

MATERIAL SAFETY DATA SHEET



Molten Metal Systems

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Monolithic Refractory

1. PRODUCT AND COMPANY IDENTIFICATION

MATERIAL: Monolithic Refractory
PRODUCT NAME(S): STARRPATCH 350, STARRPATCH 360

MANUFACTURER

Morganite Crucible, Inc.
22 North Plains Industrial Road
Unit #1
Wallingford CT 06492
Emergency Contact: Brandon Kruse
Product Stewardship: (800) 936-7550

24 HR. EMERGENCY TELEPHONE NUMBERS

(800) 936-7550

2. HAZARDS IDENTIFICATION

POTENTIAL HEALTH EFFECTS

EYES: Corrosive, contact may cause severe eye burns.

SKIN: Causes skin irritation.

INGESTION: Not a likely route of entry.

INHALATION: Do not breathe dust as it may cause permanent lung injury (Silicosis). The IARC has classified crystalline silica inhaled in the form of quartz or cristobalite carcinogenic to humans (Group I).

SIGNS AND SYMPTOMS OF OVEREXPOSURE

EYES: Irritation, burning, redness, pain.

SKIN: Contact may cause skin irritation.

INGESTION: Not a likely route of entry.

INHALATION: May include shortness of breath, wheezing, coughing, and sputum production.

ACUTE TOXICITY: Overexposure to dust may aggravate respiratory conditions.

CHRONIC EFFECTS: Prolonged or repeated overexposure may cause lung damage.

CARCINOGENICITY: The IARC has classified crystalline silica inhaled in the form of quartz or cristobalite carcinogenic to humans (Group I).

MEDICAL CONDITIONS AGGRAVATED: The condition of individuals with lung disease (e.g., bronchitis, emphysema, chronic obstructive pulmonary disease) can be aggravated by exposure.

ROUTES OF ENTRY: Inhalation, skin contact.

TARGET ORGAN STATEMENT: Respiratory system, skin

CANCER STATEMENT: IARC has listed crystalline silica from occupational sources as a Group I carcinogen.

A Group I carcinogen is one in which there is sufficient evidence for carcinogenicity in humans. NTP has listed crystalline silica as reasonably anticipated to be a carcinogen.

COMMENTS:

CAUTION:

Crystalline silica exists in several forms, the most common of which is quartz. If crystalline silica (quartz) is heated to more than 870°C (1600°F) it can change to a form of crystalline silica known as trydimite, and if crystalline silica (quartz) is heated to more than 1470°C (2680°F), it can change to a form of crystalline silica known as cristobalite. Crystalline silica as trydimite and cristobalite are more fibrogenic than crystalline silica as quartz. The OSHA PEL for crystalline silica as trydimite and cristobalite is one-half the PEL for crystalline silica (quartz); the ACGIH TLV for crystalline silica as trydimite and cristobalite is one-half the TLV for crystalline silica as quartz.

3. COMPOSITION / INFORMATION ON INGREDIENTS

Chemical Name	Wt. %	CAS
Aluminum Oxide (non-fibrous)	30 - 90	1344-28-1
Aluminum Silicate	10 - 60	1302-93-8
Phosphoric Acid	0 - 10	7664-38-2
Silica, Crystalline quartz	0 - 20	14808-60-7
Silica, Cristobalite	0 - 10	14464-46-1

4. FIRST AID MEASURES

EYES: Immediately flush eyes with plenty of water for at least 15 minutes. Seek medical attention if irritation persists.

SKIN: Wash with soap and water.

INGESTION: Drink plenty of water. Consult a physician.

INHALATION: Remove to fresh air. If not breathing, give artificial respiration or give oxygen by trained personnel. Seek immediate medical attention.

5. FIRE FIGHTING MEASURES

FLASHPOINT AND METHOD: Not Applicable

FLAMMABLE LIMITS: Not Applicable

GENERAL HAZARD: This product is noncombustible and will not ignite or contribute to the intensity of a fire.

EXTINGUISHING MEDIA: As appropriate for surrounding fire.

HAZARDOUS COMBUSTION PRODUCTS: Not Applicable

FIRE FIGHTING PROCEDURES: As appropriate for surrounding fire.

FIRE FIGHTING EQUIPMENT: As in any fire, wear self-contained breathing apparatus pressure-demand, (MSHA/NIOSH approved or equivalent) and full protective gear.

