous substances should be routinely evaluated. This may include collecting personal and area air samples. You can obtain copies of sampling results

from your employer. You have a legal right to this information under the OSHA Access to Employee Exposure and Medical Records Standard (29 CFR 1910.1020).

- * If you think you are experiencing any work-related health problems, see a doctor trained to recognize occupational diseases. Take this Fact Sheet with you.

WORKPLACE EXPOSURE LIMITS

Exposure to radioactive materials is regulated by the Nuclear Regulatory Commission (NRC) and OSHA. Refer to the NRC Standards for Protection Against Radiation Occupational Dose Limits (10 CFR 20.1201) and the OSHA Ionizing Radiation Standard (29 CFR 1910.1096).

- * **Thorium Dioxide** is a CARCINOGEN in humans. There may be no safe level of exposure to a carcinogen, so all contact should be reduced to the lowest possible level.
- * It should be recognized that **Thorium Dioxide** can be absorbed through your skin, thereby increasing your exposure.

WAYS OF REDUCING EXPOSURE

- * Enclose operations and use local exhaust ventilation at the site of chemical release. If local exhaust ventilation or enclosure is not used, respirators should be worn.
- * A regulated, marked area should be established where **Thorium Dioxide** is handled, used, or stored.
- * All processes involving **Thorium Dioxide** should be mechanized, enclosed or automated.
- * When working with small quantities of **Thorium Dioxide**, use in a glove box.
- * Wear protective work clothing.
- * Wash thoroughly immediately after exposure to **Thorium Dioxide** and at the end of the workshift.
- * Post hazard and warning information in the work area. In addition, as part of an ongoing education and training effort, communicate all information on the health and safety hazards of **Thorium Dioxide** to potentially exposed workers.

This Fact Sheet is a summary source of information of all potential and most severe health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

HEALTH HAZARD INFORMATION

Acute Health Effects

The following acute (short-term) health effects may occur immediately or shortly after exposure to **Thorium Dioxide**:

- * Exposure can reduce the ability of the bone marrow to make white blood cells.

Chronic Health Effects

The following chronic (long-term) health effects can occur at some time after exposure to **Thorium Dioxide** and can last for months or years:

Cancer Hazard

- * **Thorium Dioxide** is a CARCINOGEN in humans. It has been shown to cause lung cancer.
- * Many scientists believe there is no safe level of exposure to a carcinogen. Such substances may also have the potential for causing reproductive damage in humans.

Reproductive Hazard

- * According to the information presently available to the New Jersey Department of Health and Senior Services, **Thorium Dioxide** has not been tested for its ability to affect reproduction.
- * Because **Thorium Dioxide** gives off very dangerous radiation, it has the potential for causing reproductive damage in humans.

Other Long-Term Effects

- * Low repeated exposures may scar the lungs.
- * Exposure may damage the liver and kidneys.
- * After exposure, some **Thorium Dioxide** is retained in the bones, lymph system, lungs and other body organs for many years.

MEDICAL

Medical Testing

Before beginning employment and at regular times after that, the following are recommended:

- * White blood cell count
- * Lung function tests
- * Consider periodic chest x-ray for persons with potentially high or repeated lower exposure.

If symptoms develop or overexposure is suspected, the following are recommended:

- * Liver and kidney function tests

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under the OSHA Access to Employee Exposure and Medical Records Standard (29 CFR 1910.1020).

Mixed Exposures

- * Because smoking can cause heart disease, as well as lung cancer, emphysema, and other respiratory problems, it may worsen respiratory conditions caused by chemical exposure. Even if you have smoked for a long time, stopping now will reduce your risk of developing health problems.
- * Because more than light alcohol consumption can cause liver damage, drinking alcohol can increase the liver damage caused by **Thorium Dioxide**.

WORKPLACE CONTROLS AND PRACTICES

Unless a less toxic chemical can be substituted for a hazardous substance, **ENGINEERING CONTROLS** are the most effective way of reducing exposure. The best protection is to enclose operations and/or provide local exhaust ventilation at the site of chemical release. Isolating operations can also reduce exposure. Using respirators or protective equipment is less effective than the controls mentioned above, but is sometimes necessary.

In evaluating the controls present in your workplace, consider: (1) how hazardous the substance is, (2) how much of the substance is released into the workplace and (3) whether harmful skin or eye contact could occur. Special controls should be in place for highly toxic chemicals or when significant skin, eye, or breathing exposures are possible.

