Charah Solutions, Inc.
12601 Plantside Drive
Louisville, KY 40299
(877) 314-7724

SAFETY DATA SHEET

1. PRODUCT IDENTIFICATION AND USE:

Product name: Iron Rich Material (IRM)

Chemical Name & Synonyms: IRM, Iron Residue, Alstone Material, Ecotite

Material Identification and Use: This material is a kiln byproduct and is primarily a black, brown, or gray aggregate used as a raw material for the production of Portland Cement, low-grade steel, and Asphalt.

Supplier: Charah Solutions, Inc.

Address: 12601 Plantside Drive, Louisville, KY 40299

Telephone: (877) 314-7724

Fax: (502) 245-7398

Note: This SDS covers products from different sources. The concentrations of constituents will vary slightly.

2. HAZARDS IDENTIFICATION:

Most Important Hazards: Continuous long-term exposure above the permissible exposure limits is suspected of causing nervous system damage and neurological effects. Occupational exposure to the substance or mixture may cause adverse effects.

This material is classified as hazardous under U.S. OSHA regulations (29 CFR 1910.1200) (Hazcom 2012) and Canadian WHMIS regulations (Hazardous Products Regulations) (WHMIS 2015). Classification: Specific target organ toxicity, repeated exposure - Category 1

Hazard Statement: Causes damage to organs through prolonged or repeated exposure.

Precautionary Statements: Do not breathe dust or fumes. Wash exposed skin thoroughly after handling. Do not eat, drink, or smoke when using this product. Get medical attention if necessary. Dispose of in accordance with local regulations.

Other Potential Hazards: Mild respiratory irritant. May cause gastrointestinal irritation if consumed. Iron particles in the eye may leave a “rust ring” or brownish stains on the cornea.

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3. COMPOSITION AND INFORMATION ON INGREDIENTS:

High Temperature Metal Recovery (HTMR) product. Contains inorganic substances in granular form.

Chemical name	Common name and synonyms	CAS #	Concentration (% by weight)
Akermanite	Dicalcium Magnesium Disilicate	14567-90-9	**5.0 - 20.0**
Franklinite	Zinc Ferrite	12063-19-3	**0.3 - 2.5**
Forsterite	Magnesium Silicate	15118-03-3	**5.0 - 20.0**
Gehlenite	Calcium Aluminum Silicate	1302-56-3	**2.0 - 7.5**
Iron	Metallic iron	7439-89-6	**4.0 - 8.0**
Magnetite	Ferrous-Ferric Oxide Iron (II, III) Oxide	1317-61-9	**20.0 - 30.0**
Manganese oxide	Manganese Compounds	1344-43-0	**4.0 - 6.0**
Wüstite	Ferrous Oxide Iron (II) Oxide	1345-25-1	**38.0 - 48.0**

The percent concentrations for the listed chemicals above will vary from batch to batch. Concentrations listed represent the actual concentration range for each chemical.

4. FIRST AID MEASURES:

Eye Contact: Flush the eye(s) with lukewarm water until the particles have been removed. If irritation persists, obtain medical attention. May cause irritation due to the presence of a “foreign object”. Calcium oxide is caustic to living tissue, especially when moist, so contact may cause burns or damage to the cornea.

Skin Contact: Wash with soap and water. Possible skin irritation or dry skin. Remove contaminated clothing and wash clothing before reuse. Get medical attention as necessary.

Inhalation: If inhaled, move to fresh air. If not breathing, give artificial respiration. Administer oxygen if breathing is difficult. Get medical attention as necessary.

Ingestion: Do not induce vomiting. Rinse mouth. May cause irritation and damage to mucous membranes. Get medical attention as necessary.