HAZARDOUS DECOMPOSITION PRODUCTS: Not Applicable

6. ACCIDENTAL RELEASE MEASURES

SMALL SPILL: Vacuum or sweep up material and place in a disposal container. Avoid dust generation.

LARGE SPILL: Clean up using methods which avoid dust generation. Compressed air should not be used to clean up spills. Wear appropriate personal protective equipment. Collect material in a compatible and appropriately labeled container. Dispose of material from processing, installation, maintenance, or tear-out operations in accordance with applicable federal, state, and local regulations.

ENVIRONMENTAL PRECAUTIONS

WATER SPILL: Dusts of as-manufactured refractory product have a low order of aquatic toxicity (rating TLm96: over 1000 ppm), are insoluble, and are not very mobile. Based upon this information, it is not believed to be a significant threat to the environment if accidentally released into water.

LAND SPILL: Dusts of as-manufactured refractory product are not believed to be a significant threat to the environment if accidentally released on land. Dust and material generated during maintenance and tear-out operations may be contaminated with other hazardous substances (e.g., metals, alkaline materials). Evaluation of dust and material from specific processes should be performed by a qualified environmental professional to determine if an environmental threat exists in the case of a release.

AIR SPILL: Exhaust ventilation is recommended to maintain airborne dust concentrations below regulatory exposure levels. Consult individual operating permits for allowable air emissions.

SPECIAL PROTECTIVE EQUIPMENT: Personal Protective Equipment should be worn as indicated in Section 8.

7. HANDLING AND STORAGE

GENERAL PROCEDURES: Steam spalling, which can lead to personal injury, may result from improper drying and firing procedures. For safest use and optimum performance, proper practices must be followed.

HANDLING: Use proper procedures for installation and operation. Contact manufacturer for proper procedures. Practice good housekeeping to minimize dust generation. Respirators should be worn during installation and removal of product. Consult Section 8 for respirator selection information.

STORAGE: Store in a cool area. Avoid excess heat that can dry product and render it unusable. Do not allow product to freeze.

COMMENTS: Do not breathe fumes during the heating of this product.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE GUIDELINES

OSHA HAZARDOUS COMPONENTS (29 CFR1910.1200)							
		EXPOSURE LIMITS					
		OSHA PEL		ACGIH TLV		Supplier OEL	
Chemical Name		ppm	mg/m ³	ppm	mg/m ³	ppm	mg/m ³
Aluminum Oxide (non-fibrous)	TWA	[1]	15*,5 [^] [1]	[2]	10** [2]	[3]	NA [3]
Aluminum Silicate	TWA		5.0		5.0		NA
Phosphoric Acid	TWA		1.0		1.0		NA
Silica, Crystalline quartz	TWA		0.1	[4]	0.025 [4]		NA
Silica, Cristobalite	TWA		0.05	[4]	0.025 [4]		NA
OSHA TABLE COMMENTS:							
1. * = Total dust, ^ = Respirable fraction							
2. ** The value is for inhalable particulate matter containing no asbestos and <1% crystalline silica.							
3. Not Applicable							
4. Silica exposure limits listed are for respirable fractions.							

ENGINEERING CONTROLS: Local exhaust ventilation may be necessary to control any air contaminants to within their TLVs during the use of this product.

PERSONAL PROTECTIVE EQUIPMENT

EYES AND FACE: Wear safety glasses with side shields (or goggles) and a face shield.

SKIN: Use rubber gloves. Wash thoroughly after handling.

RESPIRATORY: If it is not possible to reduce airborne exposure levels to below the OEL with ventilation, use the table below to assist you in selecting respirators that will reduce personal exposures to below the OEL. This table is part of the NIOSH Respirator Selection Logic, 2004, Chapter III, Table 1, "Particulate Respirators". The full document can be found at www.cdc.gov/niosh/npptl/topics/respirators; the user of this MSDS is directed to that site for information concerning respirator selection and use.

The assigned protection factor (APF) is the minimum anticipated level of protection provided by each type of respirator worn in accordance with an adequate respiratory protection program. For example, an APF of 10 means that the respirator should reduce the airborne concentration of a particulate by a factor of 10, so that if the workplace concentration of a particulate was 150 ug/m³, then a respirator with an APF of 10 should reduce the concentration of particulate to 15 ug/m³.

