

NUCOR[®]

SAFETY DATA SHEET

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Trade Name: DRI-B Cold Briquetted Iron (CBI)

CAS Number: 7439-89-6

Synonyms: Briquettes

Use/Description: Feedstock for steel making

| | | |
|--|--|---|
| NU-IRON UNLIMITED Caribbean Drive, Point Lisas Industrial Estate Trinidad, West Indies Phone: 1 (868) 636-1944 Fax: 1 (868) 679-0561 | NUCOR STEEL LOUISIANA LLC 9101 HWY 3125 Convent, LA 70723 United States Phone: 1 (225) 331-4000 | EMERGENCY 24-HOUR CONTACT NUMBER 1 (868) 636-0275 For general product information, contact mill as listed above. For emergencies, use the 24 hour contact. |
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2. HAZARDS IDENTIFICATION

OSHA Hazards: Self-heating Mixture
Combustible Dust

GHS Classification: Self-heat (Category 2)
Comb. Dust

Pictogram(s):



Signal Word: Warning

Hazard Statement(s)

H252: Self-heating in large quantities; may catch fire

H232: May form combustible dust concentrations in air

Precautionary Statement(s)

P210: Keep away from heat, open flames, hot surfaces, sparks. – No smoking

P232: Protect from moisture

P240: Ground/bond container and receiving equipment

P241: Use explosion-proof electrical, lighting, ventilating equipment

P281: Use personal protective equipment as required P407:

Maintain air gap between stacks and pallets

Potential Health Effects

Eye Contact

Dusts or particulates may cause mechanical irritation including pain, tearing, and redness. Scratching of the cornea can occur if eye is rubbed. Fumes may be irritating. Contact with heated material may cause thermal burns.

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Skin Contact

Dusts or particulates may cause mechanical irritation due to abrasion. Contact with heated material may cause thermal burns.

Inhalation

Dusts may cause irritation of the nose, throat, and lungs. The inhalation of large amounts of iron dust results in iron pneumoconiosis (arc welder's lung).

Ingestion

Ingestion overexposures to iron may affect the gastrointestinal, nervous, and hematopoietic system and the liver. Swallowing of excessive amounts of the dust may cause irritation, nausea, and diarrhea.

Chronic or Special Toxic Effects

Repeated exposure to fine dusts may inflame the nasal mucosa and cause changes to the lung. In addition, a red-brown pigmentation of the eye and/or skin may occur. Chronic exposure to excess iron can result in pathological deposition in the body tissues, the symptoms of which are fibrosis of the pancreas, diabetes melitus and liver cirrhosis.

3. COMPOSITION/INFORMATION ON INGREDIENTS

| Components, % | Average % Weight | CAS No. | ACGIH TLV TWA (mg/m ³) | OSHA PEL TWA (mg/m ³) |
|--|------------------|-----------|--|--|
| Total Iron | 75-85 | 7439-89-6 | 5 (respirable iron oxide) | 10 (Iron oxide fume) |
| Metallic iron | 68.0-75.0 | 7439-89-6 | | 15 (total Iron oxide dust) |
| Carbon | 3.5 - 6.0 | 7440-44-0 | 3 (respirable Carbon black) | 5 (respirable Iron oxide) |
| Silicon dioxide (SiO ₂) | 1.00 - 3.00 | 7631-86-9 | 0.025 (respirable quartz) | 5 (Iron oxide fume) |
| Graphitic Carbon | 1.0 - 3.0 | 7440-44-0 | Not established | 3.5 (carbon black) |
| Calcium Oxide (CaO) | 3.00 - 5.00 | 1305-78-8 | 2 | (30)/(%SiO ₂ + 2) total quartz |
| Aluminium Oxide(Al ₂ O ₃) | 0.5 - 0.8 | 1344-28-1 | Not established | (10)/(%SiO ₂ + 2) respirable quartz |
| Magnesium Oxide (MgO) | 0.25 - 0.744 | 1309-48-4 | 10 (respirable fraction) | 15 Total dust |
| Manganese (Mn) | 0.007 - 0.2 | 7439-96-5 | 0.02 (respirable fraction) 0.1 (inhalable fraction) | 5 Respirable fraction |
| Phosphorous (P) | 0.02 - 0.10 | 7723-14-0 | 0.1 | 5 |
| Sulfur (S) | 0.002 - 0.003 | 7704-34-9 | Not established | 15 (total dust 5 (respirable fraction) |