Acute and Delayed Effects: Causes damage to organs through prolonged or repeated exposure. This product contains manganese compounds. Manganese can attack the central nervous system, causing symptoms similar to Parkinson's Disease. Chronic manganese exposures can lead to neurological problems such as apathy, drowsiness, weakness, spastic gait, paralysis, and other

neurological problems resembling Parkinsonism. These symptoms can become progressive and permanent if not treated. Mild respiratory irritant. May cause coughing and breathing difficulties. Inhalation of fumes may result in metal fume fever, a flu-like illness. Symptoms of metal fume fever may include fever, fatigue, vomiting, muscle aches, and shortness of breath. Dust contact with the eyes can lead to mechanical irritation. Symptoms may include stinging and tearing. Ingestion may cause gastrointestinal irritation, nausea, vomiting, and diarrhea. Iron particles in the eye may leave a "rust ring" or brownish stain on the cornea.

5. FIRE FIGHTING MEASURES:

This material is not considered flammable. Use media suitable to the surrounding fire, such as water fog or fine spray, alcohol foams, carbon dioxide, and dry chemicals. Metal oxides are considered to be hazardous combustion products.

Firefighters must utilize standard protective equipment, including flame-retardant coats, helmets with face shields, gloves, rubber boots, and, in enclosed/confined spaces, SCBA (with a full-facepiece operated in positive-pressure mode).

6. ACCIDENTAL RELEASE MEASURES:

Leaks and Spills: Minimize skin contact and avoid breathing dust. Wear gloves, long sleeves, and long pants. Material is usually slightly moist and granular, which minimizes potential for dust generation. Ventilate the area of the leak or spill. Wear appropriate personal protective equipment. Sweep up and containerize for reclamation or disposal. Vacuuming or wet sweeping may be used to avoid dust dispersal. Dispose of in accordance with federal, state, or local regulations.

7. HANDLING AND STORAGE:

Storage Requirements: Use with adequate ventilation. Minimize dust generation when handling and wear suitable protective equipment. Do not breathe dust or fumes. Do not ingest. Avoid contact with skin, eyes, and clothing.

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8. EXPOSURE CONTROLS / PERSONAL PROTECTIVE EQUIPMENT:

Chemical Name	Exposure Limits:			
	ACGIH TLV		OSHA PEL	
	TWA	STEL	PEL	STEL
Akermanite	N/Av	N/Av	N/Av	N/Av
Forsterite	N/Av	N/Av	N/Av	N/Av
Franklinite	N/Av	N/Av	N/Av	N/Av
Gehlenite	N/Av	N/Av	N/Av	N/Av
Iron	N/Av	N/Av	N/Av	N/Av
Magnetite	5 mg/m³ (respirable) (as Ferric oxide)	N/Av	10 mg/m³ (iron fume)	N/Av oxide
Manganese oxide	0.02 mg/m³ (respirable); 0.1 mg/m³ (inhalable) (Manganese and inorganic compounds)	N/Av	5 mg/m³ (Ceiling) (Manganese compounds)	N/Av
Wüstite	5 mg/m³ (respirable) (as Ferric oxide)	N/Av	10 mg/m³ (fume); mg/m³ (total dust); 5 mg/m³ (respirable) (as Ferric oxide)	N/Av 15



Eye Protection: Safety goggles or glasses (with side shields), as required by the nature of the task(s) being performed. Contact Lenses may concentrate irritants. Ensure eyewash stations are close to the work area.

Skin Protection: As required by the nature of work being done, such as long-sleeve shirts and long pants. Gloves are recommended with >90% efficiency.

Ventilation: Use in a well-ventilated area. Apply technical measures to comply with the occupational exposure limits. Where reasonably practicable, this should be achieved using local exhaust ventilation systems and good general extraction.

The local exhaust ventilation system should be high efficiency (84%). Recommended cyclone/filter (for minimizing dust emissions) efficiency:

- 70-90% (cyclones);
- 50-80% (dust filters);
- 85-95% (double stage, cassette filters)

Process enclosure should be considered, especially in potentially dusty units. In case of insufficient ventilation, wear suitable respiratory equipment.

