

NUCOR[®]

SAFETY DATA SHEET

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Trade Name: Ladle Metallurgy Furnace (LMF) Steelmaking Slag

CAS Number: 65996-71-6 (Slag, steelmaking)

Synonyms: LMF Slag

Use/Description: Aggregate, road base, construction aggregates varying sizes, rock-like material

Nucor Mills with LMF - Locations		24 Hour Contact – CHEMTREC 1-800-424-9300	
Nucor Steel South Carolina 300 Steel Mill Road Darlington, S.C. 29540 (843) 393-5841	Nucor Steel Berkeley 1455 Hagan Avenue Huger, SC 29450 (843) 336-6000	Nucor Steel Nebraska 2911 East Nucor Road Norfolk, Nebraska 68701 (402) 644-0200	Nucor Steel Gallatin 4831 U.S. Hwy 42 West Ghent, KY 41045 (859)567-3100
Nucor Steel Auburn 25 Quarry Road Auburn, N.Y. 13021 (315) 253-4561	Nucor Steel Tuscaloosa 1700 Holt Road NE Tuscaloosa, AL35404 (205) 556-1310	Nucor Steel Decatur 4301 Iverson Blvd. Trinity, Alabama 35673 (256) 301-3500	Nucor Steel Memphis 3601 Paul R. Lowry Road Memphis, TN 38109 (901) 786-5900
Nucor Steel Texas U.S. Highway 79 South Jewett, Texas 75846 (903) 626-4461	Nucor Steel Hertford Cnty 1505 River Road Cofield, N.C. 27922 (252) 356-3700	Nucor Steel Arkansas 7301 E. Cnty Road 142 Blytheville, AR 72315 (870) 762-2100	Nucor Yamato Steel 5929 E. State Hwy 18 Armored, AR 72310 (870) 762-5500
Nucor Steel Indiana 4537 South Nucor Road Crawfordsville, IN 47933 (765) 364-1323	Nucor Steel Brandenburg 100 Ronnie Greenwell Commerce Rd. Brandenburg, KY 40108		

For general product information, contact mill as listed above. For emergencies, use the 24 Hour Contact.

OSHA Hazards

Target Organ Effect - Lungs, Central Nervous System, Skin Irritation, Eye Irritation

GHS Classification

	Health	Environmental	Physical
Pictogram	Eye Irritation (Category 2B)	Not Classified	Not Classified
Signal Word	Skin Irritation (Category 2)		
Hazard Statements	Specific Target Organ Toxicity – Single Exposure (Category 3)		
	Specific Target Organ Toxicity – Repeated Exposure (Category 1 and 1A)		
Dust/fume may cause skin irritation H320	 		
Causes eye irritation.	Danger	Warning	

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H303	May be harmful if swallowed.
H335	May cause respiratory irritation.
H351	Inhalation of dust/fume suspected of causing cancer.
H372	Inhalation of dust/fume causes damage to respiratory system and central nervous system through prolonged or repeated exposure.
H350	May cause lung cancer

Precautionary Statements

P202	Do not handle until all safety precautions have been read and understood.
P261	Avoid breathing dust/fume.
P262	Wash thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P272	Contaminated work clothing should not be allowed out of the workplace.
P280	Wear protective gloves / protective clothing / eye protection / face protection.
P308 + P313	If exposed or concerned: Get medical advice/attention.

Emergency Overview

Ladle Metallurgy Furnace Slag is composed mainly of oxides of iron, calcium, magnesium, and manganese, varying amounts of other metallic oxides, and crystalline silica (cristobalite). Electric arc furnace (EAF) Slag has components that are hazardous under OSHA's Hazard Communication Standard (29 CFR 19120.1200).

Granular solid or aggregate with no appreciable odor. Skin Irritant, Possibly Corrosive.

Potential Health Effects

Routes of exposure

Skin Contact, Eye, Inhalation.

