Right to Know

Hazardous Substance Fact Sheet

Common Name: **ZIRCONIUM**

Synonyms: None

Chemical Name: Zirconium

Date: October 1998 Revision: January 2008

CAS Number: 7440-67-7

RTK Substance Number: 2047

DOT Number: UN 1358, UN 2008

EMERGENCY RESPONDERS >>>> SEE BACK PAGE

Description and Use

Zirconium is a soft, easily shaped or molded gray to gold solid, a bluish-black powder, or grayish-white platelet or flake. It is used to coat nuclear fuel rods, and in corrosion resistant alloys, photoflash bulbs, explosives, vacuum tubes, and iron and steel manufacturing.

Reasons for Citation

- **Zirconium** is on the Right to Know Hazardous Substance List because it is cited by OSHA, ACGIH, DOT and NIOSH.
- This chemical is on the Special Health Hazard Substance List.

SEE GLOSSARY ON PAGE 5.

FIRST AID

Eye Contact

- Immediately flush with large amounts of water for at least 15 minutes, lifting upper and lower lids. Remove contact lenses, if worn, while rinsing.

Skin Contact

- Remove contaminated clothing and wash contaminated skin with soap and water.

Inhalation

- Remove the person from exposure.
- Begin rescue breathing (using universal precautions) if breathing has stopped and CPR if heart action has stopped.
- Transfer promptly to a medical facility.

EMERGENCY NUMBERS

Poison Control: 1-800-222-1222

CHEMTREC: 1-800-424-9300

NJDEP Hotline: 1-877-927-6337

National Response Center: 1-800-424-8802

Hazard Summary

Hazard Rating	NJDOH	NFPA
HEALTH	2	-
FLAMMABILITY	4	-
REACTIVITY	1	-

FLAMMABLE
SPONTANEOUSLY COMBUSTIBLE
POISONOUS GASES ARE PRODUCED IN FIRE
CONTAINERS MAY EXPLODE IN FIRE

Hazard Rating Key: 0=minimal; 1=slight; 2=moderate; 3=serious; 4=severe

- **Zirconium** can affect you when inhaled.
- **Zirconium** *powder* may irritate the eyes.
- Inhaling **Zirconium** can irritate the lungs causing coughing and/or shortness of breath.
- Repeated contact can cause an allergic skin reaction to develop with small nodules (granulomas).
- **Zirconium** *powder*, *dust* or *granule* is HIGHLY FLAMMABLE and can EXPLODE SPONTANEOUSLY IN AIR.

Workplace Exposure Limits

OSHA: The legal airborne permissible exposure limit (PEL) is **5 mg/m^3** averaged over an 8-hour workshift.

NIOSH: The recommended airborne exposure limit (REL) is **5 mg/m^3** averaged over a 10-hour workshift and **10 mg/m^3**, not to be exceeded during any 15-minute work period.

ACGIH: The threshold limit value (TLV) is **5 mg/m^3** averaged over an 8-hour workshift and **10 mg/m^3** as a STEL (short-term exposure limit).

Determining Your Exposure

- Read the product manufacturer's Material Safety Data Sheet (MSDS) and the label to determine product ingredients and important safety and health information about the product mixture.
- For each individual hazardous ingredient, read the New Jersey Department of Health Hazardous Substance Fact Sheet, available on the RTK website (www.nj.gov/health/eoh/rtkweb) or in your facility's RTK Central File or Hazard Communication Standard file.
- You have a right to this information under the New Jersey Worker and Community Right to Know Act, the Public Employees Occupational Safety and Health (PEOSH) Act if you are a public worker in New Jersey, and under the federal Occupational Safety and Health Act (OSHA) if you are a private worker.
- 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 concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard (29 CFR 1910.1200) and the PEOSH Hazard Communication Standard (N.J.A.C. 12:100-7) require employers to provide similar information and training to their employees.

This Fact Sheet is a summary of available information regarding the 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 **Zirconium**:

- **Zirconium** *powder* may irritate the eyes.

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

Cancer Hazard
- While **Zirconium** has been tested, further testing is required to assess its potential to cause cancer.

Reproductive Hazard
- While **Zirconium** has been tested, further testing is required to assess its potential to cause reproductive harm.