Respiratory Protection: Wear NIOSH-approved dust masks. The respirator's filter class must be suitable for the maximum expected contaminant concentration. If this concentration is exceeded, SCBAs must be utilized. SCBAs should be fitted, maintained, and cleaned in accordance with the regulations.

Recommended Filter type:

- dust filter-half mask P1 (efficiency 75%)
- dust filter-half mask P2 (efficiency 90%)
- dust filter-half mask P3 (efficiency 95%)
- dust filter-full mask P1 (efficiency 75%)

Respirators should be selected based on the form and concentration of contaminants in air, and in accordance with OSHA (29 CFR 1910.134) or CSA Z94.4-02.

Other Preventive Practices: Avoid breathing i n dust. Practice good housekeeping using a vacuum or wet methods to clean up dust. Practice good personal hygiene by washing hands and face promptly after handling and before eating, drinking, or smoking. Ensure safety showers are close to the work area.

9. PHYSICAL AND CHEMICAL PROPERTIES:

Appearance:	Solid Angular Aggregate (Black/Brown Gray)
Odor:	No Appreciable Odor
Solubility in Water:	Insoluble in Water
pH:	Not Applicable
Auto-Ignition Temperature	
Melting Point:	>1,000°C (1,830°F)
Boiling Point:	>1,000°C (1,830°F)
Flammability:	Not Flammable
Vapor Pressure:	Not Applicable
Specific Gravity:	2.1 – 4.2

Percent Volatiles:	Not Applicable
Evaporation Rate:	Not Applicable

10. STABILITY AND REACTIVITY:

Product Stability:	Stable under normal conditions.
Hazardous Polymerization:	Will Not Occur.
Conditions to Avoid:	Do not use in unventilated areas without proper protection. Avoid breathing dust and use approved respirators against ordinary dust. Goggles are recommended. May cause eye irritation.
Incompatible Materials:	None known.
Hazardous Decomposition Products:	None known. May oxidize (rust) iron and steel in the presence of moisture.

11. TOXICOLOGICAL INFORMATION:

Information on likely routes of exposure:

Routes of entry Inhalation:	Yes
Routes of entry skin & eyes:	Yes
Routes of entry ingestion:	Yes
Routes of exposure skin absorption:	No

Potential Health Effects:

Signs and symptoms of short-term (acute) exposure:

Signs and symptoms of inhalation:	May cause irritation of the mucous membranes. Inhalation of dust may cause shortness of breath, tightness of the chest, a sore throat, and a cough.
Signs and symptoms of ingestion:	Ingestion may cause gastrointestinal irritation, nausea, vomiting, and diarrhea.
Signs and symptoms on skin:	No adverse effects due to skin contact are expected.
Signs and symptoms in the eyes:	Dust contact with the eyes can lead to mechanical irritation. Symptoms may include stinging and tearing.
Potential Chronic Health Effects:	Pneumoconiosis, or “dusty lung” disease, may result from chronic exposure to any dust. Repeated or prolonged inhalation of fine dust may increase mucous production.
Mutagenicity:	No data available to indicate product or any components present at greater than 0.1% are mutagenic or genotoxic.
Carcinogenicity:	Not classifiable as a human carcinogen. No components are listed as carcinogens by ACGIH, IARC, OSHA, or NTP.
Reproductive effects & Teratogenicity:	This product is not expected to cause reproductive or developmental effects.

Sensitization to material: Not expected to be a skin or respiratory sensitizer.

Specific target organ effects: This material is classified as hazardous under U.S. OSHA regulations (29 CFR 1910.1200) (Hazcom 2012) and Canadian WHMIS regulations (Hazardous Products Regulations) (WHMIS 2015). Classification: Specific target organ toxicity, repeated exposure - Category 1. Causes organ damage through prolonged or repeated exposure. This product contains manganese compounds. Manganese can attack the central nervous system, causing symptoms similar to Parkinson's Disease. Chronic manganese exposures can lead to neurological problems such as apathy, drowsiness, weakness, spastic gait, paralysis, and other neurological problems resembling Parkinsonism. These symptoms can become progressive and permanent if not treated.