IMMEDIATE EFFECTS:

Skin (Contact and Absorption)

May cause mechanical or chemical irritation, redness and pain. Contains calcium oxide that may cause irritation or damage to the skin.

Eyes

May cause mechanical or chemical irritation, tearing, redness and pain. Contains calcium oxide that may cause severe irritation or permanent damage to the tissues of the eye.

Inhalation

May cause irritation, coughing. Contains substances that may cause severe irritation one of which is calcium oxide a corrosive. Contains manganese and its salts: Manganese inhalation may cause flu-like illness (metal fume fever), characterized by chills, fever, aching muscles, dryness in the throat and mouth and headache, possible resulting in fatal pneumonia.

Ingestion

Not expected to be a normal route of exposure. Ingestion may cause symptoms similar to inhalation.

DELAYED/LONG TERM EFFECTS:

Chronic Exposure

Contains manganese and its salts: Chronic manganese exposure may affect the Lung, Kidney, Brain / Central Nervous System and Blood /Blood forming organs with early symptoms like sluggishness, sleepiness and weakness in legs. Advanced cases have shown fixed facial expression, emotional

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disturbances, spastic gait. Illness closely resembles Parkinson's Disease. Kidney effects, blood changes, lung damage and manganese psychosis may result from chronic exposure.

May contain crystalline silica. Chronic respiratory exposure to silica may cause lung disease. Symptoms may include shortness of breath, coughing and right heart enlargement or heart failure. Not all individuals with silicosis will exhibit symptoms. Silicosis is progressive and symptoms can appear at any time, even after exposure has ceased. Tobacco smoking may increase the risk of developing lung disorders, including emphysema and lung cancer.

Carcinogenic Effects

May contain crystalline silica that can cause a disease called silicosis. Crystalline silica is classified by the International Agency for Research on Cancer (IARC) as carcinogenic to humans (Group 1). The National Toxicology Program (NTP) has characterized respirable silica as "known to be a human carcinogen".

Reproductive Effects

No product specific data.

TARGET ORGAN EFFECTS: LUNG, KIDNEY, BRAIN / CENTRAL NERVOUS SYSTEM AND BLOOD FORMING ORGANS.

SIGNS AND SYMPTOMS OF OVEREXPOSURE: COUGHING, IRRITATION TO THE EYE OR SKIN.

3. COMPOSITION/INFORMATION ON INGREDIENTS

<u>Components</u>	<u>CAS No.</u>	<u>% Weight</u>
Aluminum Oxide	1344-28-1	0- 40%

Ladle Metallurgy Furnace Slag is a complex mixture that can change due to changes in feedstocks and the method used for manufacturing steel. **Exact specifications for specific products may be available upon request.** This **Ladle Metallurgy Furnace Slag** product may contain small amounts of various elements in addition to those listed. These "trace" or "residual" amounts may exist as intentional additions, or as elements that generally originate in raw materials used. These elements may include, but necessarily limited to (weight %) barium ($\leq 0.004\%$), boron ($\leq 0.004\%$), chromium ($\leq 0.004\%$), manganese ($\leq 0.05\%$), nickel ($\leq 0.0009\%$), and titanium ($\leq 0.07\%$). Product did not contain detectable levels (reporting limit weight %) of hexavalent chromium (< 0.00001), antimony ($< 0.003\%$), arsenic ($< 0.003\%$), beryllium ($< 0.0004\%$), bismuth ($< 0.02\%$), cadmium ($< 0.0005\%$), cobalt ($< 0.0009\%$), copper ($< 0.002\%$), lead ($< 0.003\%$), mercury (< 0.000004), molybdenum ($< 0.001\%$), potassium ($< 0.003\%$), selenium ($< 0.005\%$), silver ($< 0.001\%$), thallium ($< 0.003\%$), tin ($< 0.0009\%$), vanadium ($< 0.0005\%$), zinc ($< 0.003\%$), or zirconium ($< 0.001\%$).

