



MATERIAL SAFETY DATA SHEET

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| MSDS No: 211 | Date Prepared: 05/01/1987 | Revised/Reviewed: 06/01/1998 |
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1. PRODUCT AND COMPANY IDENTIFICATION

Material Name: Refractory Ceramic Fiber Containing Crystalline Silica
Common Name: RCF; Ceramic Fiber; Man-made Vitreous Fiber (MMVF); Synthetic Vitreous Fiber (SVF)
Intended Use: High temperature industrial thermal insulation
Trade Names: **Kaowool®: S, HS, HS45, SHP Boards and Shapes**

Manufacturer/Supplier: THERMAL CERAMICS INC.
P.O. BOX 923; DEPT. 300
AUGUSTA, GA 30903-0923
Product Stewardship Program: 800-722-5681 / FAX: 706-560-4053
For additional MSDS's, call our automated FAXBACK: 800-329-7444

2. COMPOSITION/INFORMATION ON INGREDIENTS

| <u>INGREDIENT CAS NUMBER</u> | <u>PERCENT</u> | <u>OSHA PEL</u> | <u>ACGIH TLV</u> | <u>MANUFACTURER RECOMMENDED</u> |
|--|----------------|--|------------------------------------|---------------------------------|
| Refractories, fibers, aluminosilicate 142844-00-6 | 23 - 64 | Not Established | Not Established | 0.5 f/cc * |
| Crystalline silica - quartz 14808-60-7 | 0 - 2 | 0.1 mg/m ³ (respirable) | 0.1 mg/m ³ (respirable) | |
| Silica, amorphous 7631-86-9 | 3 - 7 | (80 mg/m ³ ÷ % SiO ₂ **) or 20 mppcf | 10 mg/m ³ | |
| Starch 9005-25-8 | 4 - 8 | 15 mg/m ³ (total); 5 mg/m ³ (respirable) | 10 mg/m ³ | |
| Silica, fused (amorphous) 60676-86-0 | Up to 56 | (80 mg/m ³ ÷ % SiO ₂ **) or 20 mppcf | 0.1 mg/m ³ (respirable) | |
| Alumina 1344-28-1 | Up to 46 | 15 mg/m ³ (total); 5 mg/m ³ (respirable) | 10 mg/m ³ | |

NOTES:

Oxides of carbon and trace of ammonia may release from **starch** during initial heating of this product.

* Thermal Ceramics' recommended exposure guideline (REG) for respirable fibers as an 8 hour time weighted average (TWA) exposure, based on air samples collected and analyzed using NIOSH method 7400(B).

** % SiO₂ = percent of crystalline silica

(See Section 8 for Personal Protection Guidelines.)

3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

**** WARNING ****

- Cancer hazard by inhalation. [SEE BELOW]

- Pre-existing medical conditions, including dermatitis, asthma or chronic lung disease may be aggravated by exposure; individuals who are atopic (with a history of allergies) may experience greater amounts of skin and respiratory irritation.

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Possible Health Effects

Target Organs: Eyes, skin and respiratory system
Primary Entry Route: Inhalation
Acute effects: Upper respiratory physical irritation. Irritation and inflammation to the eyes on contact and to the skin on prolonged contact.
Chronic effects: Studies to date, involving occupationally exposed workers, have not identified any increased incidence of respiratory disease. Long-term, high-dose exposure to specially-sized, rodent respirable fiber has resulted in the development of fibrosis, lung cancer and mesothelioma in rats & hamsters. Prolonged/repeated inhalation of respirable crystalline silica may cause delayed lung injury (silicosis). [See Section 11 of this MSDS for more information.]

Hazard Classification:

- Refractory Ceramic Fiber

Although studies, involving occupationally exposed workers, have not identified any increased incidence of respiratory disease, results from animal testing have been used as the basis for hazard classification:

The Seventh Annual Report on Carcinogens (1994), prepared by the **National Toxicology Program (NTP)**, classified respirable refractory ceramic fiber (RCF) and glasswool as substances reasonably anticipated to be carcinogens.

The **International Agency for Research on Cancer (IARC)** has classified man-made vitreous fibers (MMVF), including fibrous glasswool, mineral wool (rockwool & slagwool), and refractory ceramic fiber, as possible human carcinogens (Group 2B). The classification of refractory ceramic fiber was based on sufficient evidence of carcinogenicity in animals and no available data in humans.

The **State of California**, pursuant to Proposition 65, The Safe Drinking Water and Toxic Enforcement Act of 1986, has listed "ceramic fibers (airborne fibers of respirable size)" as a material known to the State of California to cause cancer.

