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Manufacturer's CAGE: 1P573

Safety Data Sheet

Date Effective: March 28, 2016

421BP-AB, 422BP-AB, 424BP-AB Beryllium Planchets
412BGH-AB Beryllium Half Grids
412BG-AB Beryllium TEM Grids

Section 1.1: Identification

Chemical Name/Synonyms..... Metallic Beryllium

Product or Trade Name..... Beryllium Planchets, Beryllium Half Grids, Beryllium TEM Grids

CAS #'s..... 7440-41-7

Chemical Formula..... Be

Section 1.2: Relevant Uses/Restrictions

Planchets for sample background in EDS analysis in SEM.
Grids for Transmission Electron Microscopy

Section 1.3: Supplier of the Safety Data Sheet

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Section 1.4: Emergency telephone number

Emergencies
Contacting CHEMTREC:

24 Hour Emergency Use Only #'s...
Worldwide phone: 1-(703)-741-5970
Toll-free phone: 1-(800)-424-9300 USA + Canada only

Section 2: Hazard Identification

2.1 Classification of the substance

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Physical Hazard: Not classified – beryllium products in article form.

Health Hazards:

Sensitization: skin – Category 2
Carcinogenicity – Category 1

Specific target organ toxicity, repeated exposure – Category 1 (Respiratory system)

2.2 Label elements

Pictogram

Signal Word: Danger

Hazard statements:
H317: May cause an allergic skin reaction
H350: May cause cancer by inhalation
H372: Causes damage to organs (respiratory system) through prolonged or repeated exposure by inhalation

Precautionary statements:
P201: Obtain special instructions before use
P202: Do not handle until all safety precautions have been read and understood. Minimize dust generation and accumulation.
P260: Do not breathe dust/fume/gas/mist/vapors/spray
P264: Wash thoroughly after handling
P270: Do not eat, drink or smoke when using this product
P272: Contaminated work clothing should not be allowed out of the workplace
P280: Wear protective gloves/protective clothing/eye protection/face protection
P285: In case of inadequate ventilation wear respiratory protection
P405: Store locked up
P501: Dispose of contents/container in accordance with local/regional/national/international regulations.

Unknown percentage statements (if needed): None known.

2.3 Other Hazards: None known.

Hazardous Material Information System USA
- Health..... 4
- Fire Hazard..... 0
- Reactivity..... 0
- Personal Protection.....

NFPA Rating (estimated)
- Health..... 3
- Flammability..... 0
- Reactivity..... 0

Section 3: Composition

3.1 Substances:

Chemical name: Beryllium
Chemical symbol: Be
CAS#: 7440-41-7
Percentage: 100%

Section 4: First Aid Measures

4.1 Description of first aid measures:

Inhalation
If symptoms develop,k move victim to fresh air. For breathing difficulties, oxygen may be necessary. Breathing difficulty caused by inhalation of particulate requires immediate removal to fresh air. If breathing has stopped, perform artificial respiration and obtain medical help.

Skin Contact
Take off contaminated clothing and wash before reuse. Thoroughly wash skin cuts or wounds to remove all particulate debris from the wound. Seek medical attention for wounds that cannot be thoroughly cleansed. Treat skin cuts and wounds with standard first aid practices such as cleansing, disinfecting and covering to prevent wound infection and contamination before continuing work. Obtain medical help for persistent irritation. Material accidentally implanted or lodged under the skin must be removed.

Eye Contact
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention if symptoms persist.

Ingestion
If swallowed, seek medical advice immediately and show this container or label. Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person.

Self-protection of the first aider: No information available.

4.2 Most important symptoms and effects, both acute and delayed
May cause allergic skin reaction. Prolonged exposure may cause chronic effects.

4.3 Indication of any immediate medical attention and special treatment needed
Treatment of Chronic Beryllium Disease: There is no known treatment which will cure chronic beryllium disease. Prednisone or other corticosteroids are the most specific treatment currently available. They are directed at suppressing the immunological reaction and can be effective in diminishing signs and symptoms of chronic beryllium disease. In cases where steroid therapy has had only partial or minimal effectiveness, other immunosuppressive agents, such as cyclophosphamide, cyclosporine, or methotrexate, have been used. These latter agents remain investigational. Further, in view of the potential side effects of all the immunosuppressive medications, including steroids such as prednisone, they should be used only under the direct care of a physician. In general, these medications should be reserved for cases with significant symptoms and/or significant loss of lung function. Other symptomatic treatment, such as oxygen, inhaled steroids, or bronchodilators, may be prescribed by some physicians and can be effective in selected cases.

