MATERIAL SAFETY DATA SHEET

I. PRODUCT IDENTIFICATION

Manufacturer/Supplier:
ESPI Metals
1050 Benson Way, Ashland, OR 97520
Toll Free (800) 638-2581 * Fax (541) 488-8313
E-Mail: sales@espimetals.com

Trade Name: Zirconium
Chemical Nature: Metallic Element
Formula: Zr
CAS Number: 7440-67-7

II. HAZARDOUS INGREDIENTS

Hazardous Component: Zirconium
%: 0-100
OSHA/PEL: 5 mg/m^3
ACGIH/TLV: 10 mg/m^3

HMIS Ratings (Sponge or Powder): **Health**: 2 **Flammability**: 4 **Reactivity**: 0 **Equip**: F: glasses, gloves, apron, respirator

III. PHYSICAL DATA

Boiling Point: 4377 ^oC
Melting Point: 1852 ^oC
Specific Gravity: 6.506 g/cc
Vapor Pressure: N/A
Vapor Density: N/A
Solubility in H_2O: Insoluble
Appearance and Odor: Metallic gray or silver-gray, odorless.
% Volatile: N/A

IV. FIRE AND EXPLOSION HAZARDS DATA

Autoignition Temperature: Solid metal will not ignite. High surface area material such as 10 micron powder may autoignite at room temperature. Fine chips, turnings, or grinding dust produced from this metal are flammable. Ignition point for powder varies from 200 ^oC to above 500 ^oC depending on particle size.

Minimum Explosible Concentration (g/m^3): Less than 100. Varies with particle size.
Extinguishing Media: Dry table salt. Type D fire extinguisher. DO NOT USE water, carbon dioxide or halocarbon extinguishing agent.
Special Firefighting Procedures: If metal fines become ignited it is advisable to allow the material to burnout. Fire can be controlled by smothering with dry table salt or using Type D dry-powder fire extinguisher material. Wear reflective heat-resistant suit.
Unusual Fire & Explosion Hazard: Do not spray water on burning zirconium. Carbon dioxide is not effective in

extinguishing burning zirconium.

If a fire starts in a mass of wet metal fines, the initial fire may be followed by an explosion. Therefore, when in doubt, personnel should retire and not attempt to extinguish the fire. The explosive characteristic of such material is caused by the steam and hydrogen generated within the burning mass.

Spontaneously combustible in dry powder form. Flammable and explosive as dust or powder, also in the form of borings and shavings. Zirconium metal is a very dangerous fire hazard in the form of dust when exposed to heat, flame or by chemical reaction with oxidizing agents. May be an explosion hazard in the form of dust by chemical reaction with air, alkali hydroxides, alkali metal chromates, dichromates, molybdates, sulfates, tungstates, borax, CCl_4, copper oxide, lead, lead oxide, phosphorous, $KClO_3$, KNO_3, nitryl fluoride. May be extremely sensitive to shock, and static electricity may cause spontaneous ignition.

V. HEALTH HAZARD INFORMATION

Effects of Exposure:

To the best of our knowledge the chemical, physical and toxicological properties of zirconium have not been thoroughly investigated and recorded.

Zirconium compounds are not an important industrial poison. Most zirconium compounds in common use are insoluble and considered inert. Pulmonary granuloma in zirconium workers has been reported.

Acute Effects:

Inhalation: May cause irritation to the respiratory tract, mucous membranes or the nose and throat.
Ingestion: May cause irritation to the gastrointestinal tract.
Skin: May cause irritation.
Eye: May cause irritation.

Chronic Effects: **Skin**: May cause skin granulomas. No other chronic health effects recorded.

Target Organs: May affect the respiratory system and skin.
Medical Conditions Generally Aggravated by Exposure: Pre-existing respiratory disorders.
Carcinogenicity: **NTP**: No **IARC**: No **OSHA**: No

EMERGENCY AND FIRST AID PROCEDURES:

INHALATION: Remove victim to fresh air, keep warm and quiet, give oxygen if breathing is difficult, seek medical attention if symptoms persist.
INGESTION: Give 1-2 glasses or milk or water and induce vomiting; seek medical attention if symptoms persist. Never induce vomiting or give anything by mouth to an unconscious person.
SKIN: Remove contaminated clothing, brush material off skin, wash affected area with mild soap and water, seek medical attention if symptoms persist.
EYE: Flush eyes with lukewarm water, lifting upper and lower eyelids, for at least 15 minutes. Seek medical attention if symptoms persist.