In addition, the following controls are recommended:

- * Where possible, automatically transfer **Thorium Dioxide** from drums or other storage containers to process containers.
- * Specific engineering controls and personnel monitoring are required by the NRC Standards for Protection Against Radiation (10 CFR 20) and the OSHA Ionizing Radiation Standards for Protection Against Radiation (29 CFR 1910.1096). Also check specific state regulations.

Good **WORK PRACTICES** can help to reduce hazardous exposures. The following work practices are recommended:

- * Workers whose clothing has been contaminated by **Thorium Dioxide** should change into clean clothing promptly.
- * Do not take contaminated work clothes home. Family members could be exposed.
- * Contaminated work clothes should be laundered by individuals who have been informed of the hazards of exposure to **Thorium Dioxide**.
- * Eye wash fountains should be provided in the immediate work area for emergency use.

- * If there is the possibility of skin exposure, emergency shower facilities should be provided.
- * On skin contact with **Thorium Dioxide**, immediately wash or shower to remove the chemical. At the end of the workshift, wash any areas of the body that may have contacted **Thorium Dioxide**, whether or not known skin contact has occurred.
- * Do not eat, smoke, or drink where **Thorium Dioxide** is handled, processed, or stored, since the chemical can be swallowed. Wash hands carefully before eating, drinking, applying cosmetics, smoking, or using the toilet.
- * Employees exposed to ionizing radiation should be provided with personal monitoring equipment such as film badges or pocket dosimeters.
- * Use damp methods to control dust.
- * Test for trace levels of radioactivity after clean-up.

PERSONAL PROTECTIVE EQUIPMENT

WORKPLACE CONTROLS ARE BETTER THAN PERSONAL PROTECTIVE EQUIPMENT. However, for some jobs (such as outside work, confined space entry, jobs done only once in a while, or jobs done while workplace controls are being installed), personal protective equipment may be appropriate.

The OSHA Personal Protective Equipment Standard (29 CFR 1910.132) requires employers to determine the appropriate personal protective equipment for each hazard and to train employees on how and when to use protective equipment.

The following recommendations are only guidelines and may not apply to every situation.

Clothing

- * Avoid skin contact with **Thorium Dioxide**. Wear protective gloves and clothing. Safety equipment suppliers/manufacturers can provide recommendations on the most protective glove/clothing material for your operation.
- * All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.

Eye Protection

- * Wear eye protection with side shields or goggles.
- * Wear a face shield along with goggles when working with corrosive, highly irritating or toxic substances.

Respiratory Protection

IMPROPER USE OF RESPIRATORS IS DANGEROUS.

Such equipment should only be used if the employer has a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing, and medical exams, as described in the OSHA Respiratory Protection Standard (29 CFR 1910.134).

- * Engineering controls must be effective to ensure that exposure to **Thorium Dioxide** does not occur.
- * At any exposure level, use a NIOSH approved supplied-air respirator with a full facepiece operated in a pressure-demand or other positive-pressure mode. For increased protection use in combination with an auxiliary self-contained breathing apparatus operated in a pressure-demand or other positive-pressure mode.

QUESTIONS AND ANSWERS

Q: If I have acute health effects, will I later get chronic health effects?

A: Not always. Most chronic (long-term) effects result from repeated exposures to a chemical.

Q: Can I get long-term effects without ever having short-term effects?

A: Yes, because long-term effects can occur from repeated exposures to a chemical at levels not high enough to make you immediately sick.

Q: What are my chances of getting sick when I have been exposed to chemicals?

A: The likelihood of becoming sick from chemicals is increased as the amount of exposure increases. This is determined by the length of time and the amount of material to which someone is exposed.

Q: When are higher exposures more likely?

A: Conditions which increase risk of exposure include dust releasing operations (grinding, mixing, blasting, dumping, etc.), other physical and mechanical processes (heating, pouring, spraying, spills and evaporation from large surface areas such as open containers), and "confined space" exposures (working inside vats, reactors, boilers, small rooms, etc.).

Q: Is the risk of getting sick higher for workers than for community residents?

A: Yes. Exposures in the community, except possibly in cases of fires or spills, are usually much lower than those found in the workplace. However, people in the community may be exposed to contaminated water as well as to chemicals in the air over long periods. This may be a problem for children or people who are already ill.

Q: Don't all chemicals cause cancer?

A: No. Most chemicals tested by scientists are not cancer-causing.

Q: Can men as well as women be affected by chemicals that cause reproductive system damage?

A: Yes. Some chemicals reduce potency or fertility in both men and women. Some damage sperm and eggs, possibly leading to birth defects.

- Q: Who is at the greatest risk from reproductive hazards?
A: Pregnant women are at greatest risk from chemicals that harm the developing fetus. However, chemicals may affect the ability to have children, so both men and women of childbearing age are at high risk.

