MATERION

Processing Copper Beryllium Alloys

SF105 - Version 3, March, 2018

CuBe

Copper beryllium (CuBe), in solid form and as contained in finished products, presents no special health risks. Most manufacturing operations conducted properly on well-maintained equipment are capable of safely processing copper beryllium containing materials. However, like many industrial materials, copper beryllium may present a health risk if handled improperly. The inhalation of dust, mist or fume containing beryllium can cause a serious lung condition in some individuals. The degree of hazard varies, depending on the form of the product, how it is processed and handled, as well as the amount of beryllium in the product. Read the product specific Safety Data Sheet (SDS) for additional environmental, health, and safety information before working with copper beryllium alloys.

In addition, processing copper beryllium alloys shall be conducted in accordance with the Beryllium Standard for General Industry (29 CFR 1910.1024) established by the Occupational Safety and Health Administration (OSHA) which includes a Permissible Exposure Limits (PEL) of 0.2 microgram beryllium per cubic meter (0.2 $\mu g/m^3$) as an 8-hour Time Weighted Average (TWA), a Short-Term Exposure Limit (STEL) of 2.0 $\mu g/m^3$ determined over a 15-minute sampling period and ancillary requirements prompted at an Action Level (AL) of 0.1 $\mu g/m^3$ or other specified situations.

Potential for exposure to beryllium-containing particulate should be determined by conducting a workplace exposure characterization which includes air sampling in the worker's breathing zone, work area and throughout the department. Use an industrial hygienist or other qualified professional to establish the frequency and type of air sampling necessary. Develop and implement a sampling approach that identifies the extent of potential exposure variation and provides statistical confidence in the results. Make air sample results available to workers.

Facilities handling beryllium-containing materials in ways which generate particulate are encouraged to use engineering and work practice controls, including personal protective equipment, to control potential worker exposure. Use exposure controls to keep beryllium work areas clean and keep beryllium particulate out of the lungs, off the skin, off of clothing, in the work process, in the work area and on the plant site. It remains the best practice to maintain levels of all forms of beryllium exposure as low as reasonably achievable, and continue to work to improve exposure control practices and procedures.

SOURCES OF EXPOSURE

The following table provides a summary of those copper beryllium processes that typically present low inhalation concern (green).

Low Inhalation Concern Operations			
Adhesive Bonding	Drawing	Packaging	Skiving
Age Hardening (<950°F)	Drilling	Painting	Slitting
Assembly	Electroless Plating	Physical Testing	Stamping
Bending	Electroplating	Piercing	Straightening
Blanking	Filing by Hand	Pilger	Stretch Bend Leveling
Bonding	Gun Drilling	Plating	Stretcher Leveling
Boring	Hand Solvent Cleaning	Pressing	Swaging
Broaching	Handling	Radiography/X-ray	Tapping
CNC Machining	Heading	Reaming	Tensile Testing
Cold Heading	Heat Treating (inert	Ring Rolling	Thread Rolling
Cold Pilger	atmosphere)	Roll Bonding	Trepanning
Cold Rolling	Inspection	Sawing (tooth blade)	Turning
Cutting	Machining	Shearing	Ultrasonic Cleaning
Deburring (non-grinding)	Metallography	Shipping	Ultrasonic Testing
Deep Hole Drilling	Milling	Sizing	

Notes:

1) Operations in the "Low Inhalation Concern" category represent operations that typically release non-respirable (>10 micrometer) particles, are not expected to generate significant ultra-fine particulate, and/or are not expected to result in exposures in excess of the OSHA PEL.
2) This list is not all-inclusive and variation can exist within specific processes. To verify the adequacy of engineering and work practice controls, conduct an exposure characterization of all copper beryllium processing operations.
3) Age hardening, as included in this table, is a heat treatment process conducted at <950°F.
4) When evaluating operations, consideration must be given to potential exposures from activities in support of these operations such as setup, preparation, cleanup and maintenance.

The following table provides a summary of those copper beryllium processes that may present a likely inhalation hazard (yellow).

Likely Inhalation Hazard Operations			
Abrasive Blasting	Dross Handling	Laser Cutting	Sanding
Abrasive Processing	Dry Tumbling	Laser Machining	Scrap Management (Clean)
Abrasive Sawing	Electrical Chemical Machining (ECM)	Laser Scribing	Sectioning
Annealing	Electrical Discharge Machining (EDM)	Laser Marking	Slab Milling
Brazing	Electron Beam Welding (EBW)	Laser Welding	Soldering
Bright Cleaning	Extrusion	Laundering	Solution Management
Brushing	Forging	Melting	Spot Welding
Buffing	Grinding	Photo-Etching	Sputtering
Burnishing	Heat Treating (in air)	Pickling	Torch cutting (i.e., oxy- acetylene)
Casting	High Speed Machining (>10,000 rpm)	Point and Chamfer	Tumbling
Centerless Grinding	Honing	Polishing	Upsetting
Chemical Cleaning	Hot Forging	Process Ventilation Maintenance	Water-jet Cutting
Chemical Etching	Hot Rolling	Resistance Welding	Welding (ARC, TIG, MIG, etc.)
Chemical Milling	Investment Casting	Ring Forging	Wire Electrical Discharge Machining (WEDM)
Cold Forging	Lapping	Roller Burnishing	
Coolant Management		Rotary forging	
Deburring (grinding)		Sand Blasting	
Destructive Testing		Sand Casting	

Notes:

1) Operations in the “Likely Inhalation Hazard” category represent those operations which may release respirable (<10 micrometer) particles, may generate ultra-fine particulate, may generate beryllium oxide and/or may result in exposures in excess of the OSHA PEL.
2) This list is not all-inclusive and variation can exist within specific processes. Determine, then verify, the adequacy of engineering and work practice controls by conducting an exposure characterization of all copper beryllium processing operations.
3) Effective ventilation, work practices and personal protective equipment use can control a “Likely Inhalation Hazard”.
4) When evaluating operations, consideration must be given to potential exposures from activities in support of these operations such as setup, preparation, cleanup and maintenance.
5) High temperature annealing (>1000^{o}F) conducted in air can generate a loose beryllium-containing oxide scale that can flake off during processing and become airborne. Annealing in an inert or reducing atmosphere can minimize the formation of surface metal oxides.
6) Pickling, as included in this table, involves the use of strong acid and/or caustic solutions to remove metal oxides from the surface of beryllium-containing alloys. Other chemical cleaning or surface preparation operations should be characterized to determine potential exposure risk.
7) The use of the term "may generate ultra-fine particulate” to categorize the hazard of particular operations addresses the hypothesis that exposure to a large number of beryllium-containing particles with low mass and an aerodynamic diameter of 1 micrometer or less increases the risk of developing CBD.

ADDITIONAL INFORMATION

The information contained in this Safety Facts applies only to the subject referenced in the title. Read the SDS specific to the products in use at your facility for more detailed environmental, health and safety guidance. SDSs can be obtained by contacting the Materion Brush Inc. Product Safety Hotline at (800) 862-4118 or website at www.materion.com.

Additional information can also be obtained by contacting a Materion Brush Inc. Sales Representative or:

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