

Beryllium

Hazard Awareness Bulletin
April 2023

Helping to reduce your exposure to Beryllium during metal production and fabrication.

What is Beryllium?

Beryllium is a white-gray lightweight metal with highly valued mechanical and thermal properties, that is used in both an elemental form in specialty applications and also in alloys.

Beryllium metal is used for lightweight structural components in the defense and aerospace industries due to stiffness, weight, and thermal stability properties. Alloys with aluminum, iron, nickel and notably copper (beryllium-copper alloys do not spark when impacted with steel) are common uses of beryllium.

Beryllium oxide (beryllia) is a hard, white ceramic material that is an electrical insulator with exceptionally high thermal conductivity and a high melting point, making it suitable as a specialty refractory material.

How can Beryllium affect me?

Workplace exposures to beryllium have been associated with a range of potential health effects – some can result from short-term acute exposures, others from long-term, repetitive, chronic exposures. Common symptoms can include irritation of the eyes, nose, and throat.

Did you know?

Pneumoconiosis is the accumulation of dust in the lungs and the subsequent reaction to its presence. The term covers a wide range of different diseases and is derived from the Greek, meaning “dusty lungs”.

Pneumoconiosis are generally long-term and irreversible diseases characterized by inflammation (pneumonitis) and scarring (pulmonary fibrosis) of the lung tissue. However, in some cases, particularly silicosis. Rapidly progressive forms can occur after only short periods of intense exposure.

Potential acute health effects associated with metal production or fabrication

- Eye and skin irritation
- Corn-like lesions from beryllium swarf contact
- “Acute beryllium disease” – from short-term, large exposures
- Wheezing, shortness of breath, cough, fatigue
- Pneumonitis

Potential chronic health effects associated with metal production or fabrication

- Allergic dermatitis
- “Chronic Beryllium Disease, CBD (Berylliosis)
- Pneumoconiosis and pneumonitis
- Wheezing, shortness of breath, cough, fatigue
- Pulmonary Fibrosis
- Lung and respiratory cancers

Potential health effects associated with other industries or compounds

- Eye and skin irritation from soluble beryllium salt contact

Additional Information

- Beryllium is classified as a Group 1 - Carcinogenic to humans by the International Agency for Research on Cancer (IARC), and as an A1 - Confirmed human carcinogen by the American Conference of Governmental Industrial Hygienists (ACGIH).

When do workplace exposures occur?

Inhalation

Often the primary route of beryllium exposure is through inhaling dust and fumes from the production and working of elemental beryllium and alloys. In metal fabrication the welding, grinding, cutting, drilling, and polishing of alloys that contain beryllium can result in significant exposure.

What is welding fume?

The majority of welding fume is filler material that is vaporized by the welding arc. The gaseous metal will react with oxygen in the air to form a metal oxide and will solidify to form tiny metal oxide particles, or fume. Some welding fume will originate from the metals being welded. Many filler materials will contain metals that are known to be toxic and that can have potential health effects if inhaled. The contents of the filler material and the amount of welding fume generated will vary by welding process.

Hot Work

Other high energy or “hot work” processes, including cutting, grinding, and even polishing metals can create particles of metal and metal oxides that can be inhaled.

Other industrial applications may create dusts, mists, or fumes of beryllium. For example, the handling or application of powered or liquid chemicals which contain beryllium.

Dermal

The secondary route of exposure is through contact with the skin and eyes, particularly if beryllium is in a liquid form that can readily pass through or damage the skin.

Ingestion

Workers can be exposed by the accidental ingestion of beryllium, for example workers eating, drinking, smoking, or biting their nails when their hands are contaminated.

Did you know?

Metal workers, and particularly welders, are prone to developing pneumonia infections. There is a clear correlation between welders and increased risk of developing serious or fatal pneumonia infections.

Industries / Applications where workplace exposures may occur

Examples of metal production and fabrication applications, as well as other industries and processes in which individuals may be exposed to beryllium compounds:

Metal production, metal fabrication and related applications

- Specialty alloys production, welding, grinding, and machining e.g. copper-beryllium alloys used in the aerospace and nuclear industries.

Other applications

- Neutron moderator for the nuclear industry
- X-ray generators and detectors
- Electrical control gear and switchgear
- Injection mold coating for durability
- Electronics equipment, including lasers and microwave devices

Note: Workers are also at risk of exposure from inhaling mists of beryllium salts. Beryllium exposure is a particular issue through dermal exposure to soluble salts as well as metal dusts and swarf from working with beryllium metals and alloys.

Medical surveillance

Those who are, or are likely to be significantly exposed to beryllium, may be required by national, state, or provincial regulations to undergo regular health checks and medical surveillance, including periodic monitoring of beryllium levels within their blood or urine.

National, state regulations typically define a “suspension level,” a concentration of beryllium in the blood or urine that must not be exceeded. If the “suspension level” is exceeded then the worker will need to be removed from work tasks that may result in further exposures, and an investigation leading to corrective actions implemented.