According to the classification criteria of U.S. OSHA regulations (29 CFR 1910.1200) (Hazcom 2012) and Canadian WHMIS regulations (Hazardous Products Regulations) (WHMIS 2015), this product is not expected to cause target-organ toxicity following single exposures.

Medical conditions aggravated by overexposure: Pre-existing skin, eye, and respiratory disorders.

Synergistic materials: None known or reported by the manufacturer.

Toxicological data: Not classified for acute toxicity based on available data. No data is available on the product itself.

See the table below for individual acute toxicity data.

Chemical name	LC_{50}(4hr) inh, rat	LD_{50} (Oral, rat)	LD_{50} (Rabbit, dermal)
Akermanite	N/Av	N/Av	N/Av
Forsterite	N/Av	N/Av	N/Av
Franklinite	N/Av	N/Av	N/Av
Gehlenite	N/Av	N/Av	N/Av
Iron	N/Av	98 600 mg/kg	N/Av
Magnetite	N/Av	> 5000 mg/kg	N/Av
Manganese oxide	> 5.35 mg/L (dust) (No mortality)	> 2000 mg/kg (No mortality)	N/Av
Wüstite	N/Av	> 10 000 mg/kg	N/Av

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12. ECOLOGICAL INFORMATION:

Ecotoxicity:

Low toxicity - This product has been applied to groundwater sources as part of an effort to reduce contaminants.

See the tables below for individual ingredient ecotoxicity data for algae, daphnia, and fish.

Ingredients	CAS #	Toxicity to Algae		
		EC50 / 96h or 72h	NOEC / 96h or 72h	M Factor
Akermanite	14567-90-9	N/Av	N/Av	None
Forsterite	15118-03-3	N/Av	N/Av	None
Franklinite	12063-19-3	N/Av	N/Av	None
Gehlenite	1302-56-3	N/Av	N/Av	None
Iron	7439-89-6	N/Av	N/Av	None
Magnetite	1317-61-9	N/Av	N/Av	None
Manganese oxide	1344-43-0	> 100 mg/L/72hr (Green algae)	32 mg/L/72hr	None
Wüstite	1345-25-1	N/Av	N/Av	N/Av

Ingredients	CAS #	Toxicity to Daphnia		
		EC50 / 48h	NOEC / 21 day	M Factor
Akermanite	14567-90-9	N/Av	N/Av	None
Forsterite	15118-03-3	N/Av	N/Av	None
Franklinite	12063-19-3	N/Av	N/Av	None
Gehlenite	1302-56-3	N/Av	N/Av	None
Iron	7439-89-6	> 100 mg/L (Daphnia magna)	5.9 mg/L	None
Magnetite	1317-61-9	N/Av	N/Av	None
Manganese oxide	1344-43-0	> 100 mg/L (Daphnia magna)	N/Av	None
Wüstite	1345-25-1	> 100 mg/L (Daphnia magna) (Read-across)	N/Av	None

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Ingredients	CAS #	Toxicity to Fish		
		LC50 / 96h	NOEC / 21 day	M Factor
Akermanite	14567-90-9	N/Av	N/Av	None
Forsterite	15118-03-3	N/Av	N/Av	None
Franklinite	12063-19-3	N/Av	N/Av	None
Gehlenite	1302-56-3	N/Av	N/Av	None
Iron	7439-89-6	> 10 000 mg/L (Zebra fish)	N/Av	None
Magnetite	1317-61-9	N/Av	N/Av	None
Manganese oxide	1344-43-0	> 100 mg/L (Rainbow trout)	N/Av	None
Wüstite	1345-25-1	> 50 000, < 100 000 mg/L (Zebra fish) (Read-across)	N/Av	None

Persistence and degradability: Not applicable.

Bioaccumulative potential: Not known.

