



MATERIAL SAFETY DATA SHEET - NO. Z02

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

HEATSINK - ALUMINA, HEATSINK - ALUMINUM NITRIDE

MANUFACTURER

Zentrix Technologies Inc.
22 Graf Road
Newburyport, MA 01950
Phone: (978) 462-9361
Fax: (978) 462-9439
Website: www.zentrix.com

SYNONYMS DBC - Al₂O₃, DBC - Aluminum Oxide, Braze Packages, Power RF Packages, CuPack® Direct Bond Copper- Alumina, Aluminum Oxide, Alumina, Aluminum Nitride, Opto, Optoelectronics

CHEMICAL FAMILY Aluminum Compound

24-HR. EMERGENCY ASSISTANCE

Transportation Emergency

Call Chemtrec at:

Domestic: (800) 424-9300

International: (703) 527-3887

Other Emergency

Call Brush Wellman at: (800) 862-4118

Revised: 01-01-10

Replaces: MSDS Z02 (04-01-09)

PRODUCT SAFETY SERVICE

Brush Wellman Inc.

Product Stewardship Department

6070 Parkland Boulevard

Mayfield Heights, Ohio 44124

Phone: (800) 862-4118 or (216) 486-4200

Fax: (216) 383-4091

Websites www.brushwellman.com

2. HAZARD IDENTIFICATION

2.1 EMERGENCY OVERVIEW

White/gray solid which poses little or no immediate hazard in solid form. Layers of direct bonded or plated metals on a beryllia ceramic substrate. See label in Section 16. If the material is involved in a fire; pressure-demand self-contained breathing apparatus and protective clothing must be worn by persons potentially exposed to the airborne particulate during or after a fire.

2.2 POTENTIAL HEALTH EFFECTS

Exposure to the elements listed in Section 3 by inhalation, ingestion, and skin contact can occur when sintering, machining, grinding, sanding, abrasive cutting, polishing, laser scribing and trimming, chemical etching, crushing, or otherwise abrading the surface of this material in a manner which generates particulate.

Exposure may also occur during repair or maintenance activities on contaminated equipment such as: furnace rebuilding, maintenance or repair of air cleaning equipment, structural renovation, etc.

Particulate depositing on hands, gloves, and clothing, can be transferred to the breathing zone and inhaled during normal hand to face motions such as rubbing of the nose or eyes, sneezing, coughing, etc.

2.2.1 Inhalation

Particulate containing those elements listed in Section 3 can cause irritation to the nose, throat, lungs, and mucous membranes. Inhalation of this particulate may cause metal fume fever (high temperature, metallic taste, nausea, coughing, general weakness, muscle aches, and exhaustion), bronchitis, chills, decreased pulmonary function and asthma-like symptoms.

Aluminum Nitride: When inhaled as a particulate, may cause respiratory tract irritation.

Copper: Inhalation of particulate containing metallic copper can cause ulceration and perforation of the nasal septum.

Molybdenum: When inhaled as a particulate, may cause benign pneumoconiosis. Can produce delayed pulmonary edema.

Nickel: Can cause headaches, dizziness, and difficult breathing. Symptoms may include coughing, sore throat and shortness of breath.

2.2.2 Ingestion

Ingestion can occur from hand, clothing, food and drink contact with particulate during hand to mouth activities such as eating, drinking, smoking, nail biting, etc.

Aluminum Nitride: May cause irritation of the digestive tract.

Copper: Copper ingestion causes nausea, vomiting, abdominal pain, metallic taste, and diarrhea. Ingestion of large doses may cause stomach and intestine ulceration, jaundice, and kidney and liver damage.

Gold: Causes gastrointestinal irritation with nausea, vomiting and diarrhea.

Molybdenum: May cause reduction of red blood cells, white blood cells and/or platelets. May cause headache, fever, nausea, abdominal pain, muscle pain and bloody urine.

Nickel: Causes gastrointestinal irritation with nausea, vomiting and diarrhea.

Silver: May cause gastrointestinal irritation. Effects may be cumulative. Ingestion of silver compounds may cause abdominal pain, rigidity, convulsions and shock.

Tungsten: May cause gastrointestinal irritation with nausea, vomiting and diarrhea.

2.2.3 Skin

Skin contact with this material may cause, in some sensitive individuals, an allergic dermal response. Skin contact may cause irritation. Symptoms include redness, itching and pain.

Aluminum Nitride: May cause skin irritation.

