

SAFETY DATA SHEET

1. SUBSTANCE AND SOURCE IDENTIFICATION

Product Identifier

RM Number: 8455
RM Name: Pyrite Ore Bioleaching Substrate
Other Means of Identification: Not applicable.

Recommended Use of This Material and Restrictions of Use

This Reference Material (RM) is was produced to provide a sample of mineral pyrite for use as a bioleaching substrate and for testing bioleaching rates. A unit of RM 8455 consists of 100 g of New Mexico pyrite, sized to be between -165 mesh and +250 mesh.

Company Information

National Institute of Standards and Technology
 Standard Reference Materials Program
 100 Bureau Drive, Stop 2300
 Gaithersburg, Maryland 20899-2300

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 FAX: 301-948-3730
 E-mail: SRMMSDS@nist.gov
 Website: <http://www.nist.gov/srm>

Emergency Telephone ChemTrec:
 1-800-424-9300 (North America)
 +1-703-527-3887 (International)

2. HAZARDS IDENTIFICATION

Classification

Physical Hazard: Not classified.
Health Hazard: Carcinogenic, Category 1
 STOT, Repeat Exposure Category 1

Label Elements

Symbol



Signal Word

Danger

Hazard Statement(s)

H350 May cause cancer (lung) via inhalation.
 H372 Causes damage to lungs through prolonged or repeat inhalation.

Precautionary Statement(s)

P201 Obtain special instructions before use.
 P202 Do not handle until all safety precautions have been read and understood.
 P260 Do not breathe dust.
 P264 Wash hands thoroughly after handling.
 P270 Do not eat, drink or smoke when using this product.
 P280 Wear eye protection, protective gloves and clothing.
 P308+P313 If exposed or concerned: Get medical attention.
 P405 Store locked up.
 P501 Dispose of contents and container in accordance with local regulations.

Hazards Not Otherwise Classified: Not applicable.

Ingredients(s) with Unknown Acute Toxicity: Not applicable.

3. COMPOSITION AND INFORMATION ON HAZARDOUS INGREDIENTS

Substance: Hematite and pyrite

Other Designations: Hematite (ferric oxide red, hi-dense 3; Miox; oligist) and pyrite [(FeS₂); iron disulfide; iron ores, pyrox; fool's gold].

Hazardous Component(s)	CAS Number	EC Number (EINECS)	Nominal Mass Concentration (%)
Hematite	1309-37-1	215-168-2	>95
Pyrite	1309-36-0	215-167-7	>3.5
Silica, crystalline quartz ^(a)	14808-60-7	238-878-4	>0.1

^(a) Silica, crystalline quartz is an inherent component of pyrite ore.

4. FIRST AID MEASURES

Description of First Aid Measures:

Inhalation: If adverse effects occur, remove to uncontaminated area. If not breathing, give artificial respiration or oxygen by qualified personnel. Seek immediate medical attention.

Skin Contact: Wash skin with soap and water.

Eye Contact: Flush eyes with water for at least 15 minutes. If necessary, seek medical attention.

Ingestion: If adverse effects occur after ingestion, seek medical treatment.

Most Important Symptoms/Effects, Acute and Delayed: Prolonged exposure to respirable silica particles can cause lung damage (silicosis) and cancer.

Indication of any immediate medical attention and special treatment needed, if necessary: If any of the above symptoms are present, seek medical attention if needed.

5. FIRE FIGHTING MEASURES

Fire and Explosion Hazards: Negligible fire hazard. Avoid generating dust. See Section 9, "Physical and Chemical Properties" for flammability properties.

Extinguishing Media:

Suitable: Regular dry chemical, carbon dioxide, water, regular foam.

Unsuitable: None listed.

Specific Hazards Arising from the Chemical: None listed.

Special Protective Equipment and Precautions for Fire-Fighters: Avoid inhalation of material or combustion byproducts. Wear full protective clothing and NIOSH approved self-contained breathing apparatus (SCBA).

NFPA Ratings (0 = Minimal; 1 = Slight; 2 = Moderate; 3 = Serious; 4 = Severe)

Health = 1

Fire = 0

Reactivity = 0

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions, Protective Equipment and Emergency Procedures: Any accumulated material on surfaces should be removed and properly disposed of. Use suitable protective equipment; see Section 8, "Exposure Controls and Personal Protection".

Methods and Materials for Containment and Clean up: Collect spilled material in appropriate container for disposal. Keep out of water supplies and sewers. Keep unnecessary people away, isolate hazard area and deny entry.

7. HANDLING AND STORAGE

Safe Handling Precautions: Minimize dust generation and accumulation on surfaces. Routine housekeeping should be instituted to ensure that dusts do not accumulate on surfaces. See Section 8, "Exposure Controls and Personal Protection". Avoid contact with incompatible materials (see Section 10 "Stability and Reactivity").