NOTE: No permissible exposure limits (PEL) or threshold limit values (TLV) exist for Briquettes overall. The above listing is a summary of elements found in CBI.

4. FIRST AID MEASURES

Eye Contact - Immediately flush eyes with plenty of water for at least 15 minutes occasionally lifting the eye lids. Get medical attention if irritation persists.

Skin Contact - In case of overexposure to dusts or particulates, wash with soap and plenty of water. Get medical attention if irritation develops or persists.

Inhalation - In case of overexposure to dusts or fumes, remove affected person to fresh air and keep at rest in a comfortable position.

Ingestion - Not considered an ingestion hazard. However, if ingested, seek medical attention.

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5. FIRE FIGHTING MEASURES

Suitable Extinguishing Media - Use foam, dry powder, or sand. For small fires, class 4 fire extinguishers can be used; however typical portable fire extinguishers will not contain enough material to cool larger amounts of overheating DRI.

Unsuitable Extinguishing Media - Do not use CO₂ as an extinguishing media as carbon monoxide can be formed.

Fire hazard – Product is porous iron, which rusts in the presence of water and air. Rusting (re-oxidation) causes heat, which may cause large piles to heat up and ignite. DRI dust generated during handling will ignite more easily than pellets. Accumulations of DRI dust may self heat in the presence of humid air. DRI is dense and overheating stockpiles can store a large amount of heat, requiring very large amounts of water to cool the material.

Explosion hazard – Dusts at sufficient concentrations may form explosive mixtures with air. Results indicate a potential for moderate explosion severity (ST1 class explosive). Dust accumulations should be avoided to prevent potential for secondary dust explosions.

CBI Dust:

| | |
|--|-----------------------------------|
| Dust Explosion Classification | ST-1 (Weak to Moderate Explosion) |
| Deflagration Index (Kst): | 10-126 bar.m/s |
| Maximum Explosion Pressure (Pmax): | 2.2-5.4 bar |
| Minimum Ignition Energy (MIE): | No data available |
| Minimum Ignition Temp.-Dust Cloud | No data available |
| Minimum Ignition Temp.-Dust Layer | No data available |
| Minimum Explosion Concentration (MEC): | No data available |
| Limiting Oxygen Concentration (LOC): | No data available |
| Volume Resistivity Ambient R.H. | No data available |
| Volume Resistivity Low R.H. | No data available |
| Charge Decay Time Ambient R.H. | No data available |
| Charge Decay Time Low R.H. | No data available |

Reactivity - Introduction of water onto very hot Briquettes can release steam and hydrogen. Burning piles of Briquettes and/or Briquette dust may release carbon monoxide (CO), and could accumulate to the explosive limit in poorly or unventilated buildings, storage bins or other closed vessels. Hydrogen gas may be released from wet Briquettes and could accumulate to the lower explosive limit in unventilated buildings, storage bins, silos or other closed vessels.

Firefighting instructions – Remove overheating product from all fuel sources including other DRI product, DRI dust, conveyor belts, etc. Divide overheating product into small piles in a well-ventilated area and allow to cool to ambient temperature. Flood with water if necessary and/or possible. Overheating Briquettes can compromise electrical insulation inside conduit and around electrically driven material handling equipment. In order to prevent electrocution, ensure that all electrical power sources to the area of CBI fire have been de-energized before fighting a DRI fire with water.

Protection during firefighting – Do not enter fire area without proper protective equipment, including respiratory protection.