The decision about when and with what medication to treat is a judgment situation for individual physicians. For the most part, treatment is reserved for those persons with symptoms and a measurable loss of lung function. The value of starting oral steroid treatment, before signs or symptoms are evident, remains a medically unresolved issue.

The effects of continued low exposure to beryllium are unknown for individuals who are sensitized to beryllium or who have a diagnosis of chronic beryllium disease. It is generally recommended that persons who are sensitized to beryllium or who have CBD terminate their occupational exposure to beryllium.

General information:
If exposed or concerned: get medical attention/ advice. Get medical attention if symptoms occur. Wash contaminated clothing before reuse. As supplied, there is no immediate medical risk with beryllium products in article form. First aid measures provided are related to particulate containing beryllium.

Section 5: Fire Fighting Measures

5.1 **Extinguishing media** – The product is non-combustible. Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

Unsuitable extinguishing media – Do not use water to extinguish fires around operations involving molten metal due to the potential for steam explosions.

5.2 **Special hazards arising from the substance or mixture** – Not applicable.

Hazardous combustion products – None known.

5.3 Advice for firefighters

Special protective equipment and precautions for firefighters – Firefighter should wear full protective clothing including self contained breathing apparatus. Wear suitable protective equipment.

Move containers from fire area if you can do so without risk. Water runoff can cause environmental damage.

Pressure-demand self-contained breathing apparatus must be worn by firefighters or any other persons potentially exposed to the particulate released during or after a fire.

Section 6: Accidental Release Measures

6.1 **Personal precautions** – In solid form this material poses no special clean-up problems. Wear appropriate protective equipment and clothing during clean-up.

6.2 **Environmental precautions** – Avoid release to the environment. In the event of a spill or accidental release, notify relevant authorities in accordance with all applicable regulations. Prevent further leakage or spillage if safe to do so . Avoid discharge into drains, water courses or onto the ground.

6.3 **Methods and materials for containment and cleaning up** – Clean up in accordance with all applicable regulations.

6.4 Reference to other sections - none known.

Section 7: Handling and Storage

7.1 Precautions for safe handling:

Protective measures

Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Minimize dust generation and accumulation. Do not breathe dust / fume. Wear protective gloves/ protective clothing/ eye protection/ face protection. Wear respiratory protection.

Advice on general hygiene conditions

Wash thoroughly after handling. Wen using, do not eat, drink or smoke. Contaminated work clothing must not be allowed out of the workplace.

7.2 Conditions for safe storage, including any incompatibilities:

Keep locked-up. Avoid contact with acids and alkalies. Avoid contact with oxidizing agents.

7.3 Specific end uses:

Planchets for sample background in EDS analysis in SEM.
Grids for Transmission Electron Microscopy.

Section 8: Exposure Controls and Personal Protection

8.1 Control parameter and Personal Protection
Occupational exposure limits – Beryllium (CAS# 7440-41-7)

Agency	Type	Value
US. OSHA Table Z-2(29 CFR 1910.1000)	Ceiling	0.005 mg/m^3
	TWA	0.002 mg/m^3
US. ACGIH Threshold Limit Values	TWA	0.00005 mg/m^3 Inhalable fraction
US. NIOSH: Pocket Guide to Chem. Hazards	Ceiling	0.0005 mg/m^3
US. California Code of Regulations, Title 8	Ceiling	0.025 mg/m^3
Section 5155. Airborne Contaminants	PEL	0.0002 mg/m^3

Biological limit values
No biological exposure Limits noted for the ingredient.

8.2 Exposure controls
8.2.1 Control parameters:
VENTILATION: Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level.

Whenever possible, the use of local exhaust ventilation or other engineering controls is the preferred method of controlling exposure to airborne particulate. Where utilized, exhaust inlets to the ventilation system must be positioned as close as possible to the source of airborne generation. Avoid disruption of the airflow in the area of a local exhaust inlet by equipment such as a man-cooling fan. Check ventilation equipment regularly to ensure it is functioning properly. Provide training on the use and operation of ventilation to all users. Use qualified professionals to design and install ventilation systems.

