Mercury and Mercury Compounds Safe Handling Guideline

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Synonyms

Mercury metal, colloidal mercury, metallic mercury, quicksilver

Reactivity and Physical Concerns

Mercury is a silver liquid metal that vaporizes at temperatures as low as 10º F. Mercury vapor is colorless and odorless. If a mercury spill is not cleaned up promptly it may be ground into the floor, dispersing into extremely small particles with a large total surface area (6.4 ft^2 for 1 ml as 10 micron spheres). From such large areas mercury may vaporize at a rate faster than the room's ventilation can safely dilute it. The rate of mercury volatilization is directly related to temperature. A common occurrence is the breaking of thermometers in ovens due to bumping or raising the oven above the thermometer's capacity. Additionally, the impact of mercury at high velocities or its release into high air velocity systems will also atomize mercury into extremely small particle sizes and large surface area.

Elemental mercury is incompatible with acetylene, aluminum, ammonia, azides, calcium, chlorates, chlorine dioxide, copper, copper alloys, ethylene oxide, halogens, iron, metal oxides, nitrates, oxygen, lithium, lead, nitromethane, rubidium, sodium carbide, sulfur, sulfuric acid, and others.

Exposure Hazards

Routes of Exposure

Inhalation, ingestion, skin contact, eye contact

A pool of mercury exposed to the air can produce airborne concentrations greater than the permissible exposure limit of 0.05 mg/m^3. Organo-alkyl mercury compounds are highly toxic and can be fatal on contact with skin (e.g., a Dartmouth chemistry professor died in 1997 from an exposure to dimethylmercury that penetrated through a latex glove). Elemental mercury can remain on the skin for many hours creating the potential for ingestion.

Chronic Exposure

Chronic poisoning can be caused by long-term exposure to low levels of mercury. Steady exposure can cause a slow buildup of mercury in the body that produces illness, personality changes, and eventual disability. Symptoms of chronic poisoning include tremors, mental disturbances such as insomnia, irritability and indecision, headache, fatigue, muscular weakness, stomach ache, excessive salivation, digestive disturbances, anorexia, weight loss, inability to absorb protein, and eye and skin irritation.

First Aid

Obtain medical attention immediately.
- Eye contact: irrigate immediately
- Skin contact: wash promptly with soap
- Breathing: oxygen administration and respiratory support

- Ingestion: immediate medical attention

(See Chemical Safety: Accidental Exposure Requirements [SLAC-I-730-0A09S-041].)

Exposure Limits

Metallic Mercury Vapor

- NIOSH REL: TWA 0.05 mg/m^3 (skin)
- Other: C 0.1 mg/m^3 (skin)
- OSHA PEL: C 0.1 mg/m^3
- IDLH: 10 mg/m^3 (as Hg)

Organo-alkyl Mercury Compounds

- NIOSH REL: TWA 0.01 mg/m^3, ST 0.03 mg/m^3 (skin)
- OSHA PEL: TWA 0.01 mg/m^3 C 0.04 mg/m^3
- IDLH: 2 mg/m^3 (as Hg)

Exposure Controls

Engineering Controls

The use of mercury is restricted. Use an alternative if one is available. For example, use alcohol thermometers instead of mercury ones, oil bubblers instead of mercury bubblers when possible; reducing agents other than mercury amalgams, etc. Avoid using mercury thermometers in ovens. When handling mercury use a glass, plastic, or steel tray to contain any spills that might occur. Glass or plastic vessels should have a secondary steel or plastic container around them in case the vessel fails.

Administrative Controls

Managers and supervisors must notify ESHQ before beginning new processes involving mercury or mercury compounds. Plastic containers should be used to store mercury whenever possible. Label all equipment and vessels containing mercury. Close all containers of mercury when not in use. Store mercury in a secured area. Maintain a written inventory of mercury usage, location, and amounts.

Personal Protective Equipment

Skin. Elemental mercury requires nitrile, PVC, or latex gloves. Organo-alkyl mercury compounds require the use of silver shield, 4H, or other brand laminate-style gloves and outer gloves (heavy-duty nitrile or neoprene, with long cuffs).

Eye. Safety glasses or safety goggles.

Respiratory. Elemental mercury vapor: concentrations up to 0.5 mg/m^3, a half-face air purifying respirator with a cartridge that provides protection for mercury vapor can be used. For concentrations between 0.5 and 2.5 mg/m^3 a full face cartridge respirator may be used. Above that a self-contained breathing apparatus is required. Organo-alkyl mercury vapor: due to the high toxicity of organo-alkyl mercury compounds, a self-contained breathing apparatus is required if concentrations are in excess of the PEL.

Disposal

Material is disposed of as hazardous waste. Do not combine it with “regular” organic or inorganic wastes. **Never dispose of down the sink.** Contact the Waste Management Group for specific disposal requirements and procedures.

Medical Monitoring (if applicable)

ESHQ will determine the need for biological monitoring or medical surveillance examinations of workers with potential mercury exposure based on an evaluation of the operation and workplace controls.

Emergency Response

Do not attempt to clean up spilled mercury. In the event of a spill, immediately evacuate the area and call 911. Then call SLAC Site Security (ext. 5555 or 650-926-5555 from a cell phone) and notify your supervisor. (See Spills: Response, Cleanup, and Reporting Procedure [SLAC-I-750-0A16C-006].)

Standards and Regulations

- OSHA. PEL: 29 CFR 1910.1000 Table Z-1; Respiratory Protection: 29 CFR 1910.134
- EPA. Release: 40 CFR 355.40; Waste: 40 CFR 261.21-261.24
- *California Fire Code*, Chapters 27 through 41 (24 CCR Part 9)

Other References

- NLM. TOXNET: Toxicology Data Network
- NIOSH. International Chemical Safety Card: Mercury (ICSC 0056)
- Lawrence Livermore National Laboratory, *Environment, Safety, and Health Manual*, Document 14.5, “Safe Handling of Mercury and Mercury Compounds”