4. FIRST AID MEASURES

Inhalation

If overexposure to dusts and/or fumes occurs, remove person to fresh air. If symptoms develop, seek medical attention.

Skin Contact

If irritation occurs, wash affected areas with soap or mild detergent and water. If irritation persists, seek medical attention.

Eye Contact

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Flush eyes with large amounts of water to remove particles. Eye injury from solid particles should be treated by a physician.

Ingestion

If an excessive amount of dust is ingested, rinse mouth with water. Seek medical attention if you feel unwell.

5. FIRE FIGHTING MEASURES

Suitable Extinguishing Media

Use extinguishers appropriate for surrounding materials.

Special Protective Equipment and Precautions for Firefighters

Use self-contained breathing apparatus (SCBA) and full-protective clothing when fumes and/or smoke from fire are present.

Hazardous Combustion Products

Heat and flames cause release of acrid smoke and metallic oxide fumes.

Unusual Fire and Explosion Hazards

Do not use water on molten metal. Accumulation of metal dust can be combustible.

NFPA Rating

Health hazard = 1; Fire = 0; Instability = 0.

6. ACCIDENTAL RELEASE MEASURES

Accidental Release

For spills involving particles, avoid inhalation, eye, or skin contact of dusts using appropriate precautions outlined in this Safety Data Sheet (SDS) (see Section 8). Remove fine, dry material by vacuuming or wet sweeping methods to prevent spreading of the dust. Avoid using compressed air.

Environmental Precautions

Do not release particulate into sewers or waterways.

Methods and Materials for Containment and Cleanup

Collect material in appropriate labeled containers for recovery or disposal in accordance with federal, state, and local regulations. Follow applicable OSHA regulations (29 CFR 1910.1200) and all other pertinent state and federal requirements.

7. HANDLING AND STORAGE PRECAUTIONS

Precautions for Safe Handling

Operations with the potential for generating high concentrations of particulate and/or fumes should be evaluated and controlled as necessary. Avoid breathing dust and/or fumes. Practice good housekeeping to minimize the accumulation of surface dust.

Conditions for Safe Storage

Store away from strong acids and oxidizers; e.g., sodium hypochlorite. Magnesium oxide reacts violently with halogens.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Occupational Exposure Limits			
Chemical	OSHA PEL¹	ACGIH TLV²	NIOSH REL³
Aluminum metal	15 mg/m ³ (total dust, PNOR) ⁵ 15 mg/m ³ (respirable, PNOR)	10 mg/m ³	NE ⁴

Notes to Occupational Exposure Limits table:

¹ OSHA Permissible Exposure Limits (PEL) are 8-hour TWA (time-weighted average) concentrations unless otherwise noted. A “C” designation denotes a ceiling limit, which should not be exceeded during a workday.

² Threshold Limit Values (TLV) established by the ACGIH are 8-hour TWA concentrations unless otherwise noted.

³ NIOSH Recommended Exposure Limit (REL) is a TWA concentration for up to a 10-hour workday during a 40-hour workweek. STEL denotes a Short-Term Exposure Limit defined as a 15-minute exposure, which should not be exceeded during a workday.

⁴ **R** = Respirable Fraction; **I** = Inhalable Fraction; **NE** = None Established; **PNOR** = Particulates Not Otherwise Regulated. Includes all inert or nuisance dusts, whether mineral, inorganic, not listed specifically in 29 CFR 1910.1000.

Engineering Controls

General Ventilation: General room ventilation is adequate for processing that does not generate dusts or fumes.

Local Exhaust: For processes that generate dusts or fumes, a local exhaust system is recommended.

Personal Protective Equipment (PPE)

Eye and Face Protection: Safety glasses with side shields for normal use.

Skin Protection

Under normal use, wear work gloves to prevent direct skin contact.

