



SAFETY DATA SHEET

Following Regulation 1910.1200

SDS Number: 228 Date of first issue: 12 September 1996 Date of last revision: 21 February 2022

1 - Identification of product

a - Product identifier used on the label

Tradenames: Kaowool 336-E Millboard

b - Other means of identification

Refractory Ceramic Fiber Product containing Crystalline Silica

c - Recommended use of the chemical and restrictions on use

Primary Use: Refractory Ceramic Fiber (RCF) materials are used primarily in industrial high temperature insulating applications. Examples include heat shields, heat containment, gaskets, expansion joints, industrial furnaces, ovens, kilns, boilers and other process equipment at applications up to 1400°C. RCF based products are not intended for direct sale to the general public. While RCFs are used in the manufacture of some consumer products, such as catalytic converter mats and wood burning stoves, the materials are contained, encapsulated, or bonded within the units

Secondary Use: Conversion into wet and dry mixtures and articles (refer to section 8) **Tertiary Use:** Installation, removal (industrial and professional) / Maintenance and servicelife (industrial and professional) (refer to section 8).

Uses Advised Against: Spraying of dry product.

d - Name, address, and telephone number

Morgan Advanced Materials
P. O. Box 923; Dept. 300
Augusta, GA 30903-0923
Telephone: 706-796-4200

e - Emergency Phone Number

For Product Stewardship and Emergency Information:
Hotline - 1-800-722-5681
Fax - 706-560-4054

For additional SDSs and to confirm this is the most current SDS for the product, visit our web page www.morganthermalceramics.com or send a request to MT.NorthAmerica@morganplc.com

2 - Hazard Identification

a - Classification of the chemical in accordance with paragraph (d) of §1910.1200

The U.S. Occupational Safety and Health Administration (OSHA) Hazard Communication Standard (HCS) 2012 indicates that IARC Group 1 carcinogen (such as respirable crystalline silica) corresponds to OSHA HCS 2012 Category 1A carcinogen classification (see, e.g., §1910.1200, Appendix F, Part D). Also IARC Group 2B carcinogen (such as RCF) corresponds to OSHA HCS 2012 Category 2 carcinogen classification.

b - Signal word, hazard statement(s), symbol(s) and precautionary statement(s) in accordance with paragraph (f) of §1910.1200

Hazard Pictograms



Signal Words

Danger

Hazard Statements

May cause cancer by inhalation.

Precaution Statements

Do not handle until all safety instructions have been read and understood.

Use respiratory protection as required; see Section 8 of the Safety Data Sheet.

If concerned about exposure, get medical advice.

Store in a manner to minimize airborne dust.

Dispose of waste in accordance with local, state and federal regulations.

Minimize exposure to airborne dust.

Emergency Overview

c - Describe any hazards not otherwise classified that have been identified during the classification process

Mild mechanical irritation to skin, eyes and upper respiratory system may result from exposure. These effects are usually temporary.

d - Mixture Rule

These products contain mixtures of RCF and crystalline silica. Dust samples from these products have not been tested for their specific toxicity. The hazard classification of these products were based on GHS classification of respirable crystalline silica as category 1 carcinogen.

3 - Composition / Information On Ingredients

a - Composition table

COMPONENTS	CAS NUMBER	% BY WEIGHT
Refractories, Fibers, Aluminosilicate	142844-00-6	60 - 70
Clay, Aluminum Silicate	1302-76-7	10 - 15
Latex	NONE	5 - 10
Silica Amorphous	7631-86-9	3 - 5
Crystalline Silica	14808-60-7 or 14464-46-1	Up to 2

b - Common Name

(See Section 8 "Exposure Controls / Personal Protection" for exposure guidelines)

d - Impurities and Stabilizing Additives

None.

4 - First-Aid measures

a - Description of necessary measures, subdivided according to the different routes of exposure, i.e., inhalation, skin and eye contact, and ingestion

Eyes

If eyes become irritated, flush immediately with large amounts of lukewarm water for at least 15 minutes. Eyelids should be held away from the eyeball to ensure thorough rinsing. Do not rub eyes.