Other Effects
- Inhaling **Zirconium** can irritate the lungs causing coughing and/or shortness of breath.
- Repeated contact can cause an allergic skin reaction to develop with small nodules (granulomas).

Medical

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

- Evaluation by a qualified allergist can help diagnose skin allergy.

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
- Smoking can cause heart disease, 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.

Workplace Controls and Practices

Very toxic chemicals, or those that are reproductive hazards or sensitizers, require expert advice on control measures if a less toxic chemical cannot be substituted. Control measures include: (1) enclosing chemical processes for severely irritating and corrosive chemicals, (2) using local exhaust ventilation for chemicals that may be harmful with a single exposure, and (3) using general ventilation to control exposures to skin and eye irritants. For further information on workplace controls, consult the NIOSH document on Control Banding at www.cdc.gov/niosh/topics/ctrlbanding/.

The following work practices are also recommended:

- Label process containers.
- Provide employees with hazard information and training.
- Monitor airborne chemical concentrations.
- Use engineering controls if concentrations exceed recommended exposure levels.
- Provide eye wash fountains and emergency showers.
- Wash or shower if skin comes in contact with a hazardous material.
- Always wash at the end of the workshift.
- Change into clean clothing if clothing becomes contaminated.
- Do not take contaminated clothing home.
- Get special training to wash contaminated clothing.
- Do not eat, smoke, or drink in areas where chemicals are being handled, processed or stored.
- Wash hands carefully before eating, smoking, drinking, applying cosmetics or using the toilet.

In addition, the following may be useful or required:

- Before entering a confined space where **Zirconium** *powder*, *dust* or *granule* may be present, check to make sure that an explosive concentration does not exist.

Personal Protective Equipment

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.

Gloves and Clothing

- Avoid skin contact with **Zirconium**. Wear personal protective equipment made from material which can not be permeated or degraded by this substance. Safety equipment suppliers and manufacturers can provide recommendations on the most protective glove and clothing material for your operation.
- Safety equipment manufacturers recommend DuPont *Tyvek*® as protective material for *hazardous dusts*.
- Wear protective clothing made of material that does not generate static electricity.
- 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.
- Do not wear contact lenses when working with this substance.

Respiratory Protection

Improper use of respirators is dangerous. Respirators should only be used if the employer has implemented 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).

- Where the potential exists for exposure over **5 mg/m^3**, use a NIOSH approved air-purifying, particulate filter respirator with an N, R or P95 filter. More protection is provided by a full facepiece respirator than by a half-mask respirator, and even greater protection is provided by a powered-air purifying respirator.
- Leave the area immediately if (1) while wearing a filter or cartridge respirator you can smell, taste, or otherwise detect **Zirconium**, (2) while wearing particulate filters abnormal resistance to breathing is experienced, or (3) eye irritation occurs while wearing a full facepiece respirator. Check to make sure the respirator-to-face seal is still good. If it is, replace the filter or cartridge. If the seal is no longer good, you may need a new respirator.
- Consider all potential sources of exposure in your workplace. You may need a combination of filters, prefilters or cartridges to protect against different forms of a chemical (such as vapor and mist) or against a mixture of chemicals.
- Exposure to **25 mg/m^3** is immediately dangerous to life and health. If the possibility of exposure above **25 mg/m^3** exists, use a NIOSH approved self-contained breathing apparatus with a full facepiece operated in a pressure-demand or other positive-pressure mode equipped with an emergency escape air cylinder.

Fire Hazards

If employees are expected to fight fires, they must be trained and equipped as stated in the OSHA Fire Brigades Standard (29 CFR 1910.156).

- **Zirconium** *powder*, *dust* or *granule* is HIGHLY FLAMMABLE and can EXPLODE SPONTANEOUSLY IN AIR.
- Use dry chemicals appropriate for extinguishing metal fires (such as dry lime, soda ash and graphite).
- USE WATER with care as **Zirconium** re-ignites in the presence of WATER and burns more violently.
- DO NOT USE CO_2 or HALOGEN extinguishing agents.
- POISONOUS GASES ARE PRODUCED IN FIRE.
- CONTAINERS MAY EXPLODE IN FIRE.
- Use water spray to keep fire-exposed containers cool. DO NOT get water inside containers.