Respiratory Protection

A respiratory protection program that meets OSHA’s 29 CFR 1910.134 or ANSI Z88.2 requirements must be followed whenever workplace conditions warrant respirator use. Where unknown concentrations are encountered or during an emergency, use NIOSH approved supplied air respirator

9. PHYSICAL AND CHEMICAL PROPERTIES

ODOR: None.

pH (aqueous solution): <11

DENSITY: 3.2 – 3.6 typical

PHYSICAL STATE: Granular solid or aggregate.

MELTING POINT: Not known.

SOLUBILITY IN WATER: Partially soluble

10. STABILITY AND REACTIVITY

Stability

Stable under normal storage and handling conditions

Incompatibility

Avoid contact with strong acids or oxidizers; e.g., calcium hypochlorite.

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Hazardous Polymerization

Will not occur

Chemical incompatibilities

Iron oxide dusts in contact with calcium hypochlorite can evolve oxygen and may be sufficient to cause an explosion.

Hazardous Decomposition Products

Under fire conditions, product may release toxic metal oxide fumes and/or carbon monoxide or carbon dioxide.

Other

This product is a mixture that contains a large percentage of hygroscopic, calcium salts. Changes in the moisture content of this product may change the density resulting in expansion and contraction of the material.

Polymerization: Hazardous polymerization will not occur.

11. TOXICOLOGICAL INFORMATION

Toxicological information is not available for Ladle Metallurgy Furnace Slag as sold/shipped. Following data is for the components.	
LD ₅₀ (lethal animal dose, 50%) or LC ₅₀ (lethal animal concentration, 50%)	
Iron Oxide: LD ₅₀ = 10000 mg/kg (Oral/Rat)	Manganese: LD ₅₀ 1484 mg/kg (Oral/Rat)
Iron: LD ₅₀ = 1060 mg/kg (Oral/Rat)	Magnesium Oxide: TD _{LO} 1.1 mg/m ³ /24 hr/29 days (Inhalation/Rat)
Chromium (Cr⁺⁶): LD ₅₀ = 80 mg/kg (Oral/Rat)	Nickel: LD ₅₀ = >9000 mg/kg (Oral/Rat); LC ₅₀ = 10 mg/L (Inh/Rat)
Copper Oxide: LD ₅₀ = 470 mg/kg (Oral/Rat)	Crystalline silica: LD ₅₀ = 22,500 mg/kg (Oral/Rat)
Lead: LD _{LO} = 1400 mg/g (Oral/Dog)	Silicon: LD ₅₀ = 3160 mg/kg (Oral/Rat)
Calcium Oxide: LD ₅₀ 3059 mg/kg (Intraperitoneal/Mouse)	Aluminum Oxide: LD ₅₀ = >5000 mg/kg (Oral/Rat)
Skin (Dermal) Irritation.	
Iron, Copper Oxide: Cause skin irritation.	Chromium (Cr⁺⁶): Human Skin Sensitizer
Copper: Copper alloys may induce allergic contact dermatitis in susceptible individuals.	Nickel: Slight irritation (rabbits). Nickel Oxide: Human Skin Sensitizer
Eye Irritation.	
Iron Oxide, Copper Oxide: Irritating	Metallic particulates: Irritation from mechanical abrasion
Carcinogenicity	
Ladle Metallurgy Furnace Slag is not listed by IARC, National Toxicology Program (NTP), or OSHA as a carcinogen or as a reasonably anticipated to be a human carcinogen.	
Crystalline Silica (quartz or cristobalite): IARC Group 1 carcinogen (Carcinogenic to Humans); NTP-K (Known to be Carcinogenic to Humans); and NIOSH-Ca (Potential Occupational Carcinogen).	
Chromium Metal and Chromium (III): Chromium metal – IARC Group 3 Carcinogen (not classifiable as to their human carcinogenicity). Hexavalent chromium – IARC Group 1 Carcinogen (Carcinogenic to Humans).	

