

Occupational Health Guideline for Rhodium Metal Fume and Dusts (as Rhodium)

INTRODUCTION

This guideline is intended as a source of information for employees, employers, physicians, industrial hygienists, and other occupational health professionals who may have a need for such information. It does not attempt to present all data; rather, it presents pertinent information and data in summary form.

SUBSTANCE IDENTIFICATION

- Formula: Rh
- Synonyms: None
- Appearance: Gray fume or dust.

PERMISSIBLE EXPOSURE LIMIT (PEL)

The current OSHA standard for rhodium metal fume and dusts is 0.1 milligram of rhodium metal fume and dusts (as rhodium) per cubic meter of air (mg/m^3) averaged over an eight-hour work shift.

HEALTH HAZARD INFORMATION

• Routes of exposure

None: See "Summary of toxicology."

• Effects of overexposure

1. *Short-term Exposure:* None known.
2. *Long-term Exposure:* None known.
3. *Reporting Signs and Symptoms:* A physician should be contacted if anyone develops any signs or symptoms and suspects that they are caused by exposure to rhodium metal fume and dusts.

• Recommended medical surveillance

Routine medical examinations should be provided to each employee who is exposed to rhodium metal fume and dusts at potentially hazardous levels.

• Summary of toxicology

No toxic effects of rhodium metal fume and dusts have been reported from animal experiments or from observations on human beings.

CHEMICAL AND PHYSICAL PROPERTIES

• Physical data

1. Molecular weight: 102.9
2. Boiling point (760 mm Hg): Above 2500 C (4532 F)
3. Specific gravity (water = 1): 12.4
4. Vapor density (air = 1 at boiling point of rhodium metal fume and dusts): Not applicable
5. Melting point: 1966 C (3570 F)
6. Vapor pressure at 20 C (68 F): Essentially zero
7. Solubility in water, g/100 g water at 20 C (68 F): Insoluble
8. Evaporation rate (butyl acetate = 1): Not applicable

• Reactivity

1. Conditions contributing to instability: None
2. Incompatibilities: None
3. Hazardous decomposition products: None
4. Special precautions: None

• Flammability

1. Not combustible

• Warning properties

Rhodium metal fume and dusts are not known to be eye irritants.

MONITORING AND MEASUREMENT PROCEDURES

• General

Measurements to determine employee exposure are best taken so that the average eight-hour exposure is based on a single eight-hour sample or on two four-hour samples. Several short-time interval samples (up to 30 minutes) may also be used to determine the average exposure level. Air samples should be taken in the employee's breathing zone (air that would most nearly represent that inhaled by the employee).

• Method

Sampling and analyses may be performed by collection of rhodium metal fume and dusts on a filter, followed by

These recommendations reflect good industrial hygiene and medical surveillance practices and their implementation will assist in achieving an effective occupational health program. However, they may not be sufficient to achieve compliance with all requirements of OSHA regulations.

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treatment with nitric acid, solution in hydrochloric acid, treatment with potassium bisulfate, and atomic absorption spectrophotometric analysis. An analytical method for rhodium metal fume and dusts is in the *NIOSH Manual of Analytical Methods*, 2nd Ed., Vol. 3, 1977, available from the Government Printing Office, Washington, D.C. 20402 (GPO No. 017-033-00261-4).

RESPIRATORS

- Good industrial hygiene practices recommend that engineering controls be used to reduce environmental concentrations to the permissible exposure level. However, there are some exceptions where respirators may be used to control exposure. Respirators may be used when engineering and work practice controls are not technically feasible, when such controls are in the process of being installed, or when they fail and need to be supplemented. Respirators may also be used for operations which require entry into tanks or closed vessels, and in emergency situations. If the use of respirators is necessary, the only respirators permitted are those that have been approved by the Mine Safety and Health Administration (formerly Mining Enforcement and Safety Administration) or by the National Institute for Occupational Safety and Health.
- In addition to respirator selection, a complete respiratory protection program should be instituted which includes regular training, maintenance, inspection, cleaning, and evaluation.