Skin

If skin becomes irritated, remove soiled clothing. Do not rub or scratch exposed skin. Wash area of contact thoroughly with soap and water. Using a skin cream or lotion after washing may be helpful.

Respiratory Tract

If respiratory tract irritation develops, move the person to a dust free location. See Section 8 for additional measures to reduce or eliminate exposure.

Gastrointestinal

If gastrointestinal tract irritation develops, move the person to a dust free environment.

c - Indication of immediate medical attention and special treatment needed, if necessary

5 - Fire-fighting measures

a - Suitable (and unsuitable) extinguishing media and

Use extinguishing media suitable for type of surrounding fire

c - Special Protective Equipment and Precautions for Firefighters

NFPA Codes: Flammability: 0 Health: 1 Reactivity: 0 Special: 0

b - Specific hazards arising from the chemical (e.g., nature of any hazardous combustion products):

None

6 - Accidental Release Measures

a - Personal precautions, protective equipment, and emergency procedures

Minimize airborne dust. Compressed air or dry sweeping should not be used for cleaning. See Section 8 "Exposure Controls / Personal Protection" for exposure guidelines.

b - Methods and materials for containment and cleaning up

Pick up large pieces and dispose in a closed container. Follow precaution stated in above section for clean up.

7 - Handling and storage

a - Precautions for safe handling

Handle fiber carefully to minimize airborne dust. Limit use of power tools unless in conjunction with local exhaust ventilation. Use hand tools whenever possible.

b - Conditions for safe storage, including any incompatibilities

Store in a manner to minimize airborne dust.

c - empty containers

Product packaging may contain residue. Do not reuse.

8 - Risk Management Measures / Exposures Controls / Personal Protection

a - OSHA permissible exposure limit (PEL), American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value (TLV), and any other exposure limit used or recommended by the chemical manufacturer, importer, or employer preparing the safety data sheet, where available

EXPOSURE GUIDELINES			
MAJOR COMPONENT	OSHA PEL	ACGIH TLV	MANUFACTURER'S REG
Refractories, Fibers, Aluminosilicate	None Established *	0.2 f/cc, 8-hr. TWA	0.5 f/cc, 8-hr. TWA **
Silica, Amorphous	(80 mg/m ³ + % SiO ₂) or 20 mppcf	None Established	NONE
Crystalline Silica	0.05 mg/m ³ ***	0.025 mg/m ³	NONE
* Except of in the state of California, there is no specific regulatory standard for RCF in the U.S. OSHA's "Particulate Not Otherwise Regulated (PNOR)" standard [29 CFR 1910.1000, Subpart Z, Air Contaminants] applies generally - Total Dust 15 mg/m ³ ; Respirable Fraction 5 mg/m ³ . The PEL for RCF in California is 0.2 f/cc, 8-hr TWA			
** HTIW Coalition has sponsored comprehensive toxicology and epidemiology studies to identify potential RCF-related health effects [see Section 11 for more details], consulted experts familiar with fiber and particle science, conducted a thorough review of the RCF-related scientific literature, and further evaluated the data in a state-of-the-art quantitative risk assessment. Based on these efforts and in the absence of an OSHA PEL, HTIW Coalition has adopted a recommended exposure guideline (REG), as measured under NIOSH Method 7400 B. The manufacturers' REG is intended to promote occupational health and safety through feasible exposure controls and reductions as determined by extensive industrial hygiene monitoring efforts undertaken voluntarily and pursuant to an agreement with the U.S. Environmental Protection Agency.			
*** OSHA new Permissible Exposure Limit (PEL) for respirable crystalline silica is 0.05 mg/m ³ (8-hr TWA), an Action Level (AL) of 0.025 mg/m ³ (8-hr TWA), together with associated ancillary requirements listed under General Industry and Maritime Standard (29 CFR 1910.1053) and Construction Standards (29 CFR 1910.1153).			
OTHER OCCUPATIONAL EXPOSURE LEVELS (OEL)			
Ontario Canada OEL - Silica, Crystalline: Quartz/Tripoli = 0.1 mg/m ³ ; Cristobalite = 0.05 mg/m ³ . RCF-related occupational exposure limits vary internationally. Regulatory OEL examples include: Canada – 0.2 to 1.0 f/cc; Ontario Canada OEL - 1.0 f/cc; United Kingdom – 1.0 f/cc. Non-regulatory OEL examples include: HTIW Coalition REG – 0.5 f/cc. The objectives and criteria underlying each of these OEL decisions also vary. The evaluation of occupational exposure limits and their relative applicability to the workplace is best performed, on a case-by-case basis, by a qualified Industrial Hygienist.			