Assigned Protection Factor ¹	Type of Respirator (Use only NIOSH-certified respirators)
10	Any air-purifying elastomeric half-mask respirator equipped with appropriate type of particulate filter. ² Appropriate filtering facepiece respirator. ^{2,3} Any air-purifying full facepiece respirator equipped with appropriate type of particulate filter. Any negative pressure (demand) supplied-air respirator equipped with a half-mask.
25	Any powered air-purifying respirator equipped with a hood or helmet and a high efficiency (HEPA) filter. Any continuous flow supplied-air respirator equipped with a hood or helmet.
50	Any air-purifying full facepiece respirator equipped with N-100, R-100, or P-100 filter(s). Any powered air-purifying respirator equipped with a tight-fitting facepiece (half or full facepiece) and a high-efficiency filter. Any negative pressure (demand) supplied-air respirator equipped with a full facepiece. Any continuous flow supplied-air respirator equipped with a tight-fitting facepiece (half or full facepiece). Any negative pressure (demand) self-contained respirator equipped with a full facepiece.
1000	Any pressure-demand supplied-air respirator equipped with a half-mask.
	1. The protection offered by a given respirator is contingent upon (1) the respirator user adhering to complete program requirements (such as the ones required by OSHA in 29CFR 1910.134), (2) the use of NIOSH certified respirators in their approved configuration, and (3) individual fit testing to rule out those respirators that cannot achieve a good fit on individual workers. 2. Appropriate means that the filter medium will provide adequate protection against the particulate in question. 3. An APF of 10 can only be achieved if the respirator is qualitatively or quantitatively fit tested on individual workers.

PROTECTIVE CLOTHING: Wear clothing which minimizes skin contact or exposure.

WORK HYGIENIC PRACTICES: Use good personal hygiene when handling this product. Wash hands after use, before smoking, or before using the toilet.

OTHER USE PRECAUTIONS: Recommend yearly chest X-rays and vital capacity tests for employees regularly exposed to silica for early detection of silicosis. Comply with all guidelines for crystalline silica exposure. The IARC has classified crystalline silica inhaled in the form of quartz or cristobalite carcinogenic to humans (Group I). After exposure to temperatures above 1600 F (870 C), cristobalite and tridymite are formed.

9. PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE: Granular solid

ODOR: Mild Odor

APPEARANCE: Damp Mix

COLOR: White, gray, brown

pH: 1 to 3

PERCENT VOLATILE: Not Applicable

VAPOR PRESSURE: Not Applicable

VAPOR DENSITY: Not Applicable

BOILING POINT: Not Applicable

MELTING POINT: 1925°C (3500°F)

FLASHPOINT AND METHOD: Not Applicable

SOLUBILITY IN WATER: < 6%

EVAPORATION RATE: Not Applicable

SPECIFIC GRAVITY: 2.500 to 3.500 g/cc

10. STABILITY AND REACTIVITY

STABILITY: Stable.

POLYMERIZATION: Hazardous polymerization will not occur.

CONDITIONS TO AVOID: Not Applicable

HAZARDOUS DECOMPOSITION PRODUCTS: May produce fumes of phosphorus oxides.

INCOMPATIBLE MATERIALS: Not Applicable

11. TOXICOLOGICAL INFORMATION

ACUTE

Chemical Name	ORAL LD ₅₀ (rat)	INHALATION LC ₅₀ (rat)
Phosphoric Acid	1530 mg/kg	25.5 mg/kg

NOTES: Acute silicosis can occur with exposures to very high concentrations of respirable crystalline silica over a very short time period.

EYE EFFECTS: Will irritate eyes causing redness, pain.

