



Material Safety Data Sheet

FERROMANGANESE ALLOYS

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1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Identifier: High Carbon Ferromanganese, Standard Ferromanganese

2. COMPOSITION/INFORMATION ON INGREDIENTS¹

	wt. %	CAS Registry #	EXPOSURE LIMITS 8 hrs. TWA (mg/m ³)	
			OSHA PEL	ACGIH TLV
Manganese	74.0 – 82.0%	7439-96-5	5 (ceiling)	0.2
Iron	20.5 – 25.0%	7439-89-6		
Carbon	5.0 – 7.5%	7440-44-0		
Silicon	0.3 – 1.5%	7440-21-3		
Chromium	0.1 – 0.5%	7440-47-3	0.5	0.5
Nickel	0.1 – 0.5%	7440-02-0	1	1

¹ Elemental analysis of the alloy. The manufacturer can provide a more detailed analysis, including other trace elements.

3. HAZARDS IDENTIFICATION

This product does not represent a significant hazard to health, safety or the environment when handled and stored as advised (see Section 7). Repeated, long term inhalation of ferromanganese alloy dust in excess of exposure limits may cause adverse health effects (see Section 11). Handling of ferromanganese does not represent a health risk when usual safety rules are observed. Flammable and noxious gases may be formed in contact with moisture and/or acids (see Sections 10 and 11). Ferromanganese alloy dust suspended in air may under certain conditions cause dust explosions (see Section 5).

4. FIRST AID MEASURES

INHALATION:

Emergency responders should use the appropriate respiratory protection when moving an affected victim to fresh air. Give artificial respiration if breathing has stopped. Call for prompt medical attention (See Section 11).

SKIN CONTACT:

Wash skin with water and/or a mild detergent. If irritation develops, seek medical attention.

EYE CONTACT:

Rinse eyes with large amounts of water/saline solution until no particles remain in eye. See a physician on persistent feeling of discomfort or if irritation occurs.

INGESTION:

Incidental ingestion of small quantities of airborne material in a dusty atmosphere does not represent a significant acute hazard. If large amounts are swallowed, get prompt medical attention.

5. FIRE FIGHTING MEASURES

COMBUSTIBILITY:

Ferromanganese alloy, as packaged, is not combustible. When suspended in air, dust of ferromanganese alloy can be ignited, will propagate flame readily, and may generate considerable pressure and/or a mild explosion. Avoid generating sparks or ignition sources in areas of high airborne dust levels or in areas with accumulated dust. The degree of combustibility in air is dependent upon particle size, oxide coating, and quality of dispersion. The hazard increases with particle fineness. Thoroughly clean areas or equipment to be maintained prior to dust disturbing or ignition source generation activities. (See Section 10).

AUTO IGNITION TEMPERATURE (dust layer):

Ferromanganese alloy 555°F (290°C).

LOWER EXPLOSIVE LEVEL (airborne dust):

Ferromanganese alloy – 130 gr/m³.

COMBUSTION PRODUCTS:

Oxides of constituent elements.

MINIMUM IGNITION ENERGY:

Manganese – 80 millijoules; iron – 100 millijoules

EXTINGUISHING MEDIA:

Class D fire: Use dry powder, dry sand, or CO₂ to smother fire. Fire may also be isolated and allowed to burn itself out. Do not disturb metal while extinguishing the fire.

6. ACCIDENTAL RELEASE MEASURES

LAND SPILL:

Ferromanganese alloy spilled on the land represents minimal hazard. Cleanup personnel should wear appropriate respiratory protective equipment when addressing fine material.

Avoid the use of compressed air to maneuver spills or leaks of fine material. Fine material should be swept up or vacuumed using explosion-proof equipment. Keep dry material and wet material separated. Place recovered material in disposal container. Avoid repackaging wet materials in sealed containers.

WATER SPILL:

Remove spilled product from water body by dipping or other appropriate means. Avoid repackaging wet materials in sealed containers.