Copper: Particulate may cause a greenish-black skin discoloration.

Gold: May cause skin sensitization, an allergic reaction, which becomes evident upon re-exposure to this material.

Nickel: May cause allergic dermatitis. Nickel is a contact allergen and sensitizer.

Silver: Skin contact may cause permanent discoloration.

2.2.4 Eyes

Exposure may result from direct contact with airborne particulate or contact to the eye with contaminated hands or clothing. Damage can result from irritation or mechanical injury to the eyes by particulate.

Copper: Particulate in the eyes may cause discoloration.

Molybdenum: May cause tearing, blurred vision, and photophobia.

2.2.5 Chronic (long-term health effects)

Copper: Prolonged or repeated exposure to copper can discolor skin and hair and irritate the skin; may cause mild dermatitis, runny nose, and irritation of the mucous membranes. Repeated ingestion may damage the liver and kidneys. Repeated Inhalation can cause chronic respiratory disease.

Manganese: Substance may have carcinogenic potential. Chronic manganese toxicity through inhalation may result in "manganism", which is a disease of the central nervous system involving psychic and neurological disorders.

Nickel: Prolonged exposure to excessive concentrations of particulate may cause chronic pulmonary disorders. Prolonged or repeated skin contact may cause sensitization dermatitis and possible destruction and/or ulceration.

Silica: Prolonged exposure to respirable crystalline quartz causes delayed lung injury/fibrosis (silicosis).

Silver: Chronic inhalation or ingestion may cause argyria characterized by blue-gray discoloration of the eyes, skin and mucous membranes. Chronic skin contact may cause permanent discoloration of the skin.

2.2.6 Carcinogenic References

Nickel: The International Agency for Research on Cancer (IARC) lists nickel as a Group 2B – Possibly Carcinogenic to Humans. However, IARC found there was inadequate evidence that metallic nickel is carcinogenic to humans but since there was sufficient evidence that it is carcinogenic to animals, IARC concluded that metallic nickel is possibly carcinogenic to humans. The National Toxicology Program (NTP) lists nickel as reasonably anticipated to be a human carcinogen based on sufficient evidence of carcinogenicity from studies in experimental animals. However, NTP reports that the available studies of the carcinogenicity of metallic nickel in humans are inadequate for an evaluation.

Silica: The International Agency for Research on Cancer (IARC) lists silica as a Group 1 – Known Human Carcinogen. The National Toxicology Program (NTP) lists silica as a Known Human Carcinogen.

2.2.7 Medical Conditions Aggravated by Exposure

Persons with impaired pulmonary function, airway diseases, or conditions such as asthma, emphysema, chronic bronchitis, etc. may incur further impairment if particulate is inhaled. If prior damage or disease to the neurologic (nervous), circulatory, hematologic (blood), or urinary (kidney) systems has occurred, proper screening or examinations should be conducted on individuals who may be exposed to further risk where handling and use of this material may cause exposure.

Copper: Persons with pre-existing skin disorders or impaired liver, kidney, or pulmonary function or pre-existing Wilson's disease may be more susceptible to the effects of this material.

Nickel: Skin contact with some nickel compounds in sensitive individuals may cause dermatitis (nickel itch).

2.3 POTENTIAL ENVIRONMENTAL EFFECTS

See Ecological Information (Section 12)

3. COMPOSITION/INFORMATION ON INGREDIENTS

CHEMICAL COMPOSITION (Percent by Weight)

ZENTRIX PRODUCT					
CONSTITUENTS	CAS Numbers	Braze Packages	Direct Bond Copper - Alumina	Heatsink - Aluminum Nitride	Metalized and Plated Alumina Ceramic
Copper	7440-50-8	5 - 20	30 - 80	15 - 25	--
Aluminum Nitride	24304-00-5	0 - 25	--	60 - 80	--
Tungsten	7440-33-7	60 - 70	--	--	--
Aluminum Oxide	1344-28-1	15 - 25	30 - 70	--	49 - 70
Nickel	7440-02-0	0 - 5	0 - 0.5	0 - 0.5	0 - 40
Molybdenum	7439-98-7	0 - 25	--	--	0 - 5
Iron	7439-89-6	0 - 6	--	--	--
Silver	7440-22-4	0 - 2	--	--	0 - 1
Silica	14808-60-7	--	--	--	0 - 2
Titanium	7440-32-6	--	--	--	0 - 1
Manganese	7439-96-5	--	--	--	0 - 1
Gold	7440-57-5	0 - 0.5	0 - 0.05	0 - 0.5	--

Hazard Communication regulations of the U.S. Occupational Safety and Health Administration apply to this product.