COMMON OPERATIONS AND CONTROLS

The following list includes some common operations in which exposure to rhodium metal fume and dusts may occur and control methods which may be effective in each case:

Operation	Controls
Liberation during manufacture of platinum alloys for use in thermocouples, windings for resistance furnaces, laboratory crucibles and catalysts for chemical processing, and preparation of dental castings	General dilution ventilation; local exhaust ventilation
Liberation during production and casting of rhodium powder during refining and recovery	General dilution ventilation; local exhaust ventilation; personal protective equipment

Operation

Use in applying thin reflective coatings by sublimation to scientific instruments, radio and radar equipment, searchlight reflectors, cinema projections, and headlight reflectors

Controls

General dilution ventilation; local exhaust ventilation

EMERGENCY FIRST AID PROCEDURES

In the event of an emergency, institute first aid procedures and send for first aid or medical assistance.

• Breathing

If a person breathes in large amounts of rhodium metal fume and dusts, move the exposed person to fresh air at once. If breathing has stopped, perform artificial respiration. Keep the affected person warm and at rest. Get medical attention as soon as possible.

• Swallowing

When rhodium metal dust has been swallowed and the person is conscious, give the person large quantities of water immediately. After the water has been swallowed, try to get the person to vomit by having him touch the back of his throat with his finger. Do not make an unconscious person vomit. Get medical attention.

SPILL AND DISPOSAL PROCEDURES

- If potentially hazardous amounts of rhodium metal fume and dusts are spilled or inadvertently released, the following steps should be taken:

1. Ventilate area of spill or release.
2. Collect spilled material in the most convenient and safe manner for reclamation or for disposal in a secured sanitary landfill.

• Waste disposal method:

Rhodium metal dusts may be disposed of in a secured sanitary landfill.

REFERENCES

- American Conference of Governmental Industrial Hygienists: "Rhodium as Rh," *Documentation of the Threshold Limit Values for Substances in Workroom Air* (3rd ed., 2nd printing), Cincinnati, 1974.
- Browning, E.: *Toxicity of Industrial Metals* (2nd ed.), Butterworths, London, 1969.
- International Labour Office: *Encyclopedia of Occupational Health and Safety*, McGraw-Hill, New York, 1971.
- Patty, F. A. (ed.): *Toxicology*, Vol. II of *Industrial Hygiene and Toxicology* (2nd ed. rev.), Interscience, New York, 1963.

RESPIRATORY PROTECTION FOR RHODIUM METAL FUME AND DUSTS (AS RHODIUM)

Condition	Minimum Respiratory Protection* Required Above 0.1 mg/m ³
Particulate Concentration	
0.5 mg/m ³ or less	Any dust and mist respirator.
1 mg/m ³ or less	Any fume respirator or high efficiency particulate respirator. Any dust and mist respirator, except single-use or quarter-mask respirator. Any supplied-air respirator. Any self-contained breathing apparatus.
5 mg/m ³ or less	A high efficiency particulate filter respirator with a full facepiece. Any supplied-air respirator with a full facepiece, helmet, or hood. Any self-contained breathing apparatus with a full facepiece.
100 mg/m ³ or less	A powered air-purifying respirator with a high efficiency particulate filter. A Type C supplied-air respirator operated in pressure-demand or other positive pressure or continuous-flow mode.
200 mg/m ³ or less	A Type C supplied-air respirator with a full facepiece operated in pressure-demand or other positive pressure mode or with a full facepiece, helmet, or hood operated in continuous-flow mode.
Greater than 200 mg/m ³ or entry and escape from unknown concentrations	Self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive pressure mode. A combination respirator which includes a Type C supplied-air respirator with a full facepiece operated in pressure-demand or other positive pressure or continuous-flow mode and an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.
Fire Fighting	Self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive pressure mode.

*Only NIOSH-approved or MSHA-approved equipment should be used.