7. HANDLING AND STORAGE

HANDLING:

Avoid handling that generates dust build-up. Avoid inhalation of dust (see Section 8). Avoid ignition sources (e.g. welding) in areas with high dust concentrations. Addition of wet product to molten metal may cause explosions (see Section 10).

STORAGE:

Ferromanganese alloy should be stored in a dry location at ambient temperatures. Avoid contact with hydrochloric acid (HCl) and nitric acid (HNO₃).

8. EXPOSURE CONTROLS /PERSONAL PROTECTION

ENGINEERING CONTROLS:

The use of local exhaust ventilation is recommended to control emissions near the source. Provide appropriate ventilation of confined spaces. Use explosion-proof ventilation equipment. See Section 2 for Component Exposure Guidelines.

PERSONAL PROTECTION:

Eye protection, eye flushing facilities and protective gloves are recommended. Ensure adequate ventilation. Wear an appropriate particulate respirator in accordance with 29 CFR 1910.134 or CSA Standard Z94.4-M1982 for dust exposure that may exceed exposure limits. Area and/or personal air monitoring is recommended to determine whether exposures are below permissible limits. If exposure to phosphine and arsine is suspected (see Section 10), or if adequate ventilation is not possible, then a self contained breathing apparatus or an air supplied respirator is recommended.

OCCUPATION EXPOSURE LIMITS (OSHA AND ACGIH):

	8-hour TWA (mg/m ³)	
	OSH PEL	ACGIH TLV
Total inhalable dust	15	10
Respirable dust	5	3
Manganese	5 (ceiling)	0.2
Chromium	0.5	0.5
Nickel	1	1
Phosphine gas (PH ₃)	0.4	0.42
Arsine gas (AsH ₃)	0.2	0.16

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Lump or Granule
Color:	Silvery grey, metallic surface
Odor:	Odorless
Solubility:	Insoluble in Water
Melting Point (°C):	1243°C
Specific Gravity (water = 1):	Approx. 4.5

10. STABILITY AND REACTIVITY

GENERAL:

Ferromanganese alloy is stable and hazardous polymerization will not occur.

CONDITIONS TO AVOID:

Avoid generating sparks and other ignition sources (e.g. welding) in areas with high dust concentrations. Ferromanganese alloy particles suspended in air can cause dust explosions. Addition of wet material to molten metal may cause explosions.

MATERIALS TO AVOID:

Avoid contact with water and/or acids.

HAZARDOUS REACTION/DECOMPOSITION PRODUCTS:

Highly flammable hydrogen gas (H₂) and the highly flammable and very toxic gases phosphine and arsine (garlic-like smell), both heavier than air, may be formed if ferromanganese alloy comes in contact with moisture, acids or bases. Contact with acids (pH<7) may result in generation of silane (SiH₄), a spontaneously combustible gas. Wet product will form highly flammable hydrogen gas if added to molten metal, due to decomposition of water.

11. TOXICOLOGICAL INFORMATION

ACUTE EFFECTS:

INHALATION:

Finely divided dust may irritate and dehydrate mucous membranes. Phosphine/arsine may be absorbed from dust deposited on mucous membranes. The toxic mechanism for phosphine is not clear. Phosphine irritates exposed mucous membranes, depresses the central nervous system (CNS) and can cause edema of the lungs. Acute, non-fatal poisoning with phosphine gives temporary effects, including but not limited to malaise, vomiting, stomach pains, cough, and difficulty in breathing. Symptomatic treatment: Corticosteroids, prophylactic for edema of the lungs.

SKIN CONTACT:

Frequent or prolonged contact may irritate the skin and cause a skin rash (dermatitis).

EYE CONTACT:

Dust may irritate and cause dryness but will not permanently injure eye tissue.

INGESTION:

No hazard in normal industrial use.

CHRONIC EFFECTS:

Manganese poisoning (Manganism) can occur from excessive intake of manganese via inhalation and ingestion. The most notable effects of manganese poisoning are central nervous system disorders which may occur as early as six months after initial exposure. Symptoms include apathy, drowsiness, sleep disturbance, muscular twitching, spastic gait, and emotion control problems. Permanent injury of the central nervous system may occur if chronic manganese poisoning is not treated.