NOTE: As used in this Material Safety Data Sheet, the term “particulate” refers to dust, mist, fume, fragments, particles and/or powder.

4. FIRST AID MEASURES

4.1 FIRST AID PROCEDURES

INHALATION: Breathing difficulty caused by inhalation of particulate requires immediate removal to fresh air. If breathing has stopped, perform artificial respiration and obtain medical help.

INGESTION: Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person.

SKIN: 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.

EYES: Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

5. FIRE FIGHTING MEASURES

Flash Point	Not Applicable
Explosive Limits	Not Applicable
Extinguishing Media	Not Applicable
Unusual Fire and Explosion	
Hazards	Not Applicable
Special Fire Fighting Procedures	If this material becomes airborne as a respirable particulate during a fire situation, pressure-demand self-contained breathing apparatus must be worn by firefighters or any other persons potentially exposed.

6. ACCIDENTAL RELEASE MEASURES

6.1 STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED

If this material is a particulate, establish a restricted entry zone based on the severity of the spill. Persons entering the restricted zone must wear adequate respiratory protection and protective clothing appropriate for the severity of the spill (see Section 8). Cleanup spills with a vacuum system utilizing a high efficiency particulate air (HEPA) filtration system followed by wet cleaning methods. Special precautions must be taken when changing filters on HEPA vacuum cleaners used to clean up hazardous materials. Be careful to minimize airborne generation of particulate and avoid contamination of air and water. Depending upon the quantity of material released into the environment, the incident may be required to be reported to the National Response Center at (800) 424-8802 as well as the State Emergency Response Commission and Local Emergency Planning Committee.

7. HANDLING AND STORAGE

7.1 HANDLING

Particulate may enter the body through cuts, abrasions or other wounds on the surface of the skin. Wear gloves when handling parts with loose surface particulate or sharp edges.

7.2 STORAGE

Store in a dry area.

8. EXPOSURE CONTROLS, PERSONAL PROTECTION

8.1 VENTILATION AND ENGINEERING CONTROLS

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.

8.2 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 visible 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.

To prevent exposure, remove surface scale or oxidation formed on cast or heat treated products in an adequately ventilated process prior to working the surface.

8.3 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.

8.4 RESPIRATORY PROTECTION

When airborne exposures exceed or have the potential to exceed the occupational limits shown in Section 8.11, 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. Exposure to unknown concentrations of particulate requires the wearing of a pressure-demand airline respirator or pressure-demand self-contained breathing apparatus (SCBA). Use pressure-demand airline respirators when performing jobs with high potential exposures such as changing filters in a baghouse air cleaning device.

8.5 OTHER PROTECTIVE EQUIPMENT

Protective overgarments or work clothing must be worn by persons who may become contaminated with particulate during activities such as machining, furnace rebuilding, air cleaning equipment filter changes, maintenance, furnace tending, etc. Contaminated work clothing and overgarments must be managed in a controlled manner to prevent secondary exposure to workers of third parties, to prevent the spread of particulate to other areas, and to prevent particulate from being taken home by workers.

8.6 PROTECTIVE GLOVES

Wear gloves to prevent contact with particulate or solutions. Wear gloves to prevent metal cuts and skin abrasions during handling.

8.7 EYE PROTECTION

Wear safety glasses, goggles, face shield, or welder's helmet when risk of eye injury is present, particularly during melting, casting, machining, grinding, welding, powder handling, etc.

8.8 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.

8.9 MAINTENANCE

During repair or maintenance activities the potential exists for exposures to particulate in excess of the occupational standards. Under these circumstances, protecting workers can require the use of specific work practices or procedures involving the combined use of ventilation, wet and vacuum cleaning methods, respiratory protection, decontamination, special protective clothing, and when necessary, restricted work zones.

8.10 EXPOSURE CHARACTERIZATION

Determine exposure to airborne particulate by air sampling in the employee breathing zone, work area, and department. Utilize an Industrial Hygienist or other qualified professional to specify the frequency and type of air sampling. Develop and utilize a sampling strategy which identifies the extent of exposure variation and provides statistical confidence in the results. Conduct an exposure risk assessment of processes to determine if conditions or situations exist which dictate the need for additional controls or improved work practices. Make air sample results available to employees.