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Nickel and certain Nickel compounds: Elemental Nickel - IARC Group 2B Carcinogen (Possibly Carcinogenic to Humans). Nickel compounds – IARC Group I Carcinogen (Carcinogenic to Humans). NIOSH – Potential Occupational Carcinogen.
Specific Target Organ Systemic Toxicity (Repeated Exposure)
Manganese: Inhalation of metallic fumes and dusts – degenerative changes in human brain; behavioral changes in motor activity and muscle weakness. Prolonged inhalation exposure to manganese fumes/dusts is associated with “manganism,” a Parkinson-like syndrome characterized by a variety of neurological symptoms including muscle spasms, gait disturbances, tremors, and psychoses.
Iron Oxide: Inhalation of high concentrations of iron oxide fumes or dusts may result in the development of a benign pneumoconiosis, called Siderosis, which is observable as an X-ray change. No physical impairment of lung function has been associated with Siderosis.
Ecotoxicity (Aquatic & Terrestrial): No information is available for Ladle Metallurgy Furnace Slag as sold. However, components of the product have been found to be toxic to the environment. Iron Oxide: LD ₅₀ >40 mg/L (<i>Cloeon dipterium</i> , mayfly); LC ₅₀ >10,000 mg/L (<i>Gambusia affinis</i> , western mosquitofish) Chromium: LC ₅₀ 3.32 mg/L (<i>Duttaphrynus melanostictus</i> , Asian toad); LC ₅₀ 93.6 mg/L (<i>Cyprinus carpio</i> , common carp) Manganese: LC ₅₀ 15.6 mg/L (<i>Oncorhynchus mykiss</i> , rainbow trout) Aluminum Oxide: LC ₅₀ >500 mg/L (<i>Daphnia magna</i> , water flea) Zinc: EC ₅₀ 704 µg/L (<i>P. promelas</i>); EC ₅₀ >2000 µg/L (<i>S. fontinalis</i>); EC ₅₀ 220 µg/L (<i>H. azteca</i>) Calcium Oxide: LC ₅₀ >159 mg/L (Invertebrates); 96 Hr LC ₅₀ 1070 mg/L (<i>Cyprinus carpio</i> , carp) Crystalline Silica: LC ₅₀ carp >10,000 mg/L/72 hr.
Persistence and Degradability: No specific information is available for Ladle Metallurgy Furnace Slag as sold.
Bioaccumulative Potential: No specific information is available for Ladle Metallurgy Furnace Slag as sold.
Mobility in Soil: No specific information is available for Ladle Metallurgy Furnace Slag as sold. However, individual components of the product have been found to be absorbed by plants from soil. Metal dusts may migrate into soil and groundwater and be ingested by wildlife.

Radiation

This product is normally free of radiation.

12. ECOLOGICAL INFORMATION

Ecotoxicity (Aquatic & Terrestrial): No information is available for Ladle Metallurgy Furnace Slag as sold. However, components of the product have been found to be toxic to the environment. Iron Oxide: LD ₅₀ >40 mg/L (<i>Cloeon dipterium</i> , mayfly); LC ₅₀ >10,000 mg/L (<i>Gambusia affinis</i> , western mosquitofish) Chromium: LC ₅₀ 3.32 mg/L (<i>Duttaphrynus melanostictus</i> , Asian toad); LC ₅₀ 93.6 mg/L (<i>Cyprinus carpio</i> , common carp) Manganese: LC ₅₀ 15.6 mg/L (<i>Oncorhynchus mykiss</i> , rainbow trout) Aluminum Oxide: LC ₅₀ >500 mg/L (<i>Daphnia magna</i> , water flea) Zinc: EC ₅₀ 704 µg/L (<i>P. promelas</i>); EC ₅₀ >2000 µg/L (<i>S. fontinalis</i>); EC ₅₀ 220 µg/L (<i>H. azteca</i>) Calcium Oxide: LC ₅₀ >159 mg/L (Invertebrates); 96 Hr LC ₅₀ 1070 mg/L (<i>Cyprinus carpio</i> , carp) Crystalline Silica: LC ₅₀ carp >10,000 mg/L/72 hr.
Persistence and Degradability: No specific information is available for Ladle Metallurgy Furnace Slag as sold.