Spills and Emergencies

If employees are required to clean-up spills, they must be properly trained and equipped. The OSHA Hazardous Waste Operations and Emergency Response Standard (29 CFR 1910.120) may apply.

If **Zirconium** is spilled, take the following steps:

- Evacuate personnel and secure and control entrance to the area.
- Eliminate all ignition sources.
- Collect powdered material in the most convenient and safe manner and deposit in sealed containers.
- Ventilate and wash area after clean-up is complete.
- Keep **Zirconium** *powder*, *dust* or *granule* out of confined spaces, such as sewers, because of the possibility of an explosion.
- It may be necessary to contain and dispose of **Zirconium** as a HAZARDOUS WASTE. Contact your state Department of Environmental Protection (DEP) or your regional office of the federal Environmental Protection Agency (EPA) for specific recommendations.

Handling and Storage

Prior to working with **Zirconium** you should be trained on its proper handling and storage.

- **Zirconium** reacts violently or explosively with BORAX; CARBON TETRACHLORIDE and ALKALI METAL HYDROXIDES (such as POTASSIUM HYDROXIDE and SODIUM HYDROXIDE) when heated, and also reacts violently with COPPER OXIDE and LEAD OXIDE.
- *Dusts* of pure **Zirconium** will ignite or explode when in contact with WATER.
- **Zirconium** forms explosive mixtures with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); PHOSPHORUS; OXYGEN; LEAD; POTASSIUM NITRATE; POTASSIUM CHLORATE; SODIUM BORATE; SULFATES; MOLYBDATES; CHROMATES; and DICHROMATES.
- **Zirconium** is incompatible with BORON; CARBON; NITROGEN; and PLATINUM.
- **Zirconium** *powder*, *dust* or *granule* can explode if exposed to SHOCK, FRICTION or STATIC ELECTRICITY.
- Sources of ignition, such as smoking and open flames, are prohibited where **Zirconium** is used, handled, or stored.
- Metal containers involving the transfer of **Zirconium** *powder* or *granule* should be grounded and bonded.
- Use only non-sparking tools and equipment, especially when opening and closing containers of **Zirconium**.
- Use explosion-proof electrical equipment and fittings wherever **Zirconium** is used, handled, manufactured, or stored.
- Store **Zirconium** *powder* immersed in water.

Occupational Health Information Resources

The New Jersey Department of Health offers multiple services in occupational health. These services include providing informational resources, educational materials, public presentations, and industrial hygiene and medical investigations and evaluations.

For more information, please contact:

New Jersey Department of Health
Right to Know
PO Box 368
Trenton, NJ 08625-0368
Phone: 609-984-2202
Fax: 609-984-7407
E-mail: rtk@doh.state.nj.us
Web address: http://www.nj.gov/health/eoh/rtkweb

GLOSSARY

ACGIH is the American Conference of Governmental Industrial Hygienists. They publish guidelines called Threshold Limit Values (TLVs) for exposure to workplace chemicals.

Acute Exposure Guideline Levels (AEGLs) are established by the EPA. They describe the risk to humans resulting from once-in-a lifetime, or rare, exposure to airborne chemicals.

Boiling point is the temperature at which a substance can change its physical state from a liquid to a gas.

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

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

CFR is the Code of Federal Regulations, which are 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 destruction of human skin or severe corrosion of 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.

ERG is the Emergency Response Guidebook. It is a guide for emergency responders for transportation emergencies involving hazardous substances.

Emergency Response Planning Guideline (ERPG) values are intended to provide estimates of concentration ranges where one reasonably might anticipate observing adverse effects.

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.

Ionization Potential is the amount of energy needed to remove an electron from an atom or molecule. It is measured in electron volts.

IRIS is the Integrated Risk Information System database maintained by federal EPA. The database contains information on human health effects that may result from exposure to various chemicals in the environment.

LEL or **Lower Explosive Limit**, is the lowest concentration of a combustible substance (gas or vapor) in the air capable of continuing an explosion.

mg/m^3 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.

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 federal Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

PEOSHA is the New Jersey Public Employees Occupational Safety and Health Act, which adopts and enforces health and safety standards in public workplaces.