8.11 OCCUPATIONAL EXPOSURE LIMITS

CONSTITUENTS	OSHA*			ACGIH*		NIOSH RTECS NUMBER
	PEL	CEILING	PEAK	TLV	TLV-STEL	
Aluminum Nitride (as Al) Respirable	5	N/A	N/A	1	N/A	Unlisted
Aluminum Nitride (as Al) Total Dust	15	N/A	N/A	N/A	N/A	Unlisted
Aluminum Oxide Respirable	5	N/A	N/A	1	N/A	BD1200000
Aluminum Oxide Total Dust	15	N/A	N/A	N/A	N/A	BD1200000
Copper Dust & Mist	1	N/A	N/A	1	N/A	GL5325000
Copper Fume	0.1	N/A	N/A	0.2	N/A	GL5325000
Iron Oxide Fume	10	N/A	N/A	N/A	N/A	NO456550
Iron Oxide Respirable	N/A	N/A	N/A	5	N/A	NO7400000
Manganese (as Mn)	N/A	5	N/A	0.2	N/A	OO9275000
Molybdenum Total Dust	15	N/A	N/A	N/A	N/A	QA4680000
Molybdenum Inhalable	N/A	N/A	N/A	10	N/A	QA4680000
Molybdenum Respirable	N/A	N/A	N/A	3	N/A	QA4680000
Nickel	1	N/A	N/A	1.5	N/A	QR5950000
Silica (Quartz) (Respirable)	0.1	N/A	N/A	0.1	N/A	VV7330000
Silver	0.01	N/A	N/A	0.1	N/A	VW3500000
Titanium Dioxide Total Dust	15	N/A	N/A	10	N/A	XR1700000
Tungsten	N/A	N/A	N/A	5	10	YO7175000

*ALL CONCENTRATIONS ARE IN MILLIGRAMS PER CUBIC METER OF AIR
(at the concentrations noted above, these constituents may not be visible to the human eye)

A leading scientific body recommending occupational standards is the American Conference of Governmental Industrial Hygienists (ACGIH). The ACGIH recommends standards for all listed substances. The ACGIH defines a threshold limit value (standard) as follows: "Threshold Limit Values refer to airborne concentrations of substances and represent conditions under which it is believed that nearly all workers may be repeatedly exposed day after day without adverse health effects. Because of wide variation in individual susceptibility, however, a small percentage of workers may experience discomfort from some substances at concentrations at or below the threshold limit; a smaller percentage may be affected more seriously by aggravation of a pre-existing condition or by development of an occupational illness." "Individuals may also be hypersusceptible or otherwise unusually responsive to some industrial chemicals because of genetic factors, age, personal habits (smoking, alcohol, or other drugs), medication, or previous exposures. Such workers may not be adequately protected from adverse health effects from certain chemicals at concentrations at or below the threshold limits."

- ACGIH = American Conference of Governmental Industrial Hygienists
- OSHA = Occupational Safety and Health Administration
- PEL = Eight-Hour Average Permissible Exposure Limit (OSHA)
- CEILING = Not To Be Exceeded Except for Peak Limit (OSHA)
- PEAK = 30-Minute Maximum Duration Concentration Above Ceiling Limit (OSHA)
- TLV = Eight-Hour Average Threshold Limit Value (ACGIH)
- TLV-STEL = 15-Minute Short Term Exposure Limit (ACGIH)
- CAS = Chemical Abstract Service
- NIOSH = National Institute for Occupational Safety and Health
- RTECS = Registry of Toxic Effects of Chemical Substances
- N/A = Not Applicable

Zentrix recommends following good industrial hygiene practice which includes reducing airborne exposures to the lowest feasible level for all constituents in this product.

9. PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL PROPERTIES

Boiling Point:	Not Applicable	Radioactivity:	Not Applicable
Evaporation Rate:	Not Applicable	Solubility:	Insoluble
Freezing Point:	Not Applicable	Sublimes At	Not Applicable
Odor:	None	Vapor Density (Air = 1):	Not Applicable
pH:	Not Applicable	Vapor Pressure (mmHg):	Not Applicable
Physical State:	Solid	% Volatiles By Volume:	Not Applicable