WET METHODS: Machining operations are usually performed under a liquid lubricant/coolant flood which assists in reducing airborne particulate. However, the cycling through of machine coolant containing finely divided particulate in suspension can result in the concentration building to a point where the particulate may become airborne during use. Certain processes such as sanding and grinding may require complete hooded containment and local exhaust ventilation. Prevent coolant from splashing onto floor areas, external structures or operators' clothing. Utilize a coolant filtering system to remove particulate from the coolant.

WORK PRACTICES: Develop work practices and procedures that prevent particulate from coming in contact with worker skin, hair, or personal clothing. If work practices and/or procedures are ineffective in controlling airborne exposure or visual particulate from deposition on skin, hair, or clothing, provide appropriate cleaning/washing facilities. Procedures should be written that clearly communicate the facility's requirements for protective clothing and personal hygiene. These clothing and personal hygiene requirements help keep particulate from being spread to non-production areas or from being taken home by the worker. Never use compressed air to clean work clothing or other surfaces.

Fabrication processes may leave a residue of particulate on the surface of parts, products or equipment that could result in employee exposure during subsequent material handling activities. As necessary, clean loose particulate from parts between processing steps. As a standard hygiene practice, wash hands before eating or smoking.

HOUSEKEEPING: Use vacuum and wet cleaning methods for particulate removal from surfaces. Be certain to de-energize electrical systems, as necessary, before beginning wet cleaning. Use vacuum cleaners with high

efficiency particulate air (HEPA). Do not use compressed air, brooms, or conventional vacuum cleaners to remove particulate from surfaces as this activity can result in elevated exposures to airborne particulate. Follow the manufacturer's instructions when performing maintenance on HEPA filtered vacuums used to clean hazardous materials.

8.2.2 Individual protection measures

Eye/Face Protection: Wear approved safety glasses, goggles, face shield and/or welder's helmet when risk of eye injury is present, particularly during operations that generate dust, mist or fume.

Skin protection/ Hand protection: Wear gloves to prevent contact with particulate or solutions. Wear gloves to prevent metal cuts and skin abrasions during handling.

Other: Protective over-garments or work clothing must be worn by persons who may become contaminated with particulate during activities. Skin contact with this material may cause, in some sensitive individuals, an allergic dermal response. Particulate that becomes lodged under the skin has the potential to induce sensitization and skin lesions.

Respiratory protection: When airborne exposures exceed or have the potential to exceed the occupational exposure limits, approved respirators must be used as specified by an Industrial Hygienist or other qualified professional. Respirator users must be medically evaluated to determine if they are physically capable of wearing a respirator. Quantitative and/or qualitative fit testing and respirator training must be satisfactorily completed by all personnel prior to respirator use. Users of tight fitting respirators must be clean shaven on those areas of the face where the respirator seal contacts the face. Use pressure-demand airline respirators when performing jobs with high potential exposures such as changing filters in a bag-house air cleaning device.

Thermal hazards: Not applicable

8.2.3 Environmental exposure controls

Exposure guidelines: Based on joint research conducted with the National Institute for Occupational Safety and Health (NIOSH) and Materion Corporation, an 8 element Beryllium Worker Protection Model (BWPM) is recommended, which includes the use of a recommended exposure guidelines for airborne beryllium of 0.2 ug/m^3 as a time-weighted average (TWA) limit for an 8-hour work day. Subsequent NIOSH studies have shown the the BWPM has reduced by not eliminated the risk of beryllium sensitization and chronic beryllium disease (CBD) in workers. Information on the BWPM can be found at www.berylliumsafety.com or by contacting Materion at +1 800.862.4116. In August 2015, OSHA proposed a comprehensive occupational health standard for beryllium which includes a Permissible Exposure Limit (PEL) of 0.2 ug/m^3 as and 8-hour TWA. In its evaluation, OSHA concluded that “despite the reduction in risk expected with the proposed PEL, the risk to workers with average exposure levels of 0.2 ug/m^3 is still clearly significant.”(Preamble to Proposed Rule, Occupational Exposure to Beryllium, Docket #OSHA-H005C-2006-0870, at 371.) Therefore, Materion Corporation recommends that beryllium users reduce airborne exposures to the lowest feasible level and carefully apply all elements of the BWPM>

The American Conference of Governmental Industrial Hygienists (ACGIH®) is a scientific body that has developed guidelines for all listed substances. In its development documents, the ACGIH states that “Threshold Limit Values and Biological Exposure Indices represent conditions under which ACGIH believes that nearly all workers may be repeatedly exposed without adverse health effects. They are not fine lines between safe and dangerous exposures, nor are they a relative index of toxicology.”