The **Commission of The European Communities** has classified RCF as a substance which should be regarded as if it is carcinogenic to man.

- Crystalline Silica

The Seventh Annual Report on Carcinogens (1994), prepared by the **National Toxicology Program (NTP)**, classified silica, crystalline (respirable size), as a substance which may reasonably be anticipated to be a carcinogen.

The **International Agency for Research on Cancer (IARC)** has classified crystalline silica inhaled in the form of quartz or cristobalite from occupational sources as carcinogenic to humans (Group 1). This IARC Classification was based on a relatively large number of epidemiological studies that together provide sufficient evidence in humans for the carcinogenicity of inhaled crystalline silica.

The **State of California**, pursuant to Proposition 65, The Safe Drinking Water and Toxic Enforcement Act of 1986, has listed "silica, crystalline (airborne particles of respirable size)" as a material known to the State of California to cause cancer.

Signs and Symptoms of Overexposure:

Eye Contact: Physical irritation - inflammation
Skin Contact: Physical irritation - rash
Ingestion: May cause temporary irritation to the gastrointestinal tract.
Inhalation: Irritation or soreness in throat, nose and respiratory tract

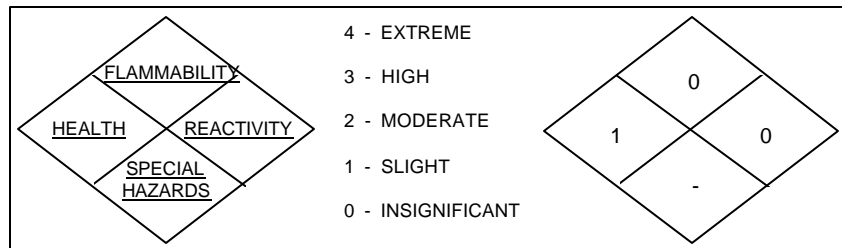
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4. FIRST AID MEASURES

Eye Contact: Flush with large amounts of water for at least 15 minutes. Do not rub eyes.
Skin Contact: Wash affected area gently with soap and water. Skin cream or lotion after washing may be helpful.
Ingestion: Do not induce vomiting; drink plenty of water.
Inhalation: Remove affected person to clean fresh air.
**** If any of the symptoms persist, seek medical attention immediately.**

5. FIRE FIGHTING MEASURES



NFPA Unusual Hazards: None
Flash Point: Non-combustible
Extinguishing Media: Use extinguishing media appropriate to the surrounding fire.
Explosion Hazards: None
Protective Equipment: Wear a NIOSH certified respirator together with other protective gear appropriate to the surrounding fire.

6. ACCIDENTAL RELEASE MEASURES

Spill/Leak Procedures: Avoid creating airborne dust. Follow routine housekeeping procedures. Vacuum only with HEPA filtered equipment. If sweeping is necessary, use a dust suppressant and place material in closed containers. Do not use compressed air for clean-up. Personnel should wear gloves, goggles and approved respirator. Avoid clean-up procedures that could result in water pollution.

7. HANDLING AND STORAGE

Handling: Limit use of power tools unless in conjunction with local exhaust. Use hand tools whenever possible. Frequently clean the work area with HEPA filtered vacuum or wet sweeping to minimize the accumulation of debris. Do not use compressed air for clean-up.

Handling After-Service:

- Aluminosilicate fibers become friable after exposure to high temperatures and may be partially converted to crystalline silica. [See Section 16 for additional information.]
- Handling after-service fibers may result in exposure to crystalline silica and fibers. It is possible that other contaminants might also be present depending on the material's application. [See Section 8 - Personal Protection Equipment.]
- To reduce exposure to these materials, follow the recommendations in Section 8 and minimize dust by dampening the material with a water/surfactant mist. Do not allow water to accumulate on the floor.

Storage: This product is stable under all conditions of storage. Store in original factory container in a dry area. Keep container closed when not in use.

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8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls: Use engineering controls such as ventilation and dust collection devices to reduce airborne fiber concentrations to the lowest attainable level.

Respiratory Protection: When it is not possible or feasible to significantly reduce airborne fiber and dust levels through engineering controls, or until they are installed, employees are encouraged to use good work practices together with respiratory protection. Before providing respirators to employees (especially negative pressure type), employers should 1) monitor for airborne fibers and respirable crystalline silica concentrations using NIOSH method 7400(B) and 7500 respectively and select the appropriate respiratory protection based upon the results of that monitoring. 2) have the workers evaluated by a physician to determine the workers' ability to wear respirators, and 3) implement respiratory protection training programs. Use NIOSH certified respirators, in compliance with OSHA Respiratory Protection Standard 29 CFR 1910.134 and 29 CFR 1926.103, for the particular hazard or airborne concentrations to be encountered in the work environment. For the most current information on respirator selection, contact your supplier.