PHYSICAL PROPERTIES			
Alloy Number/Product Name	Color	Melting Point (°F)	Density (lb/in3)
Heatsink - Aluminum Nitride	Light Gray	>3992	.0117 (AlN)
Metalized and Plated Alumina Ceramic	White/Gray	3722	0.126
Direct Bond Copper - Alumina	Mixed	3722 (Al2O3)	.126 (Al2O3)
Braze Packages	Mixed	6085 (W)	.697 (W)

10. STABILITY AND REACTIVITY

General Reactivity	This material is stable.
Incompatibility (materials to avoid)	Not Applicable
Hazardous Decomposition Products	None under normal conditions of use. Aluminum nitride substrate may emit irritating or toxic fumes upon decomposition.
Hazardous Polymerization	Will not occur

11. TOXICOLOGICAL INFORMATION

For questions concerning toxicological information, write to: Medical Director, Brush Wellman Inc., 14710 West Portage River South Road, Elmore, Ohio 43416-9502.

12. ECOLOGICAL INFORMATION

This material can be recycled; contact your Sales Representative.

13. DISPOSAL CONSIDERATIONS

13.1 BYPRODUCT RECYCLING

When recycled (used in a process to recover metals), this material is not classified as hazardous waste under federal law. Seal particulate or particulate containing materials inside two plastic bags, place in a DOT approved container, and label appropriately.

13.2 SOLID WASTE MANAGEMENT

When spent products are declared solid wastes (no longer recyclable), they must be labeled, managed and disposed of, in accordance with federal, state and local requirements. This material may contain silver, one of the metals regulated under RCRA. See Section 3 for chemical composition.

14. TRANSPORT INFORMATION

There are no U.S. Department of Transportation hazardous material regulations which apply to the packaging and labeling of this product as shipped by Zentrix.

Hazard Communication regulations of the U.S. Occupational Safety and Health Administration require this product be labeled.

15. REGULATORY INFORMATION

15.1. UNITED STATES FEDERAL REGULATIONS

15.1.1 Occupational Safety and Health Administration (OSHA)

Air contaminants, 29 CFR 1910.1000
Hazard Communication Standard, 29 CFR 1910.1200

15.1.2 Environmental Protection Agency (EPA)

AMBIENT AIR EMISSIONS: Most process air emission sources will require an air permit from a local and/or state air pollution control agency. The use of air cleaning equipment may be necessary to achieve the permissible emission. Tempered makeup air should be provided to prevent excessive negative pressure in a building. Direct recycling of cleaned process exhaust air is not recommended. Plant exhausts should be located so as not to re-enter the plant through makeup air or other inlets. Regular maintenance and inspection of air cleaning equipment and monitoring of operating parameters is recommended to ensure adequate efficiency is maintained.

WASTEWATER: Wastewater regulations can vary considerably. Contact your local and state governments to determine their requirements.

TOXIC SUBSTANCES CONTROL ACT: Component(s) of this material is/are listed on the TSCA Chemical Substance Inventory of Existing Chemical Substances

SARA TITLE III REPORTING REQUIREMENTS: On February 16, 1988, the U.S. Environmental Protection Agency (EPA) issued a final rule that implements the requirements of the Superfund Amendments and Reauthorization Act (SARA) Title III, Section 313 (53) Federal Register 4525. Title III is the portion of SARA concerning emergency planning and community right-to-know issues. Section 313 covers annual emission reporting on specific chemicals which are manufactured, processed or used at certain U.S. Industrial facilities.

Zentrix products are reportable under the Section 313 category of Compounds and/or Mixtures. These mixtures contain one or more of the following reportable constituents: Aluminum Oxide, Copper, Nickel and Silver. The specific chemical makeup, concentration by weight and the Chemical Abstracts Services number for each of our products is provided in Section 3.

You may obtain additional information by calling the EPA SARA Title III Hotline at 1-800-535-0202 (or 703-412-9810).

15.2 STATE REGULATIONS

Aluminum Nitride

- Is listed on the following state right-to-know lists: California, New Jersey, Florida, Pennsylvania, Minnesota and Massachusetts.
- California No Significant Risk Level: Not listed.

Aluminum Oxide

- Is listed on the following state right-to-know lists: California, New Jersey, Florida, Pennsylvania, Minnesota and Massachusetts.
- California No Significant Risk Level: Not Listed

Copper

- Is listed on the following state right-to-know lists: California, New Jersey, Florida, Pennsylvania, Minnesota and Massachusetts.
- California No Significant Risk Level: Not listed.

Gold

- California No Significant Risk Level: Not listed.