b - Appropriate Engineering Controls

Use engineering controls such as local exhaust ventilation, point of generation dust collection, down draft work stations, emission controlling tool designs and materials handling equipment designed to minimize airborne fiber emissions.

c - Individual protection measures, such as personal protective equipment

PPE - Skin

Wear personal protective equipment (e.g gloves), as necessary to prevent skin irritation. Washable or disposable clothing may be used. If possible, do not take unwashed clothing home. If soiled work clothing must be taken home, employees should be informed on best practices to minimize non-work dust exposure (e.g., vacuum clothes before leaving the work area, wash work clothing separately, and rinse washer before washing other household clothes).

PPE - Eye

As necessary, wear goggles or safety glasses with side shields.

PPE – Respiratory

When engineering and/or administrative controls are insufficient to maintain workplace concentrations below the 0.5 f/cc REG or a regulatory OEL, the use of appropriate respiratory protection, pursuant to the requirements of OSHA Standards 29 CFR 1910.134 and 29 CFR 1926.103, is recommended. A NIOSH certified respirator with a filter efficiency of at least 95% should be used. The 95% filter efficiency recommendation is based on NIOSH respirator selection logic sequence for exposure to manmade mineral fibers. Pursuant to NIOSH recommendations, N-95 respirators are appropriate for exposures up to 10 times the NIOSH Recommended Exposure Limit (REL). With respect to RCF, both the NIOSH REL and the industry REG have been set at 0.5 fibers per cubic centimeter of air (f/cm³). Accordingly, N-95 would provide the necessary protection for exposures up to 5 f/cm³. Further, the Respirator Selection Guide published by 3M Corporation, the primary respirator manufacturer, specifically recommends use of N-95 respirators for RCF exposures. In cases where exposures are known to be above 5.0 f/cm³, 8 hour TWA, a filter efficiency of 100% should be used. Other factors to consider are the NIOSH filter series N, R or P -- (N) Not resistant to oil, (R) Resistant to oil and (P) oil Proof. These recommendations are not designed to limit informed choices, provided that respiratory protection decisions comply with 29 CFR 1910.134.

The evaluation of workplace hazards and the identification of appropriate respiratory protection is best performed, on a case by case basis, by a qualified Industrial Hygienist.

Other Information

Concentrations based upon an eight-hour time weighted average (TWA) as determined by air samples collected and analyzed pursuant to NIOSH method 7400 (B) for airborne fibers. The manufacturer recommends the use of a full-facepiece air purifying respirator equipped with an appropriate particulate filter cartridge during furnace tear-out events and the removal of used RCF to control exposures to airborne fiber and the potential presence of crystalline silica.

9 - Physical and chemical properties

a - Appearance	Fiber shapes
b - Odor	Not applicable
c - Odor Threshold	Not applicable
e - pH	Not applicable
d - Melting Point	3200°F (1768°C)
f - Initial Boiling Point/Range	Not applicable
g - Flashpoint	Not applicable
h - Evaporation Rate	Not applicable
i - Flammability	Not applicable
j - Upper/Lower Flammability or Explosive Limits	Not applicable
k - VAPOR PRESSURE	Not applicable
l - VAPOR DENSITY	Not applicable
m - Solubility	Not soluble in water
n - Relative Density	0.5
o - Partition Coefficient: n-Octanol/water	Not applicable
p - Auto-ignition temperature	Not applicable
q - Decomposition Temperature	Not applicable
r - Viscosity	Not applicable