Recommended Respiratory Protection When Handling RCF Product Containing Crystalline Silica

• **AS-PRODUCED and AFTER-SERVICE FIBER** ⁽¹⁾

| <u>CONCENTRATION</u> ⁽²⁾ | <u>RESPIRATOR</u> |
|-------------------------------------|---|
| Up to PEL | Disposable particulate respirator (N, R, or P, 95 rated) ^{(3),(4)} or half mask air purifying respirator with high efficiency (P100) filter cartridges. |
| > 1 to 10 times PEL | Half-mask, air-purifying respirator with high efficiency particulate air (HEPA) or P100 rated filter cartridges. |
| > 10 to 50 times PEL | Full facepiece air-purifying respirator with HEPA or P100 rated filter cartridges or powered air-purifying respirator (PAPR) with HEPA or P100 rated filter cartridges. |
| > 50 times PEL | Full facepiece positive pressure supplied air respirator. |

⁽¹⁾ Unless air monitoring data indicates a lower exposure, as a minimum, use a full facepiece air-purifying respirator with HEPA or P100 rated filter cartridges during furnace tear out or when conducting RCF removal in a confined area. [See Section 16]
⁽²⁾ Eight hour time weighted average (TWA) exposures determined by air samples collected and analyzed using NIOSH method 7400(B) for airborne fibers and method 7500 for crystalline silica.
⁽³⁾ Not recommended for fiber chopping, blanket/module folding, cutting, installation or other tasks using power tools and machinery (e.g. band sawing, lathing, grinding, drilling, die cutting) unless effective engineering controls reduce fiber exposures.
⁽⁴⁾ If oil present, use only R or P rated filters.
NOTE: For unknown exposures or when working with other contaminants, consult an industrial hygienist for air monitoring and respirator selection.

Protective Clothing: Wear full body clothing, gloves, hat and eye protection. Wash work clothes separately from other clothing. Rinse washer after use. If you take work clothing home, it is recommended you vacuum your clothes with a HEPA filtered vacuum before leaving the work area.

Eye Protection: Goggles/safety glasses with sideshields should be worn.

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9. PHYSICAL AND CHEMICAL PROPERTIES

| | | | |
|-----------------------|------------------------------------|-------------------------|----------------|
| Appearance: | Fiber shape | | |
| Chemical Family: | Aluminosilicate | | |
| Vapor Pressure: | Not applicable | Vapor Density: | Not applicable |
| Boiling Point: | Not applicable | Specific Gravity Range: | Not applicable |
| Melting Point: | 2800°F (1538°C) to 3200°F (1768°C) | Volatile by Volume (%): | 0 |
| Water Solubility (%): | Not soluble in water | pH: | Not applicable |

10. STABILITY AND REACTIVITY

| | |
|-----------------------------------|--|
| Hazardous Polymerization: | Will not occur |
| Chemical Incompatibilities: | Hydrofluoric acid, phosphoric acid, strong alkalis |
| Hazardous Decomposition Products: | Oxides of carbon and trace of ammonia |

11. TOXICOLOGICAL INFORMATION

Epidemiology: - Refractories, fibers, aluminosilicate
Industry epidemiologic investigations of RCF production workers are ongoing. The preliminary evidence, obtained from employees in RCF manufacturing facilities, is as follows:

- 1) There is no evidence of any fibrotic lung disease (interstitial fibrosis) on x-ray.
- 2) There is no evidence of any lung disease among those employees exposed to RCF that have never smoked. Data, however, indicates that RCF workers who smoke may have a greater reduction in pulmonary function than those who do not. Therefore, it is recommended that persons who work with RCF do not smoke.
- 3) A statistical trend was observed in the exposed population between the duration of exposure to RCF and a decrease in some measures of pulmonary function. These observations are clinically insignificant. The results would be interpreted as being within the normal range if these observations were made on an individual employee.
- 4) Pleural plaques (thickening along the chest wall) have been observed in a small number of employees who had a long duration of employment. There are several occupational and non-occupational causes for pleural plaques. Pleural plaques are a marker of exposure only and under most circumstances are not associated with any measurable effect on lung function.