Storage: Store and handle in accordance with all current regulations and standards.

8. EXPOSURE CONTROLS AND PERSONAL PROTECTION

Exposure Limits			
Components	OSHA (PEL)	ACGIH (TLV)	NIOSH (REL)
Ferric Oxide Red	TWA: 10 mg/m ³ (fume) TWA: 15 mg/m ³ (total dust) TWA: 5 mg/m ³ (respirable fraction)	TWA: 5 mg/m ³ (respirable fraction)	TWA: 5 mg/m ³ (as Fe dust and fume) IDLH: 2500 mg/m ³ (as Fe dust and fume)
Pyrite	No occupational limits established.		
Silica, crystalline quartz	TWA: 30/(SiO ₂ + 2) mg/m ³ (total dust) TWA: 10/(SiO ₂ + 2) mg/m ³ (respirable fraction) TWA: 250/(SiO ₂ + 5) mppcf (respirable fraction)	TWA: 0.025 mg/m ³ (respirable fraction)	TWA: 0.05 mg/m ³ (respirable dust) IDLH: 50 mg/m ³ (respirable dust)

Engineering Controls: Provide local exhaust or process enclosure ventilation system. Ensure compliance with applicable exposure limits.

Personal Protection: In accordance with OSHA 29 CFR 1910.132, subpart I, wear appropriate Personal Protective Equipment (PPE) to minimize exposure to this material.

Respiratory Protection: If workplace conditions warrant a respirator, a respiratory protection program that meets OSHA 29CFR 1910.134 must be followed. Refer to NIOSH 42 CFR 84 for applicable certified respirators.

Eye/Face Protection: Wear splash resistant safety goggles with a face shield. An eye wash station should be readily available near areas of use.

Skin and Body Protection: Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product. Chemical-resistant gloves should be worn at all times when handling chemicals.

9. PHYSICAL AND CHEMICAL PROPERTIES

Descriptive Properties:

Ferric Oxide Red

Appearance (physical state, color, etc.)	red to black, lustrous solid powder
Molecular Formula	Fe ₂ O ₃
Molar Mass (g/mol)	159.70
Odor	not available
Odor threshold	not available
pH	not available
Evaporation rate	not available
Melting point/freezing point	1565 °C (2849 °F)
Specific Gravity (water=1)	4.9 to 5.3
Vapor Pressure (mmHg)	not available
Vapor Density (air = 1)	not available
Viscosity (cP)	not available
Solubility(ies)	insoluble in water
Partition coefficient (n-octanol/water)	not available
Particle Size	minimum particle size 61 µm

Thermal Stability Properties**Autoignition Temperature****Thermal Decomposition****Initial boiling point and boiling range****Explosive Limits, LEL (Volume %)****Explosive Limits, UEL (Volume %)****Flash Point****Flammability (solid, gas)****Ferric Oxide Red**

not available

not available

not available

not available

not available

not available

not available

10. STABILITY AND REACTIVITY

Reactivity: Stable at normal temperatures and pressure.**Stability:** X Stable Unstable**Possible Hazardous Reactions:** None listed.**Conditions to Avoid:** Avoid generating dust. Avoid heat, flames, sparks, and other sources of ignitions. Avoid contact with incompatible materials.**Incompatible Materials:** Metals, metal carbides, oxidizing materials, combustible materials, reducing agents, peroxides, bases, halogens, acids, metal salts.**Fire/Explosion Information:** See Section 5, "Fire Fighting Measures".**Hazardous Decomposition:** Thermal decomposition will produce oxides of phosphorus, silicon compounds.**Hazardous Polymerization:** Will Occur X Will Not Occur

11. TOXICOLOGICAL INFORMATION

Route of Exposure: X Inhalation X Skin Ingestion**Symptoms Related to the Physical, Chemical and Toxicological Characteristics:** May aggravate respiratory disorders.**Potential Health Effects (Acute, Chronic, and Delayed)****Inhalation:** Irritation, cough phlegm. Prolonged or repeated exposure to mixtures containing respirable silica may cause cough, expectoration, dyspnea, wheezing, pharyngitis, chronic bronchitis, emphysema, and silicosis.**Skin Contact:** May cause mechanical irritation.**Eye Contact:** May cause irritation or eye damage.**Ingestion:** May cause irritation.**Numerical Measures of Toxicity****Acute toxicity:** Not classified.**Skin corrosion/irritation:** No data available.**Serious eye damage/eye irritation:** No data available.**Respiratory sensitization:** No data available.**Skin sensitization:** No data available.**Germ Cell Mutagenicity:** No data available.**Carcinogenicity:** Category 1.**Listed as a Carcinogen/Potential Carcinogen** X Yes No

Ferric oxide red is listed as Group 3, *not classifiable*, by IARC and is not listed by NTP or OSHA as carcinogen/potential carcinogen. Pyrite is not listed by IARC, NTP or OSHA as a carcinogen/potential carcinogen. Silica, crystalline quartz is listed as Group 1, *carcinogenic to humans* by IARC, *known human carcinogen* (respirable size) by NTP, and is not listed by OSHA as a designated carcinogen.

