

MSDS

Material Data Safety Sheet



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Aluminum Oxide Ceramic Nanofibers



1. Product Identification

Trade Name	nCeramic
Chemical Name	Aluminum oxide
Material Name	Polycrystalline alumina nanofiber product
Synonym(s)	Ceramic nanofibers, refractory ceramic fiber
Intended Use	Various

2. Composition/Information on Ingredients

INGREDIENT	CAS NUMBER	PERCENT	OSHA PEL	ACGIH TLV	Hazardous
Aluminum oxide	1344-28-1	99+	15 mg/m ³ (T) 5 mg/m ³ (R)	1 mg/m ³ (R)	Not Established

NOTES:

(R) – Respirable fraction

(T) - Total

Ingredients not precisely identified are proprietary or non-hazardous.

Values are not product specification.

See Section 10 for Personal Protection Guidelines. The manufacturer generally recommends the control of RCF fiber exposures to 0.5f/cc or less. 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)

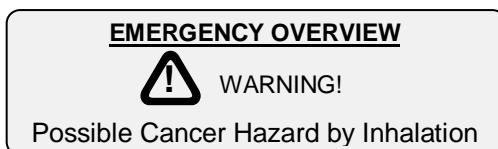
3. Physical and Chemical Properties

Chemical Family	Polycrystalline alumina	Specific Gravity Range	3.0 - 3.5
Vapor Pressure	Not applicable	Volatile by Volume (%)	0
Boiling Point	Not applicable	Water Solubility (%)	Not soluble in water
Melting Point	>3600°F (2032°C)	pH	Not applicable
Vapor Density	Not applicable	Appearance	Fibrous, non-woven
		Odor	None

4. Stability and Reactivity

Hazardous Polymerization	Will not occur
Chemical Incompatibilities	None known
Hazardous Decomposition Products	None known

5. Health Hazards Identification



Hazard Classification The International Agency for Research on Cancer (IARC) has classified ceramic fibers (including polycrystalline microfibers and nanofibers) as possible human carcinogens (Group 2B). This possible human carcinogen classification was based on sufficient evidence of carcinogenicity in experimental animals with no studies investigating the carcinogenicity to humans. In addition to the IARC classification, the NTP (National Toxicology Program) has classified respirable ceramic fiber and glasswool materials as anticipated carcinogens¹. The State of California considers ceramic fibers of respirable size a material known to cause cancer as listed pursuant to Proposition 65 (The Safe Drinking Water and Toxic Enforcement Act of 1986).

Safety Data

Health Rating	Moderate
Flammability Rating	None
Reactivity Rating	None
Contact Rating	Moderate
Lab Protective Equip.	Respirator, Goggles, Vent Hood, Proper Gloves, Lab Coat
Storage	General Storage

Potential Health Effects

Primary Exposure Route	Inhalation
Routes of Entry	Inhalation, ingestion, skin, and eyes
Medical Conditions Aggravated by Material	Pre-existing respiratory disorders.
Target Organs	Eyes, skin and respiratory system
Acute Effects	Upper respiratory physical irritation. Irritation and inflammation to the eyes on contact and to the skin on prolonged contact.
Chronic Effects	The chemical, physical and toxicological properties of ceramic nanofibers have not been thoroughly investigated and recorded. However, various toxicological studies indicate that alumina microfibers show no fibrogenic, carcinogenic or other significant toxicological effects when exposure occurs by relevant routes. Despite his evidence, the IARC has placed Alumina Fiber into a broad group called ceramic fibers

Overexposure Symptoms

Eye Contact	Irritation – inflammation
Skin Contact	irritation – rash
Ingestion	Unlikely route of exposure
Inhalation	Irritation or soreness in throat, nose and respiratory tract

¹ Seventh Annual Report on Carcinogens, 1994

6. Emergency and First Aid Measures

Respiratory	Nose and Throat If respiratory tract irritation develops, move the person to a clean air location, give oxygen if breathing is difficult. Minimize health effects by reducing or eliminating air-borne exposure. If symptoms persist, seek medical attention.
Eye	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. Seek medical attention immediately.
Skin	If skin becomes irritated, remove exposed clothing. Do not rub or scratch exposed skin and wash area of contact thoroughly with mild soap and water. Seek medical attention if symptoms persist.
Gastrointestinal	No data available but if gastrointestinal tract irritation develops, move the person to a clean air environment.
Notes To Physicians	Skin and respiratory effects are the result of temporary, mild mechanical irritation; fiber exposure does not result in allergic manifestations.