CHRONIC: SILICOSIS- The major concern is silicosis, caused by the inhalation and retention of respirable crystalline silica dust. Silicosis can exist in several forms, chronic (or ordinary), and accelerated (or acute). Chronic or Ordinary Silicosis is the most common form of silicosis, and can occur after many years of exposure to relatively low levels of airborne respirable crystalline silica dust. It is further defined as either simple or complicated silicosis. Simple Silicosis is characterized by lung lesions (shown as radiographic opacities) less than 1 centimeter in diameter, primarily in the upper lung zones. Often, simple silicosis is not associated with symptoms, detectable changes in lung function, or disability. Simple silicosis may be progressive and may develop into complicated silicosis or progressive massive fibrosis (PMF). Complicated Silicosis or PMF is characterized by lung lesions (shown as radiographic opacities) greater than 1 centimeter in diameter. Although there may be no symptoms associated with complicated silicosis or PMF, the symptoms, if present, are shortness of breath, wheezing, cough, and sputum production. Complicated silicosis or PMF may lead to death. Advanced complicated silicosis or PMF can result in heart disease secondary to the lung disease (cor pulmonale). Accelerated Silicosis can occur with exposure to high concentrations of respirable crystalline silica over a

relatively short period; the lung lesions can appear within five (5) years of the initial exposure. The progression can be rapid. Accelerated Silicosis is similar to chronic or ordinary silicosis, except that the lung lesions appear earlier and the progression is more rapid. Acute Silicosis can occur with exposures to very high concentrations of respirable crystalline silica over a very short time period, sometimes as short as a few months. The symptoms of acute silicosis include progressive shortness of breath, fever, cough, and weight loss. Acute silicosis is fatal.

SCLERODERMA- There is evidence that exposure to respirable crystalline silica or that the disease silicosis is associated with the increased incidence of scleroderma, an immune system disorder manifested by a fibrosis (scarring) of the lungs, skin, and other internal organs. Recently, the American Thoracic Society noted that "there is persuasive evidence relating scleroderma to occupational silica exposures in settings where there is appreciable silicosis risk". The following may be consulted for additional information on silica, silicosis, and scleroderma (also known as progressive systemic sclerosis): Occupational Lung Disorders, Third Edition, Chapter 12, entitled "Silicosis and Related Diseases", Parkes, W. Raymond (1994). "Adverse Effects of Crystalline Silica Exposure", American Journal of Respiratory and Critical Care Medicine, Volume 155, pp. 761-765 (1997).

TUBERCULOSIS- Individuals with silicosis are at increased risk to develop tuberculosis, if exposed to persons with tuberculosis. The following may be consulted for further information: Occupational Lung Disorders, Third Edition, Chapter 12, entitled "Silicosis and Related Diseases", Parkes, W. Raymond (1994). "Adverse Effects of Crystalline Silica Exposure", American Journal of Respiratory and Critical Care Medicine, Volume 155, pp. 761-765 (1997).

NEPHROTOXICITY- There are several recent studies suggesting that exposure to respirable crystalline silica or that the disease silicosis is associated with the increased incidence of kidney disorders. The following may be consulted for additional information on silica, silicosis, and nephrotoxicity: Occupational Lung Disorders, Third Edition, Chapter 12, entitled "Silicosis and Related Diseases", Parkes, W. Ramond (1994). "Further evidence of human silica nephrotoxicity in occupationally exposed workers", British Journal of Industrial Medicine, Vol 50, No. 10, pp. 907-912 (1993). "Adverse Effects of Crystalline Silica Exposure", American Journal of Respiratory and Critical Care Medicine, Volume 155, pp. 761-765 (1997).

ARTHRITIS- There are recent studies suggesting that exposure to respirable crystalline silica or that the disease silicosis is associated with the increased incidence of arthritis. The following may be consulted for additional information on silica exposure and arthritis: American Journal of Industrial Medicine, Volume 35, pp. 375-381 "Connective Tissue Disease and Silicosis", Rosenman KD; Moore-Fuller M.; Reilly MJ. (1999). Environmental Health Perspective, Volume 107, pp. 793-802 "Occupational Exposure to Crystalline Silica and Autoimmune Disease", Parks CG, Conrad K, Cooper GS. (1999).

CARCINOGENICITY

IARC: The International Agency for Research on Cancer ("IARC") concluded that there was "sufficient evidence in humans for the carcinogenicity of crystalline silica in the forms of quartz or cristobalite from occupational sources", and that there is "sufficient evidence in experimental animals for the carcinogenicity of quartz and cristobalite". The overall IARC evaluation was that "crystalline silica inhaled in the form of quartz or cristobalite from occupational sources is carcinogenic to humans (Group I)". The IARC evaluation noted that "carcinogenicity was not detected in all industrial circumstance studies. Carcinogenicity may be dependent on inherent characteristics of the crystalline silica or on external factors affecting its biological activity or distribution of its polymorphs". For further information on the IARC evaluation, see IARC Monographs on the Evaluation of Carcinogenic Risks to Humans, Volume 68, "Silica, Some Silicates..." (1997). (Emphasis added).