Mobility in soil: Iron-rich material is a complex inorganic substance. It mainly contains iron and calcium silicates. Traces of metals exist in metal form, mineral form, or are included in silicate phases. Full TCLP testing was completed prior to shipment of the substance and demonstrated that the trace metals are firmly built in and bonded into the glass/crystal structures of the silicate and other mineral phases. This resulted in limited release and low measured water-solubility of the trace metals present in the matrix. Contains metals which may be leached out by water if in contact with acidic water (low pH) in low scale.

Results of PBT and vPvB assessment: Does not meet requirements for PBT and vPvB substances.

13. DISPOSAL CONSIDERATIONS:

Waste Disposal Information: Reclaim material where possible. Dispose of in accordance with all state, provincial, local, and federal legislation. This material is not hazardous for RCRA criteria and should be managed as a solid waste if disposed.

14. TRANSPORT INFORMATION:

Transport Information: No special precautions are required. This product is not classified as dangerous for conveyance. Dust should be controlled during transportation.

15. REGULATORY INFORMATION:

US Federal Information:

Components listed below are present on the following U.S. Federal chemical lists:

Ingredients	CAS #	TSCA Inventory	CERCLA Reportable Quantity (RQ) (40 CFR 117.302):	SARA TITLE III: Sec. 302, Extremely Hazardous Substance, 40 CFR 355:	SARA TITLE III: Sec. 313, 40 CFR 372, Specific Toxic Chemical	
					Toxic Chemical	de minimis Concentration
Akermanite	14567-90-9	NL	None	None	No	N/Ap
Forsterite	15118-03-3	NL	None	None	No	N/Ap
Franklinite	12063-19-3	Yes	None	None	No	N/Ap
Gehlenite	1302-56-3	NL	None	None	No	N/Ap
Iron	7439-89-6	Yes	None	None	No	N/Ap
Magnetite	1317-61-9	Yes	None	None	No	N/Ap
Manganese oxide	1344-43-0	Yes	None	None	Yes	1%
Wüstite	1345-25-1	Yes	None	None	No	N/Ap

SARA TITLE III: Sec. 311 and 312, SDS Requirements, 40 CFR 370 Hazard Classes:

- Health hazards (Specific target organ toxicity, repeated exposure)

Under SARA Sections 311 and 312, the EPA has established threshold quantities for the reporting of hazardous chemicals. The current thresholds are 500 pounds or the threshold planning quantity (TPQ), whichever is lower, for extremely hazardous substances and 10,000 pounds for all other hazardous chemicals.

US State Right to Know Laws:

The following chemicals are specifically listed by individual States:

Ingredients	CAS #	California Proposition 65		State "Right to Know" Lists					
		Listed	Type of Toxicity	CA	MA	MN	NJ	PA	RI
Akermanite	14567-90-9	No	N/Ap	No	No	No	No	No	No
Forsterite	15118-03-3	No	N/Ap	No	No	No	No	No	No
Franklinite	12063-19-3	No	N/Ap	No	No	No	No	No	No
Gehlenite	1302-56-3	No	N/Ap	No	No	No	No	No	No
Iron	7439-89-6	No	N/Ap	Yes	No	No	No	No	No
Magnetite	1317-61-9	No	N/Ap	No	No	No	No	No	No
Manganese oxide	1344-43-0	No	N/Ap	No	No	No	No	No	No
Wüstite	1345-25-1	No	N/Ap	No	No	No	No	No	No

California Proposition 65: This product can expose you to chemicals, which are known to the State of California to cause cancer. This product contains trace amounts of: Nickel (< 0.1%).

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Canadian Information:

Canadian Environmental Protection Act (CEPA) information: All ingredients listed appear on or are exempt from the Domestic Substances List (DSL).

Canadian National Pollutant Release Inventory (NPRI): This product contains the following substances listed on the NPRI:

- Manganese (Part 1, Group A Substance)

WHMIS information: Refer to Section 2 for a WHMIS Classification for this product.