Specific genetic factors have been identified and shown to increase an individual's susceptibility to CBD. Medical testing is available to detect genetic factors in individuals.

General hygiene consideration: Handle in accordance with good industrial hygiene and safety practice.

Section 9: Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Appearance: solid, gray

Odor: none

Odor threshold: not applicable

pH: not applicable

Melting point/Freezing point: 2348.6 °F (1287 °C)

Boiling point/Boiling point range: 5378 VF (2970 °C)

Flash Point: not applicable

Evaporation rate: not applicable

Flammability (solid, gas): not applicable

Upper/lower flammability or explosive limits: not applicable

Vapor Pressure: 6.67 hPa estimated

Vapor density: not applicable

Relative density: not applicable

Solubility: not applicable

Partition coefficient (n-octanol/water): not available

auto-ignition temperature: not applicable

Decomposition temperature: not applicable

Viscosity: not applicable

Explosive properties: not applicable

Oxidizing Properties: not applicable

9.2 Other information

Density: 1,85 g/cm^3

Molecular formula: Be

Molecular weight: 9.01 grams/mole

Specific gravity: 1.85 estimated

Section 10: Stability and Reactivity

10.1 Reactivity: The product is stable and non-reactive under normal conditions of use, storage and transport.

10.2 Chemical Stability: Material is stable under normal conditions.

10.3 Possibility of Hazardous Reactions: Hazardous polymerization does not occur.

10.4 Conditions to avoid: Avoid dust formation, contact with acids, contact with alkalies.

10.5 Incompatible materials: Strong acids, alkalies, and oxidizing agents.

10.6 Hazardous decomposition products: No hazardous decomposition products are known.

Section 11: Toxicological Information

Information on the likely routes of exposure

Inhalation: May cause damage to organs (respiratory system) through prolonged or repeated exposure.
Skin contact: May cause an allergic skin reaction.
Eye contact: Not likely, due to the form of the product.
Ingestion: Not likely, due to the form of the product.
Symptoms: Respiratory disorder.

11.1 Information on toxicological effects

a. acute toxicity: Based on available data, the classification criteria are not met.

b. skin corrosion/irritation: May cause allergic skin reaction.

c. serious eye damage/irritation: Harmful in contact with eyes.

d. respiratory or skin sensitization:
ACGIH Sensitization: Beryllium (CAS 7440-41-7) Respiratory sensitization
Respiratory sensitization: May cause damage to organs (respiratory system) through prolonged or repeated exposure.
Skin sensitization: May cause an allergic skin reaction.

e. germ cell mutagenicity: Due to lack of data the classification is not possible.

f. carcinogenicity: Cancer hazard.
IARC Monographs. Overall Evaluation of Carcinogenicity
Beryllium (CAS 7440-41-7) 1 Carcinogenic to humans.
US. National Toxicology Program (NTP) Report on Carcinogens
Beryllium (CAS 7440-41-7) Known to be human carcinogen.
US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)
Not listed.

g. reproductive toxicity: Not classified.

h. STOT-single exposure: Not classified.

l. STOT-repeated exposure: May cause damage to organs (respiratory system) through prolonged or repeated exposure by inhalation.

j. aspiration hazard: Due to lack of data the classification is not possible.

Chronic effects: Hazardous by OSHA criteria. May cause damage to organs through prolonged ore repeated exposure.

Further information: Symptoms may be delayed.