- Crystalline silica

Results of several epidemiology studies have indicated that diseases which may be caused by the uncontrolled inhalation of crystalline silica include silicosis, pulmonary tuberculosis or industrial bronchitis. In evaluating crystalline silica as a cancer risk, the International Agency for Research on Cancer (IARC) reviewed several studies from different industries and concluded that crystalline silica from occupational sources inhaled in the form of quartz or cristobalite is carcinogenic to humans (Group 1) [IARC Monograph; Vol. 68; June 1997]. However, in reaching its conclusion, IARC stated that the carcinogenicity in humans could not be found in all industries reviewed and that carcinogenicity might be dependent on inherent characteristics of crystalline silica or on external factors affecting biological activity (e.g., cigarette smoking) or distribution of its polymorphs.

Toxicology: - Refractories, fibers aluminosilicate

A number of toxicologic bioassay studies with rats and hamsters on the health effects of refractory ceramic fiber (RCF) inhalation exposures have been completed. In a lifetime, nose-only inhalation study using rats exposed to specially prepared RCF at a maximum tolerated dose (MTD) (30 mg/m³), the animals developed progressive lung damage

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(interstitial fibrosis), lung cancer and cancer of the pleural lining between the chest wall and lung (mesothelioma). Hamsters exposed under the same conditions developed interstitial fibrosis and pleural cancer but no lung cancer.

A multiple dose inhalation study in rats at exposures of 3, 9, and 16 mg/m³ (approximately 25, 75 and 115 fiber/cc) was also carried out. The dose responsiveness of rats to the adverse effects of RCFs was established. At all exposure levels there was no statistically significant increase in lung tumors in the animals. A single mesothelioma was diagnosed in one of the 116 animals in the 9 mg/m³ exposure group. No fibrosis was observed in the 3 mg/m³ exposure group. These data tend to indicate that a critical dose level may exist below which neither fibrosis nor tumors are observed, i.e., a practical threshold.

- Crystalline silica

There is sufficient evidence of carcinogenicity of respirable silica in experimental animals (IARC Monograph; Vol. 42; 1987 and IARC Monograph; Vol. 68; 1997). Inhalation and intratracheal installation of crystalline silica in rats caused lung cancer; however, studies in other species such as mice and hamsters caused no lung cancer. Crystalline silica also caused fibrosis in rats and hamsters in several inhalation and intratracheal installation studies.

- Silica, amorphous

Toxic effects described in animals from single inhalation exposures of amorphous silica include upper respiratory irritation, lung congestion, bronchitis, and emphysema. Repeated inhalation exposures at concentration of 50 or 150 mg/m³ produced increased lung weights and lung changes. No progressive pulmonary fibrosis was seen and the observed lung changes were reversible. No adverse effects were observed in this study at 10 mg/m³. No animal test reports are available to define the carcinogenic, mutagenic, or reproductive effects.

12. ECOLOGICAL INFORMATION

Adverse effects of this material on the environment are not anticipated.

13. DISPOSAL INFORMATION

Waste Management: To prevent waste materials becoming airborne, a covered container or plastic bagging is recommended. Comply with federal, state and local regulations. Method of disposal: Landfill. Chemical additions, processing or otherwise altering this material may make the waste management information presented in this MSDS incomplete, inaccurate, or otherwise inappropriate.

RCRA: If discarded in its purchased form, this product would not be a hazardous waste either by listing or by characteristic. However, under RCRA, it is the responsibility of the product user to determine at the time of disposal whether a material containing the product or derived from the product should be classified as a hazardous waste (40 CFR 261.20-24).

14. TRANSPORT INFORMATION

Department of Transportation (D.O.T.):

| | | | |
|-----------------|----------------|-----------------------------|----------------|
| Hazard Class: | Not regulated | United Nations (UN) Number: | Not applicable |
| Labels: | Not applicable | North America (NA) Number: | Not applicable |
| Placards: | Not applicable | | |
| Bill of Lading: | Product name | | |

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15. REGULATORY INFORMATION

United States Regulations

SARA Title III: This product does not contain any substances reportable under Sections 302, 304, 313 (40 CFR 372). Sections 311 and 312 apply.

OSHA: Comply with Hazard Communication Standards 29 CFR 1910.1200 and 29 CFR 1926.59 and Respiratory Protection Standards 29 CFR 1910.134 and 29 CFR 1926.103. Components of this product are considered to be hazardous as defined by the OSHA Hazard Communication Standard.

TSCA: All substances contained in this product are listed in the TSCA Chemical Inventory [Section 8(b)].

California: Listed as "Ceramic Fibers (airborne particles of respirable size)" and "Silica, crystalline (airborne particles of respirable size)" Proposition 65, The Safe Drinking Water and Toxic Enforcement Act of 1986: Known to the State of California to cause cancer.