Permeated is the movement of chemicals through protective materials.

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.

UEL or **Upper Explosive Limit** is the highest concentration in air above which there is too much fuel (gas or vapor) to begin a reaction or explosion.

Vapor Density is the ratio of the weight of a given volume of one gas to the weight of another (usually *Hydrogen*), at the same temperature and pressure.

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.

Right to Know Hazardous Substance Fact Sheet

Emergency Responders Quick Reference

Common Name: **ZIRCONIUM**

Synonyms: None
CAS No: 7440-67-7
Molecular Formula: Zr
RTK Substance No: 2047
Description: Soft, gray to gold solid, bluish-black powder, or grayish-white platelet or flake

HAZARD DATA

Hazard Rating	Firefighting	Reactivity
2 - Health **4 - Fire** **1 - Reactivity** **DOT#:** UN 1358 UN 2008 **ERG Guide #:** 170/135 **Hazard Class:** 4.1/4.2 (Flammable solid/ spontaneously combustible)	**Zirconium** powder, dust or granule is HIGHLY FLAMMABLE and can EXPLODE SPONTANEOUSLY IN AIR. Use dry chemicals appropriate for extinguishing metal fires (such as dry lime, soda ash and graphite). USE WATER with care as **Zirconium** re-ignites in the presence of WATER and burns more violently. DO NOT USE CO_2 or HALOGEN extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE. CONTAINERS MAY EXPLODE IN FIRE. Use water spray to keep fire-exposed containers cool. DO NOT get water inside containers.	**Zirconium** reacts violently or explosively with BORAX; CARBON TETRACHLORIDE and ALKALI METAL HYDROXIDES (such as POTASSIUM HYDROXIDE and SODIUM HYDROXIDE) when heated, and also reacts violently with COPPER OXIDE and LEAD OXIDE. Dusts of pure **Zirconium** will ignite or explode when in contact with WATER. Forms explosive mixtures with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); PHOSPHORUS; OXYGEN; LEAD; POTASSIUM NITRATE; POTASSIUM CHLORATE; SODIUM BORATE; SULFATES; MOLYBDATES; CHROMATES; and DICHROMATES. **Zirconium** is incompatible with BORON; CARBON; NITROGEN; and PLATINUM.

SPILL/LEAKS

Isolation Distance:
Solids: 25 meters (75 feet)
Large Spill: 50 meters (160 feet)
Fire: 800 meters (1/2 mile)

Collect powdered material in the most convenient and safe manner and deposit in sealed containers.

Use only non-sparking tools and equipment, especially when opening and closing containers of **Zirconium**.

PHYSICAL PROPERTIES

Odor Threshold:	Odorless
Flash Point:	Spontaneously combustible powder, dust or granule
Auto Ignition Temp:	392°F (200°C)
Vapor Pressure:	0 mm Hg at 68°F (20°C)
Specific Gravity:	6.5 (water = 1)
Water Solubility:	Insoluble
Boiling Point:	6,471°F (3,577°C)
Melting Point:	3,375°F (1,857°C)
Ionization Potential:	6.6 eV
Molecular Weight:	91.2

EXPOSURE LIMITS

OSHA:	5 mg/m^3, 8-hr TWA
NIOSH:	5 mg/m^3, 10-hr TWA; 10 mg/m^3, STEL
ACGIH:	5 mg/ m^3, 8-hr TWA; 10 mg/m^3, STEL
IDLH LEVEL:	25 mg/m^3

PROTECTIVE EQUIPMENT

Gloves:	No information
Coveralls:	DuPont Tyvek® or equivalent
Boots:	No information
Respirator:	>5 mg/m^3 - full facepiece APR with High efficiency filter <25 mg/m^3 - Supplied air

HEALTH EFFECTS

Eyes:	Irritation
Skin:	Skin allergy with small nodules with repeated contact
Inhalation:	Lung irritation with coughing and/or shortness of breath

FIRST AID AND DECONTAMINATION

Remove the person from exposure.
Flush eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.
Remove contaminated clothing and wash contaminated skin with soap and water.
Begin artificial respiration if breathing has stopped and CPR if necessary.
Transfer to a medical facility.