10 - Stability and Reactivity

a - Reactivity

None.

b - Chemical Stability

Stable under conditions of normal use.

c - Possibility of Hazardous Reaction

None

d - Conditions to Avoid

None

e - Incompatible Materials

None

f - Hazardous decomposition products

During first heating, oxidation products from the organic binder such as carbon monoxide, carbon dioxide and hydrocarbons might be emitted in a temperature range from 180° C to 600° C. It is recommended to ventilate the room until gases and fumes have disappeared. Avoid exposure to high concentrations of gas or fumes.

11 - Toxicological information

a - TOXICOKINETICS, METABOLISM AND DISTRIBUTION

Exposure is predominantly by inhalation or ingestion. Man-made vitreous fibers of a similar size to RCF have not been shown to migrate from the lung and/or gut and do not become located in other organs of the body.

b - Acute Toxicity

c - Epidemiology

Crystalline silica:

Exposure to crystalline silica can cause silicosis, and exacerbate pulmonary tuberculosis and bronchitis. IARC (Monograph vol. 68, 1997) concluded that "crystalline silica from occupational sources inhaled in the form of quartz or cristobalite is carcinogenic to humans (Group 1)", and noted that "carcinogenicity in humans was not detected in all industrial circumstances studied" and "may be dependent on inherent characteristics of the crystalline silica or on external factors affecting its biological activity".

d - Toxicology

RCF:

- *Acute toxicity: short term inhalation*

No data available: Short term tests have been undertaken to determine fiber (bio) solubility rather than toxicity; repeat dose inhalation tests have been undertaken to determine chronic toxicity and carcinogenicity.

- *Acute toxicity: oral*

No data available: Repeated dose studies have been carried out using gavage. No effect was found.

- *Skin corrosion/irritation*

Not a chemical irritant according to test method OECD no. 404.

- *Serious eye damage/irritation*

Not possible to obtain acute toxicity information due to the morphology and chemical inertness of the substance.

- *Respiratory or skin sensitization*

No evidence from human epidemiological studies of any respiratory or skin sensitization potential.

- *Germ cell mutagenicity/genotoxicity*

Method: In vitro micronucleus test

Species: Hamster (CHO)

Dose: 1-35 mg/ml

Routes of administration: In suspension

Results: Negative

- *Carcinogenicity*

Method: Inhalation, multi-dose

Species: Rat

Dose: 3 mg/m³, 9 mg/m³ and 16 mg/m³

Routes of administration: Nose only inhalation

Results: Fibrosis just reached significant levels at 16 and 9 mg/m³ but not at 3 mg/m³. None of the parenchymal tumor incidences were higher than the historical control values for this strain of animal.

Method: Inhalation, single dose

Species: Rat

Dose: 30 mg/m³

Routes of administration: Nose only inhalation

Results: Rats were exposed to a single concentration of 200 WHO fibers/ml specially prepared RCF for 24 months. High incidence of exposure-related pulmonary neoplasms (bronchoalveolar adenomas and carcinomas) was observed. A small number of mesotheliomas were observed in each of the fiber exposure groups (Mast et al 1995a).

Method: Inhalation, single dose

Species: Hamster

Dose: 30 mg/m³

Routes of administration: Nose only inhalation

Results: Hamsters were exposed to a single concentration of 260 WHO fibers/ml specially prepared RCF for 18 months and developed lung fibrosis, a significant number of pleural mesotheliomas (42/102) but no primary lung tumors (McConnell et al 1995).