National, state regulations may also set an “action level,” a concentration of (metal) in the blood or urine which, if exceeded, may trigger the implementation of additional monitoring and control measures.

What can I do to help protect my workers?

Use appropriate controls

Employers need to conduct a risk assessment, including a determination of exposure levels compared to exposure limits to understand what control measures may be needed.

If required, controls from the hierarchy of controls should be implemented and their effectiveness measured. For example, local exhaust ventilation (LEV) can be a highly effective engineering control used in welding, grinding, and many other applications.

Get the equipment that you need

In addition to implementing other control measures, Personal Protective Equipment (PPE) such as Respiratory Protective Equipment (RPE) is commonly used to reduce exposures and risks to workers.

Respiratory Protective Equipment (RPE) – air-purifying respirators

3M has a range of RPE that can help reduce your exposure to dusts, mists, metal fume, as well as gases and vapors commonly encountered in metal production and fabrication. These include disposable particulate respirators, reusable half- and full-facepiece respirators, all the way to heavy-duty battery powered air-purifying respirators combined with a range of robust facepieces, headtops, and helmets.

Respiratory Protective Equipment (RPE) – supplied air respirators

3M also has a wide range of supplied air respirators, suitable for use in some of the most demanding work environments.

Welding shields with respiratory protections

3M also has a wide range of 3M™ Speedglas™ Welding shields that provide eye and face protection from harmful radiation, sparks, and spatter. All of these welding shields can be used with 3M disposable or reusable half-facepiece respirators. Alternatively, 3M has welding shields and helmets that are designed to work with 3M powered or supplied air systems that provide multiple types of protection in one product.

Eye and Face Protective Equipment

Whether it be a 3M™ Speedglas™ welding visor with an auto-darkening filter or a lightweight full face shield, 3M has a full range of PPE to help protect you from the many hazards encountered in welding and metal working.

Other PPE

3M can also provide a wide range of other safety solutions including:

- Head, eye, and face protection
- Disposable and reusable ear plugs and ear muffs
- Protective Communication solutions
- Disposable protective coveralls
- Fall protection
- Confined space solutions



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Training

A key component of an effective PPE program is training for both workers and those responsible for health and safety in the workplace.

For example, workers wearing PPE should be trained in and understand:

- How PPE works, what it does, and its limitations
- Inspection, maintenance, and cleaning of the PPE as well as identifying defective PPE and knowing proper disposal
- Proper fitting and use of the PPE
- The nature of all hazardous substances present and the potential effects upon their health

Stay Informed

When selecting the appropriate protective equipment, local, state or national regulations, laws, and guidelines need to be followed.

One of the tasks of the occupational safety and health specialist is to monitor constantly changing legal regulations, occupational exposure limits, etc.

Technical Help

At any time, you can get in touch with one of our PPE professionals for personalized help on the selection and use of 3M products. They can help you through the process of selecting suitable products based on your risk assessment, as well as helping you understand how to fit, use, and maintain your PPE – helping you to stay protected.

References and Resources

Webelements: Webelements. Beryllium: the essentials. [Online] [Cited: 1 October 2018.] <https://www.webelements.com/beryllium/>.

Smedlehy, et al: Smedley, J, Dick, F and Sadhra, S. Oxford Handbook of Occupational Health (second edition). 2013

HSE - [metal] and you: Health and Safety Executive (HSE). INDG311 - Beryllium and you. Working with beryllium - are you at risk? [Online] [Cited: 1 October 2018.] <http://www.hse.gov.uk/pubns/indg311.pdf>.

ACGIH TLVs: American Conference of Governmental Industrial Hygienists (ACGIH(R)). Threshold Limit Values for Chemical Substances and Physical Agents & Biological Exposure Indices (TLVs(R) and BEIs(R)). 2018

OSHA SLTC: Occupational Safety and Health Administration (OSHA). Safety and Health Topics - Beryllium. [Online] [Cited: 8 October 2018.] <https://www.osha.gov/SLTC/beryllium/index.html>.

NIOSH Pocket Guide: The National Institute for Occupational Safety and health (NIOSH). NIOSH Pocket Guide to Chemical Hazards. [Online] [Cited: 22 November 2018.] <https://www.cdc.gov/niosh/npg/default.html>.

IARC: International Agency for Research on Cancer (IARC). IARC Monograph - Beryllium and Beryllium Compounds. [Online] [Cited: 8 October 2018.] <https://monographs.iarc.fr/wp-content/uploads/2018/06/mono100C-7.pdf>.

Nemery: Metal toxicity and respiratory tract. Nemery, B. 1990, Eu Respir J, Vol. 3. pp. 202-219.

Palmer: Palmer et al (2009). Mortality from infectious pneumonia in metal workers: a comparison with deaths from asthma in occupations exposed to respiratory sensitizers. THORAX Online first, published on August 23, 2009.

HSE Burden of cancer: Health and Safety Executive (HSE). RR858 - The burden of occupational cancer in Great Britain - Lung Cancer. 2012. [Online] [Cited: 22 November 2018.] <http://www.hse.gov.uk/research/rrpdf/rr858.pdf>

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