6. ACCIDENTAL RELEASE MEASURES

General measures – Care must be taken when walking on and around them. All accidental spills should be cleaned up in accordance with good housekeeping practice. Dust deposits should not be allowed to accumulate on surfaces, as they may form an explosive mixture if they are disturbed and released into the atmosphere in sufficient concentration.

Environmental precautions – Do not allow water (or moist air) contact with this material. Avoid release to the environment.

Methods for containment – Spilled material that may have become wet should not be mixed with other DRI product, as it may initiate an overheating reaction. Any closed container used for cleaning a DRI spill should

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be emptied immediately to a well-ventilated area. Spilled material that may have become wet could generate hydrogen and should not be stored or retained in a closed container.

Methods for clean up – Use only non-sparking conductive tools for cleaning dust.

7. HANDLING AND STORAGE

Precautions for safe handling – Conveyors should be covered or enclosed to avoid contact with rain. Special attention should be paid to ensure product is not impacted by rain during transfers, loading. Offloading or any other handling. Protect material from all ignition sources such as spark, heat or flame. Minimize dust generation and accumulation in all product handling, storage and use areas. Routine housekeeping should be instituted to ensure that dusts do not accumulate on surfaces.

Storage conditions – Store material in dry areas protected from moisture. Hydrogen and/or carbon monoxide could be emitted slowly by material reacting with water or heat. Closed storage silos/bins should be either be ventilated, monitored for combustible gasses and/or inerted to prevent the risk of explosion.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control Parameters – No Occupation Exposure Limit (OEL) values exist for DRI. See section 3 for component OELs.

Ventilation and Dust Control Equipment - Operations with potential for generating high concentrations of airborne particulates should be evaluated and controlled as necessary. Permanent dust control equipment is recommended for material handling systems to reduce dust accumulations and worker exposure to air born dust. It is recommended that all dust control equipment such as local exhaust ventilation and material transport systems involved in handling of this product, contain explosion relief vents or an explosion suppression system or an oxygen- deficient environment. Ensure that dust-handling systems (such as exhaust ducts, dust collectors, vessels, and processing equipment) are designed in a manner to prevent the escape of dust into the work area. Use only appropriately classified electrical equipment and powered industrial trucks.

Eye Protection - Use safety glasses. Dust-resistant safety goggles are recommended under circumstances where particles could cause mechanical injury such as grinding or cutting. Face shield should be used when welding or cutting.

Skin - Protective gloves, long sleeves and long pants are recommended to minimize contact with skin.

Respiratory Protection - Work areas should be adequately ventilated. Supplied air line respirators may be required in confined spaces where IDLH atmospheres may be present. Appropriately selected respirators with HEPA filters or NIOSH/MSHA approved dust mask should be used in dusty environments.

Up to 50 mg/m3:

Any particulate respirator equipped with an N95, R95, or P95 filter (including N95, R95, and P95 filtering facepieces) except quarter-mask respirators. The following filters may also be used: N99, R99, P99, N100, R100, P100.

(APF = 10) Any supplied-air respirator Up

to 125 mg/m3:

(APF = 25) Any supplied-air respirator operated in a continuous-flow mode

(APF = 25) Any powered, air-purifying respirator with a high-efficiency particulate filter.

Up to 250 mg/m3:

(APF = 50) Any air-purifying, full-facepiece respirator with an N100, R100, or P100 filter. (APF = 50) Any supplied-air respirator that has a tight-fitting facepiece and is operated in a continuous-flow mode

(APF = 50) Any powered, air-purifying respirator with a tight-fitting facepiece and a high-efficiency particulate filter

(APF = 50) Any self-contained breathing apparatus with a full facepiece

(APF = 50) Any supplied-air respirator with a full facepiece Up

to 2500 mg/m3:

(APF = 1000) Any supplied-air respirator operated in a pressure-demand or other positive-pressure mode

Emergency or planned entry into unknown concentrations or IDLH conditions:

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(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:

(APF = 50) Any air-purifying, full-facepiece respirator with an N100, R100, or P100 filter. Any appropriate escape-type, self-contained breathing apparatus

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance – Grey smooth rectangular/square shaped

Odor - none

Boiling Point - Not applicable

Melting Point – No data available

pH – No data available

Specific Gravity – 7.5

Apparent Density - 3,500 kg/m³

Bulk Density – 2,100 kg/m³

Porosity – < 35%

Water pick-up – No data Available

Moisture content – < 0.3%

Evaporation rate – Not applicable

Dimensions –30mm x 30mm

Fines (< 5mm) – 3%

Solubility in water – insoluble

10. STABILITY AND REACTIVITY

Chemical stability - Material is stable under normal conditions. However, as with all metals, it becomes more reactive when finely divided.

Possibility of hazardous reactions – Ultrafine powder is potentially explosive.

Conditions to Avoid – Avoid open flame.

Incompatible materials – Avoid contact with water, acids. Explosive and violent reaction with ammonium nitrate and heat, ammonium peroxodisulphate, chloric acid, chlorine trifluoride, chloroformamidinium nitrate, bromine pentafluoride and heat (with iron powder), air and oil (with iron dust), sodium acetylide. Ignites on contact with chlorine, dinitrogen tetraoxide, liquid fluorine, hydrogen peroxide (with DRI dust), nitryl fluoride and heat, peroxyformic acid, potassium perchlorate, potassium dichromate, sodium peroxide (at 240oC), polystyrene and friction or spark (DRI dust).

Hazardous Decomposition Products - Hydrogen is emitted slowly from bulk material, dust or fines when in contact with water. Overheating Briquettes can release carbon monoxide. It catalyzes the exothermic polymerization of acetaldehyde.

11. TOXICOLOGICAL INFORMATION

Acute Toxicity –

LD/LC50 values that are relevant for classification:

Oral LD50 – 20,000mg/kg (guinea pig)

Oral LD50 – 30,000 mg/kg (rat)

Oral LDLo – 20 mg/kg (rabbit)

Irritation - Potentially irritating to skin and mucous membranes. Direct eye contact likely irritating.

Sensitization – No sensitizing effects known

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The primary component of this product is iron. Long-term exposure to iron dusts or fumes can result in a condition called siderosis which is considered to be a benign pneumoconiosis. Symptoms may include chronic bronchitis, emphysema, and shortness of breath upon exertion.

Penetration of iron particles in the skin or eye may cause an exogenous or ocular siderosis which may be characterized by a red-brown pigmentation of the affected area. It can also cause conjunctivitis, choroiditis, retinitis and siderosis of tissues if iron contacts and remains in these tissues.

Iron is potentially toxic in all forms and by all routes of exposure. The inhalation of large amounts of iron dust results in iron pneumoconiosis (arc welder's lung).

Chronic exposure to excess levels in the body tissues (>50 – 100 mg Fe/day) can result in pathological deposition of iron in the body tissues, the symptoms of which are fibrosis of the pancreas, diabetes mellitus and liver cirrhosis.

Ingestion overexposures to iron may affect the gastrointestinal, nervous, and hematopoietic system and the liver.

The Registry of Toxic Effect of Chemical Substances (RTECS) contains tumorigenic and/or carcinogenic and/or neoplastic data for components in this product.

No classification data on carcinogenic properties of this material is available from the EPA, IARC, NTP, OSHA, or ACGIH.

12. ECOLOGICAL INFORMATION

Ecotoxicity – no data available

Persistence and degradability – no data available

Bioaccumulative potential – no data available

Mobility in environmental media – no data available

Additional information - Metallic iron can scavenge dissolved oxygen from uncirculated and aerated bodies of water.

13. DISPOSAL CONSIDERATIONS

Waste disposal recommendations – Recovery and reuse, rather than disposal, should be the ultimate goal. Dispose in accordance with federal, state, and local health and environmental regulations. Prevent materials from entering drains, sewers, or waterways.