7. Fire Fighting Measures

NFPA Codes:	Flammability: 0	Health: 1	Reactivity: 0	Special: 0
NFPA Unusual Hazards		None		
Flammable Properties		None		
Flash Point		None		
Hazardous Decomposition Products		None		
Unusual Fire and Explosion Hazard		None		
Extinguishing Media				Use extinguishing media suitable for type of surrounding fire

8. Accidental Release Measures

General Procedures

Wear appropriate respiratory and protective equipment specified in Section 10. Isolate spill/exposure area and provide ventilation. Minimize/avoid creating airborne (respirable) fibers by utilizing dust suppressing cleaning methods such as wet sweeping. Vacuuming (even with a HEPA air filter) should be avoided. Wipe all exposed areas with a damp cloth.

9. Handling and Storage

General Storage

Store in original container in a cool, dry, well-ventilated area. Keep container closed when not in use.

Handling Procedures

Handle ceramic fiber carefully. Limit shearing, cutting, and overall handling of the material to minimize potential release and suspension in air. Whenever possible use hand tools to handle material (limit skin contact). Keep work area clean with wet sweeping to minimize the accumulation of debris.

Used/Empty Sample Containers

Product packaging may contain residue. Do not reuse.

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 side shields should be worn.

10. 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 cristobalite 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.
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 side shields should be worn.

11. Toxicological information

The chemical, physical and toxicological properties of ceramic microfibers/nanofibers have not been thoroughly investigated and recorded. No intraperitoneal, intratracheal, or intrapleural studies on the health effects of catalyzed ceramic nanofibers have been completed. Intraperitoneal, intratracheal and intrapleural studies on ceramic microfibers have been completed with negative results, indicating no fibrogenic, carcinogenic, or other significant toxicological effects through relevant routes of exposure including inhalation and oral ingestion. As stated in Section 5, the IARC has placed alumina fobers (both micro- and nano-) into a broad group of ceramic fibers which are all classified as possible human carcinogens (Group 2B).

12. Ecological Information

Adverse effects of this material on the environment have not been evaluated. Adverse effects of this material on the environment are not anticipated. Proper disposal techniques to isolate and recover material should be implemented.

13. Disposal Considerations

Waste Disposal Method	Dispose of according to Local, State, and Federal regulations
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. <i>(Chemical additions, processing or otherwise altering this material may make the waste management information presented in this MSDS incomplete, inaccurate, or otherwise inappropriate.</i>
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

15. Regulatory Information

United States Regulations

SARA Title III	This product contains aluminum oxide (fibrous forms) which is reportable under Section 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)" Proposition 65 The Safe Drinking Water and Toxic Enforcement Act of 1986: Known to the State of California to cause cancer.
Other States	Ceramic fiber 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

Definitions

ACGIH:	American Conference of Governmental Industrial Hygienists
CAS:	Chemical Abstracts Service
DOT:	Department of Transportation
DSL:	Domestic Substances List
EPA:	Environmental Protection Agency
f/cc:	Fibers per cubic centimeter
HEPA:	High Efficiency Particulate Air
HMIS:	Hazardous Materials Identification System
IARC:	International Agency for Research on Cancer
mg/m ³ :	Milligrams per cubic meter of air
MSDS:	Material Safety Data Sheet
NFPA:	National Fire Protection Association
NIOSH:	National Institute for Occupational Safety and Health
NTP:	National Toxicology Program
OSHA:	Occupational Safety and Health Administration
PEL:	Permissible Exposure Limit (OSHA)
RCF:	Refractory Ceramic Fiber
RCRA:	Resource Conservation and Recovery Act
REG:	Recommended Exposure Guideline (RCFC)
SARA:	Superfund Amendments and Reauthorization Act
TDG:	Transportation of Dangerous Goods
TLV:	Threshold Limit Value (ACGIH)
TSCA:	Toxic Substances Control Act
TWA:	Time Weighted Average
WHMIS:	Workplace Hazardous Materials Information System (Canada)
SARA Title III:	Emergency Planning and Community Right to Know Act
SARA Section 311:	MSDS/List of Chemicals and Hazardous Inventory
SARA Section 312:	Emergency and Hazardous Inventory
SARA Section 313:	Toxic Chemicals and Release Reporting
29 CFR 1910.134 & 1926.103:	OSHA Respiratory Protection Standards
29 CFR 1910.1200 & 1926.59:	OSHA Hazard Communication Standards

DISCLAIMER

The information presented herein is based on data considered to be accurate as of the date of preparation of the Material Safety Data Sheet. However, no warranty or representation, expressed or implied, is made as to the accuracy or completeness of the foregoing data and safety information, nor is any authorization given or implied to practice any patented invention without a license.

In addition, no responsibility can be assumed by the vendor for any damage or injury resulting from abnormal use, from any failure to adhere to recommended practices, or from any hazards inherent in the nature of the product.