Method: Inhalation, single dose

Species: Rat

Dose: RCF1: 130 F/ml and 50 mg/m³ (25% of non fibrous particles)

RCF1a: 125 F/ml and 26 mg/m³ (2% of non fibrous particles)

Routes of administration: Nose only inhalation

Results: Rats were exposed to RCF1 and RCF1a for 3 weeks. The objective of the study was to compare lung retention and biological effects of the original RCF1 compared to RCF1a. The main difference of these 2 samples was the non-fibrous particle content of respectively 25% versus 2%. The post treatment observation was 12 months. Alveolar clearance was barely retarded after RCF1A exposure. After RCF1 exposure, however, a severe retardation of clearance was observed. (Bellmann et al 2001).

After intraperitoneal injection of ceramic fibers into rats in three experiments (Smith et al 1987, Pott et al 1987, Davis et al 1984), mesotheliomas were found in the abdominal cavity in two studies, while the third report (Pott et al 1987) had incomplete histopathology. Only a few mesotheliomas were found in the abdominal cavity of hamsters after intraperitoneal injection in one experiment (Smith et al 1987). However, the ceramic fibers tested were of relatively large diameter. When rats and hamsters were exposed via intraperitoneal injection, tumor incidence was related to fiber length and dose (Smith et al 1987, Pott et al 1987, Miller et al 1999, Pott et al 1989). (From SCOEL publication (EU Scientific Committee on Occupational Exposure Limits) SCOEL/SUM/165, September 2011).

- *Reproductive toxicity*

Method: Gavage

Species: Rat

Dose: 250mg/kg/day

Routes of administration: Oral

Results: No effects were seen in an OECD 421 screening study. There are no reports of any reproductive toxic effects of mineral fibers. Exposure to these fibers is via inhalation and effects seen are in the lung. Clearance of fibers is via the gut and the feces, so exposure of the reproductive organs is extremely unlikely.

- *STOT-Single exposure*

Not applicable

- *STOT-Repeated exposure*

Not applicable

- *Aspiration hazard*

Not applicable

See the following review publications for a summary and discussion:

Interpretation of these animal experiments is complex and there is not complete agreement among scientists internationally. A summary of the evidence relating to RCF carcinogenicity in vivo can be found in SCOEL/SUM/165 and in Utell and Maxim 2010.

Other information

Numerous studies indicate the relevance of biopersistence as a determinant of toxic effects of fiber exposure. (Maxim et al 2006).

Irritant Properties

Negative results have been obtained in animal studies (EU method B 4) for skin irritation. Inhalation exposures using the nose only route produce simultaneous heavy exposures to the eyes, but no reports of excess eye irritation exist. Animals exposed by inhalation similarly show no evidence of respiratory tract irritation.

Human data confirm that only mechanical irritation, resulting in itching, occurs in humans. Screening at manufacturers' plants in the UK has failed to show any human cases of skin conditions related to fiber exposure

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.

To obtain more epidemiology or toxicology information, please call the toll free telephone number for the Thermal Ceramics Product Stewardship Program found in Section 16 - Other Information.

International Agency for Research on Cancer and National Toxicology Program

IARC, in 1988, Monograph v.43 (and later reaffirmed in 2002, v.81), classified RCF as possibly carcinogenic to humans (group 2B). IARC evaluated the possible health effects of RCF as follows:

There is inadequate evidence in humans for the carcinogenicity of RCF. There is sufficient evidence in experimental animals for the carcinogenicity of RCF. The Annual Report on Carcinogens (latest edition), prepared by NTP, classified respirable RCF as "reasonably anticipated" to be a carcinogen. Not classified by OSHA.

Also, IARC, in 1997, Monograph v.68, classified crystalline silica inhaled in the form of quartz or cristobalite from occupational sources as carcinogenic to human (group 1). The Ninth Annual Report on Carcinogens (2000), prepared by the National Toxicology Program (NTP), classified silica, crystalline (respirable size), as a substance known to be a human carcinogen.

Amorphous silica is not classified as to its carcinogenicity to humans (group 3).

12 - Ecological information

These products are not reported to have any ecotoxicity effects.

c - Bioaccumulative potential

No bioaccumulative potential.

d - Mobility in soil

No mobility in soil.

e - Other adverse effects (such as hazardous to the ozone layer)

No adverse effects of this material on the environment are anticipated.