NTP: Crystalline Silica (respirable) - NTP reports may reasonably be anticipated to be a carcinogen.

OSHA: Crystalline silica (quartz) is not regulated by the U.S. Occupational Safety and Health Administration as a carcinogen. There is substantial literature on the issues of the carcinogenicity of crystalline silica, which the reader should consult for additional information. A summary of the literature is set forth in "Exposure to

crystalline silica and risk of lung cancer; the epidemiological evidence", Thorax, Volume 51, pp. 97-102 (1996). The official statement of the American Thoracic Society on the issue of silica carcinogenicity was published in "Adverse Effects of Crystalline Silica Exposure", American Journal of Respiratory and Critical Care Medicine, Volume 155, pp. 761-765 (1997). The official statement concluded that "The available data support the conclusion that silicosis produces increased risk for bronchogenic carcinoma. The cancer risk may also be increased by smoking and other carcinogens in the workplace. Epidemiologic studies provide convincing evidence for increased cancer risk among tobacco smokers with silicosis. For workers with silicosis, the risks for lung cancer are relatively high and consistent among various countries and investigators. Silicosis should be considered a condition that predisposes workers to an increased risk of lung cancer". Id. at 763.

Notes: ACGIH classification for crystalline silica: A2 (Suspected Human Carcinogen)

MUTAGENICITY: For Crystalline silica, DNA damage , intratracheal rat, @ 3mg/kg TXAPA9 189, 84, 2003 and Micronucleus test, human lung, @ 40 ug/cm2 MUREAV 335, 27, 1995.

12. ECOLOGICAL INFORMATION

GENERAL COMMENTS: Dust and material generated during maintenance and tear-out operations may be contaminated with hazardous substances (e.g., metals, alkaline materials). Evaluation of dust and material from specific processes should be performed by a qualified environmental professional to determine if an environmental threat exists in the case of release.

13. DISPOSAL CONSIDERATIONS

PRODUCT DISPOSAL: The as-manufactured refractory product or refractory dust is not considered a hazardous waste as defined by 40 CFR 261. However, dust and material generated during maintenance and tear-out operations may be contaminated with other hazardous substances (e.g., metals, alkaline materials). Therefore, appropriate waste analysis may be necessary to determine proper disposal. Waste characterization and disposal/treatment methods should be determined by a qualified environmental professional in accordance with applicable federal, state, and local regulations.

14. TRANSPORT INFORMATION

DOT (DEPARTMENT OF TRANSPORTATION)

PROPER SHIPPING NAME: Not Regulated

AIR (ICAO/IATA)

SHIPPING NAME: Not Regulated

VESSEL (IMO/IMDG)

SHIPPING NAME: Not Regulated

15. REGULATORY INFORMATION

UNITED STATES

TSCA (TOXIC SUBSTANCE CONTROL ACT)

TSCA STATUS: All ingredients in this mixture are in compliance with TSCA.

CALIFORNIA PROPOSITION 65: WARNING: This product contains crystalline silica, a chemical known

to the State of California to cause cancer.

RCRA STATUS: Not regulated

CANADA

WHMIS (WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM): This product is a WHMIS controlled substance.

EUROPEAN COMMUNITY

EEC LABEL SYMBOL AND CLASSIFICATION



"Xn" - Harmful

R20: Harmful by inhalation.

R37/38: Irritating to respiratory system and skin.

S22: Do not breathe dust.

COMMENTS This product has been classified in accordance with the hazard criteria of the **Controlled Products Regulations**, and the MSDS contains all the information required by the **Controlled Products Regulations**.

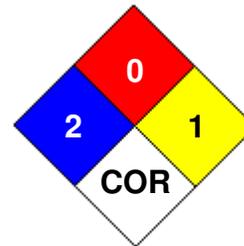
16. OTHER INFORMATION

REVISION SUMMARY: Revision #: 1. This MSDS replaces the MSDS.

HMIS RATING

HEALTH:	*	2
FLAMMABILITY:		0
PHYSICAL HAZARD:		0
PERSONAL PROTECTION:		

NFPA CODES



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