International Information:

Components listed below are present on the following International Inventory list:

Ingredients	CAS #	European EINECs	Australia AICS	Philippines PICCS	Japan ENCS	Korea KECI/KECL	China IECSC	New Zealand IOC
Akermanite	14567-90-9	235-227-6	Not specifically listed	Not specifically listed	Not specifically listed.	Not specifically listed	Not specifically listed	Not specifically listed
Forsterite	15118-03-3	239-169-2	Not specifically listed	Not specifically listed	Not specifically listed.	KE-17251	Not specifically listed	Not specifically listed
Franklinite	12063-19-3	235-052-5	Present	Present	(1)-357; (1)-561	KE-10901	Present	HSR003104
Gehlenite	1302-56-3	231-900-3	Not specifically listed	Not specifically listed	Not specifically listed.	Not specifically listed	Not specifically listed	Not specifically listed
Iron	7439-89-6	231-096-4	Present	Present	Not listed	KE-21059	Present	May be used as a single-component chemical under an appropriate group standard.
Magnetite	1317-61-9	215-277-5	Present	Present	(1)-357	KE-34314	Present	May be used as a single-component chemical under an appropriate group standard.
Manganese oxide	1344-43-0	215-695-8	Present	Present	(1)-475	KE-23031	Present	HSR003775
Wüstite	1345-25-1	215-721-8	Present	Present	(1)-357	KE-21112	Present	May be used as a component in a product covered by a group standard, but is not approved for use as a chemical in its own right.

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16. OTHER INFORMATION:

Date drawn up: August 2007

Date of latest revision: May 19, 2026

Version number: 008

Contact: Product Manager, Business Development Manager, or VP-Technical Services

Acronyms

- ACGIH: American Conference of Governmental Industrial Hygienists
- AICS: Australian Inventory of Chemical Substances
- CAS: Chemical Abstract Services
- CERCLA: Comprehensive Environmental Response, Compensation, and Liability Act of 1980
- CFR: Code of Federal Regulations
- CSA: Canadian Standards Association
- DOT: Department of Transportation
- EC50: Effective Concentration 50%
- EPA: Environmental Protection Agency
- IARC: International Agency for Research on Cancer
- IATA: International Air Transport Association
- ICAO: International Civil Aviation Organization
- IECSC: Inventory of Existing Chemical Substances
- IMDG: International Maritime Dangerous Goods I
- nh: Inhalation
- IOC: Inventory of Chemicals
- ISHL: Industrial Safety Health Law
- KECI: Korean Existing Chemicals Inventory
- KECL: Korean Existing Chemicals List
- LC: Lethal Concentration
- LD: Lethal Dose
- N/Ap: Not Applicable
- N/Av: Not Available
- NIOSH: National Institute of Occupational Safety and Health
- NOEC: No observable effect concentration
- NTP: National Toxicology Program
- OECD: Organization for Economic Co-operation and Development
- OSHA: Occupational Safety and Health Administration
- PEL: Permissible exposure limit
- PICCS: Philippine Inventory of Chemicals and Chemical Substances
- PNOR: Particulates Not Otherwise Regulated
- PNOS: Particles Not Otherwise Specified
- PPE: Personal Protective Equipment
- SARA: Superfund Amendments and Reauthorization Act
- SCBA: Self-Contained Breathing Apparatus
- STEL: Short Term Exposure Limit
- TDG: Canadian Transportation of Dangerous Goods Act & Regulations
- TLV: Threshold Limit Values
- TSCA: Toxic Substance Control Act T
- WA: Time Weighted Average
- WHMIS: Workplace Hazardous Materials Identification System

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References

- ACGIH, Threshold Limit Values for Chemical Substances and Physical Agents & Biological Exposure Indices
- ECHA - European Chemical Agency
- Canadian Centre for Occupational Health and Safety, CCInfoWeb databases
- Safety Data Sheets from the manufacturer.
- US EPA Title III List of Lists
- California Proposition 65 List
- OECD - The Global Portal to Information on Chemical Substances - eChemPortal