Manganese

- Is listed on the following state right-to-know lists: California, New Jersey, Florida, Pennsylvania, Minnesota and Massachusetts.
- California No Significant Risk Level: Not Listed

Molybdenum

- Is listed on the following state right-to-know lists: California, New Jersey, Florida, Pennsylvania, Minnesota and Massachusetts.
- California No Significant Risk Level: Not listed.

Nickel

- Is listed on the following state right-to-know lists: California, New Jersey, Florida, Pennsylvania, Minnesota and Massachusetts.
- The following statement is made in order to comply with the California Safe Drinking Water Act - **WARNING:** This product contains NICKEL, a chemical known to the state of California to cause cancer.
- California No Significant Risk Level: Not listed.

Silica

- Is listed on the following state right-to-know lists: New Jersey, Florida, Pennsylvania, Minnesota and Massachusetts.
- The following statement is made in order to comply with the California Safe Drinking Water Act - **WARNING:** This product contains SILICA, CRYSTALLINE, a chemical known to the state of California to cause cancer.
- California No Significant Risk Level: Not listed.

Silver

- Is listed on the following state right-to-know lists: California, New Jersey, Florida, Pennsylvania, Minnesota and Massachusetts.
- California No Significant Risk Level: Not Listed

Titanium

- Is listed on the following state right-to-know lists: California and New Jersey.
- California No Significant Risk Level: Not listed.

Tungsten



- Is listed on the following state right-to-know lists: California, New Jersey, Florida, Pennsylvania, Minnesota and Massachusetts.
- California No Significant Risk Level: Not listed.

15.3 CANADA

<u>Constituent</u>	<u>DSL/NDSL</u>	<u>WHMIS Classification</u>	<u>Ingredient Disclosure List</u>
Aluminum Nitride	Yes/No	Not classified	No
Aluminum Oxide	Yes/No	Not classified	Yes
Copper	Yes/No	D2B	Yes
Gold	Yes/No	Not classified	No
Manganese	Yes/No	D2A	Yes
Molybdenum	Yes/No	B4, D2B	Yes
Nickel	Yes/No	D2A	Yes
Silica	Yes/No	D2B	Yes
Silver	Yes/No	Not classified	Yes
Titanium	Yes/No	Not available	No
Tungsten	Yes/No	Not classified	Yes

16. OTHER INFORMATION

Following is the label which accompanies this product during shipment.

<p>Z02</p> <p style="text-align: center;">Heatsink - Alumina, Heatsink - Aluminum Nitride</p> <p style="text-align: center;"> WARNING </p> <p style="text-align: center;">POTENTIAL CANCER HAZARD</p> <p style="text-align: center;">READ THE MATERIAL SAFETY DATA SHEET (MSDS) ON FILE WITH YOUR EMPLOYER BEFORE WORKING WITH THIS MATERIAL.</p> <hr/> <p>This product contains nickel.</p> <ul style="list-style-type: none">• If processing or recycling produces particulate, use exhaust ventilation or other controls designed to prevent exposure to workers. Examples of such activities include cutting, grinding, abrasive sawing, machining, sanding and polishing. Any activity which abrades the surface of this material can generate airborne particulate.• The Occupational Safety and Health Administration (OSHA) has set mandatory limits on occupational exposures.• In solid form and as contained in finished products presents no special health risks.• Sold for manufacturing purposes only. This product can be recycled; contact your sales representative. <p>The Occupational Safety and Health Administration requires employers to provide training in the proper use of this product.</p> <hr/> <p>For further information, please telephone or write to: Product Stewardship Department, Brush Wellman Inc., 6070 Parkland Boulevard, Mayfield Heights, Ohio 44124, telephone: (800) 862-4118, www.brushwellman.com. For transportation emergency call Chemtrec at (800) 424-9300.</p> <p style="text-align: right;">Z02</p>

*Label may vary in size

*Label color (Dark gray edge with black lettering)

This MSDS has been revised following the guidelines outlined in the American National Standard for Hazardous Industrial Chemicals -“Material Safety Data Sheets - Preparation.” Z400.1-2004

MSDS Status: Reorganized Sections 2 and 3 to meet ANSI Z400.1-2004.

IMPORTANT: If you have any questions or require additional information regarding the materials described in this Material Safety Data Sheet, please telephone or write to the Product Stewardship Department at the location given on page 1. Additional product safety information, such as Safety Facts, is available from your sales representative or at <http://www.zentrix.com>.