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Bioaccumulative Potential: No specific information is available for **Ladle Metallurgy Furnace Slag** as sold.

Mobility in Soil: No specific information is available for **Ladle Metallurgy Furnace Slag** as sold. However, individual components of the product have been found to be absorbed by plants from soil. Metal dusts may migrate into soil and groundwater and be ingested by wildlife.

13. DISPOSAL CONSIDERATIONS

Please note that the following information pertains only to the unused, uncontaminated material.

RCRA CLASSIFICATION: Not considered a hazardous waste under RCRA 40 CFR 261. See table under REGULATORY INFORMATION section.

U.S. EPA HAZARDOUS WASTE NUMBER: Not Applicable.

DISPOSAL RECOMMENDATIONS: Reuse and recycle whenever possible. Unusable material may be disposed of with normal waste.

14. TRANSPORT INFORMATION

DOT Proper Shipping Name - Not regulated

DOT Hazard Classification - Not regulated

UN/NA Number - Not applicable

DOT Packing Group - Not applicable

Labeling Requirements - Not applicable

Placards - Not applicable

DOT Hazardous Substance - Not applicable

DOT Marine Pollutant - Not applicable

15. REGULATORY INFORMATION

This product is not hazardous under the criteria of the Federal OSHA Hazard Communication Standard 29 CFR 1910.1200. However, dusts and fumes from this product may be hazardous.

California Proposition 65:

⚠ WARNING: This product can expose you to chemicals including aluminum oxide and chromium which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov.

Regulatory Lists

Some components of this product may be specifically listed by individual states; other product-specific health and safety data in other sections of the SDS may also be applicable for state requirements. For details on your regulatory requirements, you should contact the appropriate agency in your state.

Toxic Substances Control Act (TSCA)

Components of this product are listed on the TSCA Inventory.

Comprehensive Environmental Response, Compensation and Liability Act (CERCLA)

Slag is not reportable, however, it contains hazardous substances that may be reportable if released in pieces with diameters less than or equal to 0.004 inches (RQ marked with a “*”).

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<u>Chemical Name</u>	<u>Reportable Quantity (in lb)</u>
Chromium	5000*

Superfund Amendments and Reauthorization Act of 1986 (SARA), Title III

SECTION 311/312 HAZARD CATEGORIES: Immediate Health Effect, Delayed Health Effect

This product contains the following EPCRA Section 313 chemicals subject to the reporting requirements of section 313 of the Emergency Planning and Community Right – To – Know Act of 1986 (40 CFR 372):

SECTION 313 REPORTABLE INGREDIENTS:

<u>Chemical Name</u>	<u>CAS Number</u>	<u>Concentration (% by weight)</u>	<u>Reportable</u>
Aluminum Oxide	1344-28-1	0-30%	Yes – Greater than 1%
Lead	7439-92-1	0-0.01%	Yes – No de minimis level

Concentrations based on analytical data and process knowledge of typical products distributed by the facility.

16. OTHER INFORMATION

Web Sites with information about health effects from occupational exposure to the chemical substances contained in this product and associated engineering controls and personal protective equipment:

OSHA Website:

<http://www.osha.gov>

<http://www.osha.gov/dsg/topics/silicacrystalline/index>

NIOSH Website:

<http://www.cdc.gov/niosh>

<http://www.cdc.gov/niosh/topics/silica>

ACGIH Website:

<http://www.acgih.org>

ATSDR Website:

<http://www.astdr.cdc.gov/toxprofiles>

IARC Monograph concerning crystalline silica, Volume 100C:

<http://monographs.iarc.fr/ENG/Monographs/PDFs/index.php>

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