



## SAFETY DATA SHEET

### Section 1: Identification

**Product Identifier:** NKO+, NKO-2, RNKO, UNIFORM A2

**Other means of identification:** Rigid Medium-Density Al<sub>2</sub>O<sub>3</sub>-SiO<sub>2</sub> (Refractory Ceramic Fiber) shapes. Silica bonded RCF fiber products.

**Recommended use:** Transport and casting of non-ferrous metals. Thermal and electrical insulation used primarily at high temperatures.

**Manufacturer**

ZIRCAR Ceramics, INC.  
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[sales@zircarceramics.com](mailto:sales@zircarceramics.com)  
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**Emergency Telephone Number**

CHEMTREC: (800) 424-9300 (USA/Canada), (703) 527-3887 (International)

### Section 2: Hazards Identification

**Hazard Classification(s):** Carcinogenicity, subcategory 1b, Skin Irritation, Eye Effects, category 2 Respiratory Sensitizer;

**Signal Word:** Warning



**Precautionary Statement(s):** Presumed carcinogen (inhalation), May cause skin, eye and respiratory irritation.

**CAUTION:** Handling or machining of these products may produce respirable dust particles. Dust may irritate eyes, skin and respiratory tract.

**Inhalation:** If inhaled in sufficient quantity, may cause respiratory tract irritation. Symptoms may include scratchiness of the nose or throat, cough or chest discomfort.

**Eye Contact:** Slightly to moderately irritating. Fibers may be abrasive; prolonged contact may cause damage to the outer surface of the eye.

**Skin Contact:** Slightly to moderately irritating. Exposure may result in irritation, inflammation, rash or itching.

**Ingestion:** Ingestion is unlikely. May cause gastrointestinal disturbances. Never induce vomiting without the advice of a physician.

**Medical Conditions Aggravated by Exposure:** 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.

### Section 3: Composition / Information on Ingredients

#### Chemical and common names, CAS numbers and concentration

Chemical Name	Common Name	CAS Number	% by weight
Aluminosilicate fiber (vitreous)	RCF Fiber	142844-00-6	25 - 50
Silicon dioxide	Silica	7631-86-9	50 - 75

### Section 4: First Aid Measures

**Inhalation:** If respiratory tract irritation occurs, relocate individual to a dust free environment. Get medical attention if irritation persists. See Section 8 for additional measures to reduce or eliminate exposure.

**Eye Contact:** 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. Get medical attention if irritation persists.

**Skin Contact:** If skin becomes irritated, remove contaminated 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.

**Ingestion:** If gastrointestinal irritation occurs, relocate individual to a dust free environment. Seek medical attention if symptoms persist.

Note to Physicians: Skin and respiratory effects are the result of mechanical irritation; fiber exposure does not result in allergic manifestations.

## Section 5: Fire Fighting Measures

Materials are not combustible. Use extinguishing media suitable for type of surrounding fire.

## Section 6: Accidental Release Measures

**Spill Procedures:** Dust suppressing cleaning methods such as wet sweeping or vacuuming should be used to clean the work area. If vacuuming is used the vacuum must be equipped with a HEPA filter. Compressed air or dry sweeping should not be used for cleaning. Dust suppressing compounds may be used to clean up light dust. Use wet sweeping or a dust suppressant where sweeping is necessary.

**Release into Air:** Prevent release of airborne particulates where possible. Not a regulated hazardous substance. See Section 8 for appropriate engineering controls.

**Release into Water:** Release into water is not appropriate. Not a regulated hazardous substance.

## Section 7: Handling and Storage

**Storage:** These materials are stable and may be stored in a dry place indefinitely. Physical abrasion may produce small amounts of respirable dusts. See precautions under Section 8.

**Normal Use:** Handle ceramic fiber with caution. Minimize airborne dusts by avoiding the unnecessary disturbance of materials.

**Machining and Cutting:** These materials may produce respirable and nuisance dusts when machined or cut. See Section 8 for exposure controls and personal protection during machining or installation procedures.

**High Temperature Conditions:** Service significantly above the product design temperature may increase friability and the possibility of generating airborne fibers or particulates. While not considered problematic during use, airborne fibers may complicate removal activities. It is recommended that product use be carefully matched to design parameters.