VI. REACTIVITY DATA

Stability: Stable
Conditions to Avoid: High temperatures, sources of ignition. May be extremely sensitive to shock and static electricity. May be an explosion hazard in the form of dust by chemical reaction with air.
Incompatibility (Material to Avoid): Strong oxidizing agents, air, alkali hydroxides, alkali metal chromates, dichromates,

molybdates, sulfates, tungstates, borax, CCL_4, copper oxide, lead, lead oxide, phosphorus, $KClO_3$, KNO_3, and acids.

Zirconium metal is rapidly dissolved by hydrofluoric acid or hydrofluoric-nitric acid mixtures. Above 200 ^oC, zirconium reacts exothermically with halogen gases, fluorine, chlorine, bromine, iodine, and halocarbons, including carbon tetrachloride, carbon tetrafluoride and Freons. Nitryl-Fluoride, FNO_2 will initiate a reaction with zirconium metal at room temperature to produce a glowing or white incandescence.

Hazardous Decomposition Products: Zirconium metal does not decompose. The above reactions with incompatible materials will generate hazardous reactions products such as flammable hydrogen, toxic fumes of nitrogen oxides, or corrosive zirconium halide vapors.

Hazardous Polymerization: Will not occur

VII. SPILL OR LEAK PROCEDURES

Steps to Be Taken in Case Material Is Released or Spilled: Wear appropriate respiratory and protective equipment specified in section VIII. Sweep or scoop up and place in a closed container for proper disposal. Stay aware of fire hazard. Avoid all ignition sources. Do not generate dust.

Additional Protective Measures: Evaluate each situation for possibility of flash burns. Work areas must be periodically cleaned to avoid accumulation of flammable dust. If dust has accumulated, wear reflective heat-resistant suit while cleaning.

Waste Disposal Method: Dispose of in accordance with all State, Federal and Local regulations.

VIII. SPECIAL PROTECTION INFORMATION

Respiratory Protection: Use NIOSH-approved respirator if process will generate dust.

Ventilation: General exhaust is recommended.

Protective Gloves: Use of gloves advisable to avoid cuts.

Eye Protection: Safety glasses.

Other Protective Clothing or Equipment: If dust has accumulated, wear reflective heat-resistant suit while cleaning.

IX. SPECIAL PRECAUTIONS

Precautions to Be Taken in Handling and Storage:

Machining of zirconium may result in fine turnings or chips. Any material with a dimension less than 0.0625" (1/16") or a cross section less than 0.0078" square (1/16 x 1/8), if present in any quantity, can be ignited and can sustain combustion. Keep away from any source of ignition. Keep fine turnings completely dry, or very wet. If wet, the water content should be more than 25% by weight for maximum safety in handling. Severe explosions can result from ignition of zirconium powder or machining fines containing moisture in the concentration range of 5 to 10%.(Sponge) Avoid ignition sources and high temperatures. Long term storage should be in argon-filled steel drums with tight fitting clamp-on sealable lids. All handling and storage areas should be clearly posted with “Hot Work Area Permit” signs.

Other Precautions: Very finely divided scrap or sawdust, with a dimension less than 0.012", should be considered to be pyrophoric and should not be accumulated. Dispose of these materials daily. In some cases, when the chemical corrosion resistance of zirconium is exceeded, a corrosion product containing fine zirconium particulate can form on the surface of the metal which can be easily ignited. This film can be rendered non-flammable by simple oxidation treatments such as heating to 250 ^oC for 1 hour or 100 ^oC for 7 days.

TSCA Listed: Yes

DOT Regulations:

Solid Forms:

- **Hazard Class**: None

Powder:

- **Hazard Class**: 4.2
- **Identification Number**: UN2008
- **Packing Group**: II
- **Proper Shipping Name**: Zirconium powder, dry

The above information is believed to be correct, but does not purport to be all inclusive and shall be used only as a guide. ESPI shall not be held liable for any damages resulting from handling or from contact with the above product.

Issued by: S. Dierks
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