Other States: Refractory Ceramic Fiber and Crystalline Silica products are not known to be regulated by states other than California; however, state and local OSHA and EPA regulations may apply to these products. Contact your local agency if in doubt.

International Regulations

Canadian WHMIS: Class D-2A Materials Causing Other Toxic Effects

Canadian EPA: All substances in this product are listed, as required, on the Domestic Substance List (DSL).

16. OTHER INFORMATION

Precautionary Measures to be Taken After Service and Upon Removal:

Refractory ceramic fiber and amorphous silica may transform to products which contain crystalline silica when subjected to temperatures exceeding 1800° F. Therefore, the content of crystalline silica may be higher than originally stated in Section 2. Users should observe good industrial hygiene and work practices to reduce employees' exposure when handling after service products.

HMIS Hazard Rating:

HMIS Acute Health: 1*

HMIS Flammable: 0

HMIS Reactivity: 0

HMIS Personal Protective: To be supplied by user depending upon use.

*See Section 3 of the MSDS for possible chronic health effects.

SARA Title III Hazard Categories:

| | | | |
|------------------------|-----|---------------------------|----|
| Acute Health: | Yes | Pressure Hazard: | No |
| Chronic Health: | Yes | Reactivity Hazard: | No |
| Fire Hazard: | No | | |

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Definitions:

ACGIH: American Conference of Governmental Industrial Hygienists
CAS: Chemical Abstracts Service Registry Number
EPA: Environmental Protection Agency
f/cc: Fibers per cubic centimeter
HEPA: High Efficiency Particulate Air
HMIS: Hazardous Materials Identification System
mg/m3 : Milligrams per cubic meter of air
mppcf: Million particles per cubic meter
MSHA: Mine Safety and Health Administration
NFPA: National Fire Protection Association
NIOSH: National Institute for Occupational Safety and Health
OSHA: Occupational Safety and Health Administration
RCRA: Resource Conservation and Recovery Act
SARA: Superfund Amendments and Reauthorization Act
Title III: Emergency Planning and Community Right to Know Act
...Section 302: Extremely Hazardous Substances
...Section 304: Emergency Release
...Section 311: MSDS/List of Chemicals
...Section 312: Emergency and Hazardous Inventory
...Section 313: Toxic Chemicals Release Reporting
STEL: Short-Term Exposure Limit
TCLP: Toxicity Characteristics Leaching Procedures (EPA)
TLV: Threshold Limit Values (ACGIH)
TSCA: Toxic Substance Control Act
WHMIS: Workplace Hazardous Materials Information System (Canada)
29 CFR 1910.134 & 1926.103: OSHA Respiratory Protection Standard
29 CFR 1910.1200 & 1926.59: OSHA Hazard Communications Standard

Revisions: Replaces revision 09/12/97. Revised Sections 2, 3, 5, 7, 8, 11, and 15 with updated information.
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Reasonable care has been taken in the preparation of the information contained in this Material Safety Data Sheet and is given in good faith. However, Thermal Ceramics Inc. assumes no responsibility as to the accuracy or suitability of such information and no warranty, expressed or implied, is made.

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PRODUCT SAFETY INFORMATION

REFRACTORY CERAMIC FIBER PRODUCT CONTAINING CRYSTALLINE SILICA

WARNING:

- Potential cancer hazard by inhalation. The hazard depends on duration and level of exposure.

Avoid breathing fiber particulates and dust

RISKS:

- Crystalline silica has been identified by the International Agency for Research on Cancer (IARC) as a known carcinogen to humans.
- RCF has been identified by IARC as a possible carcinogen to humans.
- Over exposure to crystalline silica may cause silicosis (lung disease).
- May cause temporary irritation to eyes, skin and respiratory tract (nose, throat and lungs).

PRECAUTIONARY MEASURES:

- Minimize airborne particulates and dust with engineering controls.
- Wear a NIOSH certified respirator.
- Wear long sleeved, loose-fitting clothing, eye protection, and gloves.
- Wash work clothing separately and rinse washing machine after use.

FIRST AID MEASURES:

- Eyes:** Flush with Water.
Skin: Wash with soap and warm water.
Ingestion: Do not induce vomiting. Get medical attention if gastrointestinal symptoms develop.
Inhalation: Remove to fresh clean air.

If any of the above irritations persists, seek medical attention immediately.

FOR ADDITIONAL PRODUCT INFORMATION AND WORK PRACTICES, REFER TO THE MATERIAL SAFETY DATA SHEETS (MSDS).

**THERMAL CERAMICS INC.
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Canadian WHMIS Class D-2A: Material causing other toxic effects.

Label No: 24-1095 (Rev. 08/99)