13 - Disposal Considerations

Waste Management and Disposal

To prevent waste materials from becoming airborne during waste storage, transportation and disposal, a covered container or plastic bagging is recommended.

Additional information

This product, as manufactured, is not classified as a listed or characteristic hazardous waste according to U. S. Federal regulations (40 CFR 261). Any processing, use, alteration or chemical additions to the product, as purchased, may alter the disposal requirements. Under U. S. Federal regulations, it is the waste generator's responsibility to properly characterize a waste material, to determine if it is a "hazardous" waste. Check local, regional, state or provincial regulations to identify all applicable disposal requirements.

14 - Transport information

a - UN number.

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

b - UN proper shipping name

Not applicable.

c - Transport hazard class(es)

Not applicable.

d - Packing group, if applicable

Not applicable.

e - Environmental hazards (e.g., Marine pollutant (Yes/No))

No.

f - Transport in bulk (according to Annex II of MARPOL 73/78 and the IBC Code)

Not regulated.

g - Special precautions which a user needs to be aware of, or needs to comply with, in connection with transport or conveyance either within or outside their premises

Not applicable.

International

INTERNATIONAL

Canadian TDG Hazard Class & PIN: Not regulated

Not classified as dangerous goods under ADR (road), RID (train), IATA (air) or IMDG (ship).

15 - Regulatory information

15.1 - United States Regulations

UNITED STATES REGULATIONS

EPA: Superfund Amendments and Reauthorization Act (SARA) Title III - This product does not contain any substances reportable under Sections 302, 304, 313, (40 CFR 372). Sections 311 and 312 (40 CFR 370) apply (delayed hazard).

Toxic Substances Control Act (TSCA) - RCF has been assigned a CAS number; however, it is not required to be listed on the TSCA inventory.

Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) and the **Clean Air Act (CAA)** - RCF contains fibers with an average diameter greater than one micron and thus is not considered a hazardous air pollutant.

OSHA: Comply with **Hazard Communication Standards** 29 CFR 1910.1200 and 29 CFR 1926.59 and the **Respiratory Protection Standards** 29 CFR 1910.134 and 29 CFR 1926.103.

California: Ceramic fibers and silica, crystalline (airborne particles of respirable size) are listed in **Proposition 65, The Safe Drinking Water and Toxic Enforcement Act of 1986** as a chemical known to the State of California to cause cancer.

Other States: RCF 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. If in doubt, contact your local regulatory agency.

15.2 - International Regulations

INTERNATIONAL REGULATIONS

Canada:

Canadian Workplace Hazardous Materials Information System (WHMIS) - RCF is classified as Class D2A - Materials Causing Other Toxic Effects

Canadian Environmental Protection Act (CEPA)- All substances in this product are listed, as required, on the Domestic Substances List (DSL)

European Union:

European Directive 97/69/EC classified RCF as a Category 2 carcinogen; that is it "should be regarded as if it is carcinogenic to man."

REACH Regulation:

RCF is classified under the CLP (classification, labelling and packaging of substances and mixtures) regulation as a category 1B carcinogen. On January 13, 2010 the European Chemicals Agency (ECHA) updated the candidate list for authorization (Annex XV of the REACH regulation) and added 14 new substances in this list including aluminosilicate refractory ceramic fibers.

As a consequence, EU (European Union) or EEA (European Economic Area) suppliers of articles which contain aluminosilicate refractory ceramic fibers in a concentration above 0.1% (w/w) have to provide sufficient information, available to them, to their customers or upon requests to a consumer within 45 days of the receipt of the request. This information must ensure safe use of the article, and as minimum contains the name of the substance.

16 - Other Information

initial statement

Trace amounts of formaldehyde, acrylonitrile may be released from latex polymer during initial heating. Under normal conditions of handling, processing and use it is reasonable to expect the amount of acrylonitrile released to be below 1.0 ppm. Consult OSHA Standards on acrylonitrile and formaldehyde (29 CFR 1910.1045 and 29 CFR 1910.1048 respectively) for specific requirements if the exposure level is beyond the threshold levels.