QUESTIONS AND ANSWERS

- Q: What acute health effects will I get from radiation exposure?
A: Exposure over a short period of time to high doses of ionizing radiation (500 rads) can cause severe tissue necrosis and death.
- Q: Can I get long-term effects without even having short-term effects?
A: Yes. The long-term effect of acute radiation exposure includes an increased risk of cancer.
- Q: What are my chances of getting sick when I have been exposed to radioactive chemicals?
A: The likelihood of becoming sick from radioactive chemicals increases as the amount of exposure increases. This is determined by the length of time and the amount of radiation to which someone is exposed.
- Q: When are higher exposures more likely?
A: Higher radiation exposures are limited to workers in the nuclear industry but could become a major hazard to the population immediately affected by a major nuclear disaster.
- Q: Do all radioactive chemicals cause cancer?
A: Yes. Ionizing radiation is carcinogenic to all tissues under appropriate conditions.

The following information is available from:

New Jersey Department of Health and Senior Services
Occupational Health Service
PO Box 360
Trenton, NJ 08625-0360
(609) 984-1863
(609) 984-7407 (fax)

Web address: <http://www.state.nj.us/health/eoh/odisweb/>

Industrial Hygiene Information

Industrial hygienists are available to answer your questions regarding the control of chemical exposures using exhaust ventilation, special work practices, good housekeeping, good hygiene practices, and personal protective equipment including respirators. In addition, they can help to interpret the results of industrial hygiene survey data.

Medical Evaluation

If you think you are becoming sick because of exposure to chemicals at your workplace, you may call personnel at the Department of Health and Senior Services, Occupational Health Service, who can help you find the information you need.

Public Presentations

Presentations and educational programs on occupational health or the Right to Know Act can be organized for labor unions, trade associations and other groups.

Right to Know Information Resources

The Right to Know Infoline (609) 984-2202 can answer questions about the identity and potential health effects of chemicals, list of educational materials in occupational health, references used to prepare the Fact Sheets, preparation of the Right to Know Survey, education and training programs, labeling requirements, and general information regarding the Right to Know Act. Violations of the law should be reported to (609) 984-2202.

DEFINITIONS

ACGIH is the American Conference of Governmental Industrial Hygienists. It recommends upper limits (called TLVs) for exposure to workplace chemicals.

A **carcinogen** is a substance that causes cancer.

The **CAS number** is assigned by the Chemical Abstracts Service to identify a specific chemical.

CFR is the Code of Federal Regulations, which consists of the regulations of the United States government.

A **combustible** substance is a solid, liquid or gas that will burn.

A **corrosive** substance is a gas, liquid or solid that causes irreversible damage to human tissue or containers.

DEP is the New Jersey Department of Environmental Protection.

DOT is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

EPA is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

A **fetus** is an unborn human or animal.

A **flammable** substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

The **flash point** is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

IARC is the International Agency for Research on Cancer, a scientific group that classifies chemicals according to their cancer-causing potential.

IRIS is the Integrated Risk Information System database of the federal EPA.

A **miscible** substance is a liquid or gas that will evenly dissolve in another.

mg/m³ means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

A **mutagen** is a substance that causes mutations. A **mutation** is a change in the genetic material in a body cell. Mutations can lead to birth defects, miscarriages, or cancer.

NAERG is the North American Emergency Response Guidebook. It was jointly developed by Transport Canada, the United States Department of Transportation and the Secretariat of Communications and Transportation of Mexico. It is a guide for first responders to quickly identify the specific or generic hazards of material involved in a transportation incident, and to protect themselves and the general public during the initial response phase of the incident.

NFPA is the National Fire Protection Association. It classifies substances according to their fire and explosion hazard.

NIOSH is the National Institute for Occupational Safety and Health. It tests equipment, evaluates and approves respirators, conducts studies of workplace hazards, and proposes standards to OSHA.

NTP is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

OSHA is the Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

PEL is the Permissible Exposure Limit which is enforceable by the Occupational Safety and Health Administration.

PIH is a DOT designation for chemicals which are Poison Inhalation Hazards.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

STEL is a Short Term Exposure Limit which is usually a 15-minute exposure that should not be exceeded at any time during a work day.

A **teratogen** is a substance that causes birth defects by damaging the fetus.

TLV is the Threshold Limit Value, the workplace exposure limit recommended by ACGIH.

The **vapor pressure** is a measure of how readily a liquid or a solid mixes with air at its surface. A higher vapor pressure indicates a higher concentration of the substance in air and therefore increases the likelihood of breathing it in.