Prolonged exposure (years) to phosphine may lead to chronic effects such as difficulty in movement and speech problems. Epidemiological studies in the Norwegian ferroalloy industry have neither shown an increased rate of mortality, nor an increased incidence of cancer.

Fumes produced through heating metal to high temperatures may be associated with pneumoconiosis. Ferromanganese alloys are not known to be reproductive toxins, teratogens, or mutagens.

POTENTIAL HEALTH EFFECTS:

This product contains chromium in the metallic state. The International Agency for Research on Cancer has determined that chromium and certain chromium compounds are “casually associated with cancer in humans” but “the compounds responsible for the carcinogenic effect in humans cannot be specified”. This requires that chromium in all forms be identified as carcinogenic under OSHA. The American Conference of Governmental Industrial Hygienists has reviewed the available data and concluded that specific water soluble and insoluble hexavalent chromium compounds are carcinogenic to humans.

NIOSH/OSHA “Guide for Chemical Hazards” conclusions are consistent with ACGIH; however, NIOSH recommended that all hexavalent chromium compounds be considered carcinogenic until proven otherwise. No recommendations have been made by ACGIH or NIOSH to include chromium metal or chromous and chromic salts as carcinogenic.

The International Agency for Research on Cancer has determined that nickel and certain nickel compounds are “probably carcinogenic to humans” but the nickel compounds responsible for the effect have not been specified. This requires that nickel in all forms be identified as carcinogenic under OSHA. The American Conference of Governmental Industrial Hygienists has reviewed the available data and concluded that not all forms of nickel are carcinogenic. The American Industrial Hygiene Association has also concluded that there is no epidemiological evidence of increased risk of respiratory cancer in the refining of oxide ores or “in any other specifically nickel occupational exposures”.

12. ECOLOGICAL INFORMATION

Ferromanganese alloy is not characterized as a hazard to the environment.

13. DISPOSAL CONSIDERATIONS

Avoid repackaging wet material in sealed containers. Dispose of in accordance with applicable federal, state, and local regulations. Ferromanganese alloy is not a listed RCRA Hazardous Waste (40 CFR 261).

14. TRANSPORT INFORMATION

DOT (DEPARTMENT OF TRANSPORTATION):

Proper Shipping Name: Not Regulated
Hazard Class: Not Regulated
I.D. Number and Initials: Not Regulated
Packing Group: Not Regulated
Label(s): Not Regulated

15. REGULATORY INFORMATION

OSHA (Occupational Safety and Health Administration)
Hazardous by definition of hazardous communication standard (29 CFR 1910.1200)
TSCA (Toxic Substance Control Act):
Components of this product are listed on the TSCA Inventory.

CERCLA (Comprehensive Response Compensation, and Liability Act):
Ferromanganese alloy is not found in "List of Hazardous Substances and Reportable Quantities" (40 CFR 302.4). No RQ has been assigned for the generic or broad class of "Manganese and Compounds".

RCRA (Resource Conservation/Recovery Act):
Ferromanganese alloy is not a listed hazardous waste.

SARA TITLE III (Superfund Amendments and Reauthorization Act):
311/312 Hazard Categories:
Immediate Health, Delayed Health, Fire.
313 Reportable Ingredients:
Manganese (CAS No. 7439-96-5)
Chromium (CAS No. 7440-47-3)
Nickel (CAS No. 7440-02-0)

CALIFORNIA PROPOSITION 65:
This product contains chemical(s) known to the State of California to cause cancer:
Nickel

16. OTHER INFORMATION

Literature references are available upon request from the manufacturer.

The information presented in this Material Safety Data Sheet relates to this specific material. It may not be valid for this material if used in combination with any other materials or in any process. It is the user's responsibility to verify the suitability and completeness of this information for the particular use intended.