14. TRANSPORT INFORMATION

DOT Proper Shipping Information – DRI pellets must be transported in accordance with applicable U.S. Department of Transportation hazardous material transportation regulations, if any.

Transport by sea (IMO/IMDG) - The International Maritime Solid Bulk Cargoes Code (IMSBC Code) classifies Briquettes as 'DRI B' and Briquette Fines as 'DRI C'. This code contains regulations for the maritime transport of solid bulk cargoes. Both DRI A and DRI C are classified as Group B cargo types, which consists of cargoes which possess a chemical hazard which could give rise to a dangerous situation on a ship.

15. REGULATORY INFORMATION

Toxic Substances Control Act (TSCA)

All components of this product are listed on the TSCA Inventory.

Briquettes (CBI)**Comprehensive Environmental Response, Compensation and Liability Act (CERCLA)**

| <u>Chemical Name</u> | <u>Reportable Quantity (in lb)</u> |
|----------------------|------------------------------------|
| Aluminum Oxide | na |
| Manganese | na |
| Phosphorus | 1 |
| Vanadium | na |

Superfund Amendments and Reauthorization Act of 1986 (SARA), Title III SECTION 311/312 HAZARD CATEGORIES: Fire hazard

SARA Section 302 Threshold Planning Quantity (TPQ):

| <u>Chemical Name</u> | <u>TPQ (in lb)</u> |
|----------------------|--------------------|
| Phosphorus | 100 |

SECTION 313 REPORTABLE INGREDIENTS:

| <u>Chemical Name</u> | <u>CAS Number</u> | <u>Concentration (% by weight)</u> |
|----------------------|-------------------|------------------------------------|
| Aluminum Oxide | 1344-28-1 | <.7 |
| Manganese | 7439-96-5 | <.12 |
| Phosphorus | 7723-14-0 | <.1 |
| Vanadium | 7440-62-2 | <.5 |

California Proposition 65:

⚠ WARNING: This product can expose you to chemicals including carbon black which is 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.

Massachusetts Substance List: Aluminum oxide, Magnesium oxide, Manganese, Phosphorus, Silicon dioxide, Sulfur

Pennsylvania Hazardous Substance List: Aluminum oxide, Magnesium oxide, Manganese, Phosphorus, Silicon dioxide, Sulfur .

New Jersey Hazardous Substance List: Aluminum oxide, Magnesium oxide, Manganese, Phosphorus, Silicon dioxide, Sulfur

16. OTHER INFORMATION

This Safety Data Sheet (SDS) covers Nucor product as delivered from the Nucor facility, but does not include chemicals that may be applied by subsequent handlers and/or distributors of this product. This could include a variety of materials including oils, paints, galvanization, etc. that are not included in this SDS. Additionally, specialty orders may require application of coating material not listed in this SDS. SDSs for any Nucor-applied specialty coating will be provided separately. During welding, precautions should be taken for airborne contaminants that may originate from components of the welding rod. Arc or spark generated when welding or burning could be a source of ignition for combustible and/or flammable materials. The information in this SDS was obtained from sources which we believe are reliable; however, the information is provided without any representation or warranty, expressed or implied, regarding the accuracy or correctness. The conditions or methods of handling, storage, use and disposal of the product are beyond our control and may be beyond our knowledge. For this and other reasons, we do not assume responsibility and expressly disclaim

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liability for loss, damage, or expense arising out of or in any way connected with the handling, storage, use, or disposal of this product.

Related NFPA Codes:

NFPA 654, Standard for the Prevention of Fire and Dust Explosions from the Manufacturing, Processing, and Handling of Combustible Particulate Solids, for safe handling.

NFPA 484, Standard for Combustible Metals

NFPA 68, Standard on Explosion Protection by Deflagration Venting

NFPA 69, Standard for Explosion Prevention systems

NFPA70, National Electric Code

NFPA 505, Fire Safety Standard for Powered Industrial Trucks Including Type Designations, Areas of Use, Conversions, Maintenance, and Operations