Section 12: Ecological Information

12.1 Toxicity: No ecotoxicity data noted for the ingredient(s).

12.2 Persistence and degradability: No data is available on the degradability of this product.

12.3 Bioaccumulative potential: Not available.

12.4 Mobility in soil: Not available.

12.5 Results of PBT and vPvB assessment: No data available

12.6 Other adverse effects: Not available.

Section 13: Disposal Considerations

13.1 Waste treatment methods

Disposal instructions: Material should be recycled if possible. Disposal recommendations are based on material as supplied. Disposal must be in accordance with current applicable laws and regulations, and material characteristics at time of disposal. When this product as supplied is to be discarded as waste, it does not meet the definition of a RCRA waste under 40 CFR 261.

Hazardous waste code: Not regulated.

Waste from residues / unused products: Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe manner (see: Disposal instructions)).

Contaminated packaging: Empty containers should be taken to a approved waste handling site for recycling or disposal. Since emptied containers may retain product residue, follow label warnings even after container is emptied.

Section 14: Transport Information

DOT: Not regulated as dangerous goods.
IATA: Not regulated as dangerous goods.
IMDG: Not regulated as dangerous goods.

Section 15: Regulatory Information

15.1 Safety, health and environmental regulations/ legislation specific for the substance or mixture

US Federal Regulations: All components are on the U.S. EPA TSCA Inventory List.

OSHA: This product is a “Hazardous Chemical: as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D): Not regulated.

CERCLA Hazardous Substance List (40 CFR 302.4): Beryllium (CAS 7440-41-7): Listed.

US OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050): Not listed.

Superfund Amendments and Re-authorization Act of 1986 (SARA):

Hazard categories:

Immediate Hazard – Yes
Delayed Hazard – Yes
Fire Hazard – No
Pressure Hazard – No
Reactivity Hazard – No

SARA 302 Extremely hazardous substances: Not listed.

SARA 311/312 Hazardous chemical: Yes

SARA 313 (TRI reporting)

Chemical: Beryllium CAS#: 7440-41-7 % by weight: 100 %

Other federal regulations:

Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List: Beryllium CAS 7440-41-7

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 66.130) Not regulated.

Clean Water Act (CWA) Section 112(r) (40 CFR 68.130): Priority pollutant, Toxic pollutant

Safe Drinking Water Act (SDWA): 0.004 mg/l

US State regulations:

WARNING: This product contains a chemical known to the State of California to cause cancer.

US. California Proposition 65-CRT: Listed date/ Carcinogenic substance

Beryllium (CAS 7440-41-7) Listed: October 1, 1987

US. California Controlled Substances. CA Department of Justice (California Health and Safety Code Section 11100): Not listed.

US. California. Candidate Chemicals List. Safer Consumer Products Regulations (Cal. Code Regs, tit.22, 69502.3, subd (a)): Beryllium (CAS 7440-41-7)

US. Pennsylvania RTK – Hazardous Substances: All compounds of this substance are considered environmental hazards: Beryllium (CAS 7440-41-7)

US. Pennsylvania RTK – Hazardous Substances: Special hazard: Beryllium (CAS 7440-41-7)

US. Pennsylvania RTK – Hazardous Substances: Beryllium (CAS 7440-41-7)

US. Pennsylvania Worker and Community Right-to-Know Law: Beryllium (CAS 7440-41-7)

US. New Jersey RTK – Substances: Listed substance: Beryllium (CAS 7440-41-7)

US. New Jersey Worker and Community Right-to-Know Act: Beryllium (CAS 7440-41-7)

US. Massachusetts RTK – Substance List: Beryllium (CAS 7440-41-7)

US. Rhode Island RTK: Beryllium (CAS 7440-41-7)

15.2 Chemical Safety Assessment: A chemical safety assessment has not been carried out.

Other information, including date of preparation or last revision: Date of preparation: 28 March 2015.

Section 16: Other Information

Disclaimer of Liability:

Caution! Do not use SPI Supplies products or materials in applications involving implantation within the body; direct or indirect contact with the blood pathway; contact with bone, tissue, tissue fluid, or blood; or prolonged contact with mucous membranes. Products offered by SPI Supplies are not designed or manufactured for use in implantation in the human body or in contact with internal body fluids or tissues. SPI Supplies will not provide to customers making devices for such applications any notice, certification, or information necessary for such medical device use required by US FDA (Food and Drug Administration) regulation or any other statute. SPI Supplies and Structure Probe, Inc. make no representation, promise, express warranty or implied warranty concerning the suitability of these materials for use in implantation in the human body or in contact with internal body tissues of fluids.

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