Tumorigenic data: Rat, Inhalation, TCLo: 50 mg/m³ (6 h)

Mutagenic data: Human, 120 mg/L (24 h)

Reproductive Toxicity: No data available.

Specific Target Organ Toxicity, Single Exposure: No data available.

Specific Target Organ Toxicity, Repeated Exposure: Category 1, Lungs.

Repeated and prolonged exposure to respirable quartz may cause chronic bronchitis, emphysema, and silicosis.

Aspiration hazard: Not applicable.

12. ECOLOGICAL INFORMATION

Ecotoxicity Data: No data available.

Persistence and Degradability: No data available.

Bioaccumulative Potential: No data available.

Mobility in Soil: No data available.

Other Adverse effects: No data available.

13. DISPOSAL CONSIDERATIONS

Waste Disposal: Dispose of waste in accordance with all applicable federal, state, and local regulations.

14. TRANSPORTATION INFORMATION

U.S. DOT and IATA: Not regulated by DOT or IATA.

15. REGULATORY INFORMATION

U.S. Regulations:

CERCLA Sections 102a/103 (40 CFR 302.4): Not regulated.

SARA Title III Section 302 (40 CFR 355.30): Not regulated.

SARA Title III Section 304 (40 CFR 355.40): Not regulated.

SARA Title III Section 313 (40 CFR 372.65): Not regulated.

OSHA Process Safety (29 CFR 1910.119): Not regulated.

SARA Title III Sections 311/312 Hazardous Categories (40 CFR 370.21):

ACUTE HEALTH:	No
CHRONIC HEALTH:	Yes
FIRE:	No
REACTIVE:	No
PRESSURE:	No

State Regulations:

California Proposition 65: Warning! This product contains a chemical (quartz) known to the state of California to cause cancer.

U.S. TSCA Inventory: Hematite, pyrite, and quartz are listed.

TSCA 12(b), Export Notification: Not listed.

Canadian Regulations: WHMIS Information is not provided for this material.

16. OTHER INFORMATION

Issue Date: 28 May 2015

Sources: ChemADVISOR, Inc., SDS, *Hematite*, 20 March 2015.
ChemADVISOR, Inc., SDS, *Pyrite*, 20 March 2015.

Key of Acronyms:

ACGIH	American Conference of Governmental Industrial Hygienists	NRC	Nuclear Regulatory Commission
ALI	Annual Limit on Intake	NTP	National Toxicology Program
CAS	Chemical Abstracts Service	OSHA	Occupational Safety and Health Administration
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act	PEL	Permissible Exposure Limit
CFR	Code of Federal Regulations	RCRA	Resource Conservation and Recovery Act
DOT	Department of Transportation	REL	Recommended Exposure Limit
EC50	Effective Concentration, 50 %	RM	Reference Material
EINECS	European Inventory of Existing Commercial Chemical Substances	RQ	Reportable Quantity
EPCRA	Emergency Planning and Community Right-to-Know Act	RTECS	Registry of Toxic Effects of Chemical Substances
IARC	International Agency for Research on Cancer	SARA	Superfund Amendments and Reauthorization Act
IATA	International Air Transportation Agency	SCBA	Self-Contained Breathing Apparatus
IDLH	Immediately Dangerous to Life and Health	SRM	Standard Reference Material
LC50	Lethal Concentration, 50 %	STEL	Short Term Exposure Limit
LD50	Lethal Dose, 50 %	TLV	Threshold Limit Value
LEL	Lower Explosive Limit	TPQ	Threshold Planning Quantity
MSDS	Material Safety Data Sheet	TSCA	Toxic Substances Control Act
NFPA	National Fire Protection Association	TWA	Time Weighted Average
NIOSH	National Institute for Occupational Safety and Health	UEL	Upper Explosive Limit
NIST	National Institute of Standards and Technology	WHMIS	Workplace Hazardous Materials Information System

Disclaimer: Physical and chemical data contained in this SDS are provided only for use in assessing the hazardous nature of the material. The SDS was prepared carefully, using current references; however, NIST does not certify the data in the SDS. The certified values for this material are given in the NIST Certificate of Analysis.

Users of this SRM should ensure that the SDS in their possession is current. This can be accomplished by contacting the SRM Program: telephone (301) 975-2200; fax (301) 948-3730; e-mail srmmsds@nist.gov; or via the Internet at <http://www.nist.gov/srm>.