Devitrification

As produced, all RCF fibers are vitreous (glassy) materials which do not contain crystalline silica. Continued exposure to elevated temperatures over time may cause these fibers to devitrify (become crystalline). The first crystalline formation (mullite) begins to occur at approximately 985° C (1805° F). Crystalline phase silica may begin to form at approximately 1100° C (2012° F). When the glass RCF fibers devitrify, they form a mixed mineral crystalline silica containing dust. The crystalline silica is trapped in grain boundaries within a matrix predominately consisting of mullite. The occurrence and extent of crystalline phase formation is dependent on the duration and temperature of exposure, fiber chemistry and/or the presence of fluxing agents or furnace contaminants. The presence of crystalline phases can be confirmed only through laboratory analysis of the "hot face" fiber.

IARC's evaluation of crystalline silica states "Crystalline silica inhaled in the form of quartz or cristobalite from occupational sources is carcinogenic to humans (Group 1)" and additionally notes "carcinogenicity in humans was not detected in all industrial circumstances studied." IARC also studied mixed mineral crystalline silica containing dusts such as coal dusts (containing 5-15 % crystalline silica) and diatomaceous earth without seeing any evidence of disease. (IARC Monograph Vol. 68, 1997). NTP lists all polymorphs of crystalline silica as substances which may "reasonably be anticipated to be carcinogens".

IARC and NTP did not evaluate after-service RCF, which may contain various crystalline phases. However, an analysis of after-service RCF samples obtained pursuant to an exposure monitoring agreement with the EPA, found that in the furnace conditions sampled, most did not contain detectable levels of crystalline silica. Other relevant RCF studies found that (1) simulated after-service RCF showed little, or no, activity where exposure was by inhalation or by intraperitoneal injection; and (2) after-service RCF was not cytotoxic to macrophage-like cells at concentrations up to 320 micrograms/cm² - by comparison, pure quartz or cristobalite were significantly active at much lower levels (circa 20 micrograms/cm²).

Product Stewardship Program

Morgan Thermal Ceramics has established a program to provide customers with up-to-date information regarding the proper use and handling of High Temperature Insulation Wool, including Refractory Ceramic Fiber (RCF). In addition, Thermal Ceramics has established a program to monitor airborne fiber concentrations at customer facilities. If you would like more information about this program, please call your local supplier or the Product Stewardship Information Hotline listed at the front of this SDS.

Morgan Thermal Ceramics is a member of the HTIWC (High Temperature Insulation Wool Coalition).

In 2002, OSHA endorsed a five year voluntary product stewardship program called PSP 2002. On May 23, 2007, HTIW Coalition's predecessor, RCFC, and its member companies renewed this voluntary product stewardship agreement with OSHA. On April 16, 2012, HTIW Coalition renewed this agreement for a second time.

This new five year program, called PSP 2012, continues and builds upon the earlier programs. PSP 2012 is a highly acclaimed, multifaceted strategic risk management initiative designed specifically to reduce workplace exposures to Refractory Ceramic Fiber (RCF). For more information regarding PSP 2012, please visit <http://www.htiwcoalition.org>

HMIS HAZARD RATING

TECHNICAL DATA SHEETS

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Revision Summary

Revision date updated.

MSDS prepared by

SDS Prepared By: MORGAN THERMAL CERAMICS ENVIRONMENTAL, HEALTH & SAFETY DEPARTMENT

Disclaimer

The information presented herein is presented in good faith and believed to be accurate as of the effective date of this Safety Data Sheet. Employers may use this SDS to supplement other information gathered by them in their efforts to assure the health and safety of their employees and the proper use of the product. This summary of the relevant data reflects professional judgment; employers should note that information perceived to be less relevant has not been included in this SDS. Therefore, given the summary nature of this document, Morgan Thermal Ceramics does not extend any warranty (expressed or implied), assume any responsibility, or make any representation regarding the completeness of this information or its suitability for the purposes envisioned by the user.