**After Service:** As manufactured these products contain an aluminosilicate which may transform upon heating (temperatures greater than 1000°C for extended periods of time) to non-hazardous mullite and cristobalite (CAS # 14464-46-1), a form of crystalline silica. Prolonged or repeated inhalation of respirable free crystalline silica dust may cause delayed lung injury (silicosis). The IARC has classified crystalline silica as group 2A, probable human carcinogen. There is sufficient evidence of carcinogenicity in animals, but limited evidence in humans. OSHA's final rule limit and ACGIH'S TLV for respirable cristobalite is 0.05 mg/m<sup>3</sup>. Product removal must consider the possibility of

usage above design temperatures. See Section 8 for appropriate respiratory protection during removal.

**Section 8: Exposure Controls / Personal Protection**

**Exposure Limits**

Aluminosilicate fiber (vitreous)	
OSHA PEL as 8 hr TWA	15/5 mg/m <sup>3</sup> Total dust/Respirable Fraction*
ZIRCAR Ceramics, Inc.	0.5 fiber/cc, 8-hr. TWA**
Silica (amorphous)	
OSHA PEL as 8 hr TWA	20 mppcfa, 80 mg/m <sup>3</sup>
NIOSH PEL as 8 hr TWA	6 mg/m <sup>3</sup>
Canadian PEL as TWA	5/2 mg/m <sup>3</sup> Total mass/Respirable Mass
ILDH Level by SCPC	3000 mg/m <sup>3</sup>

\* 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<sup>3</sup>; Respirable Fraction 5 mg/m<sup>3</sup>.

\*\* The Refractory Ceramic Fibers Coalition (RCFC) 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, RCFC has adopted a recommended exposure guideline, as measured under NIOSH Method 7400 B. The manufacturers' REG is intended to promote occupational health and safety through prudent exposure control and reduction and it reflects relative technical and economic feasibility as determined by extensive industrial hygiene monitoring efforts undertaken pursuant to an agreement with the U.S. Environmental Protection Agency.

**OTHER OCCUPATIONAL EXPOSURE LEVELS (OEL)**

RCF-related occupational exposure limits vary internationally. Regulatory OEL examples include: Australia – 0.5 f/cc; Austria – 0.5 f/cc; Canada – 0.5 to 1.0 f/cc; Denmark – 1.0 f/cc; France – 0.6 f/cc; Germany – 0.5 f/cc; Netherlands – 1.0 f/cc; New Zealand – 1.0 f/cc; Norway – 2.0 f/cc; Poland – 2.0 f/cc; Sweden – 1.0 f/cc; United Kingdom – 2.0 f/cc. Non-regulatory OEL examples include: ACGIH TLV 0.2 f/cc; RCFC REG 0.5 f/cc. The objectives and criteria underlying each of these OEL decisions also vary. The evaluation of occupational exposure limits and determining their relative applicability to the workplace is best performed, on a case-by-case basis, by a qualified Industrial Hygienist.

**Appropriate Engineering Controls:** Dust suppressing control technologies such as local exhaust ventilation, point of generation dust collection, down draft work stations, emission controlling tool designs, and materials handling equipment are effective means of minimizing airborne fiber emissions. For additional information, contact the Product Stewardship Information Hotline (See Section 16).

**Respiratory Protection:** When engineering and/or administrative controls are insufficient, the use of appropriate respiratory protection, pursuant to the requirements of OSHA 1910.134 AND 29 CFR 1926.103, is recommended. The following information is provided as an example of appropriate respiratory protection for aluminosilicate fibers. 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.

Recommendations for Personal Protective Measures<sup>1, 2, 3 & 4</sup>

Respiratory Protection:	Use appropriate protection pursuant to OSHA 29CFR 1910.134 and 29CFR 1926.103. The following information is provided as a guide and reflects industry recommendations for control of dust.
PPE < 0.5 f/cc	No specific recommendation, use personal protective equipment based on local conditions.
PPE 0.5 f/cc to 5.0 f/cc	Half-face, air purifying respirator equipped with a high efficiency particulate air (HEPA) filter cartridge.
PPE 5.0 to 25 f/cc	Full-face, air purifying respirator equipped with a high-efficiency particulate air (HEPA) filter cartridge
PPE > 25 f/cc	Full-face, positive pressure, supplied air respirator.
PPE Other	Work clothes should be washed separately and the washing machine rinsed following use. If possible, do not take work clothes home following machining or removal activities that produce significant amounts of dust.
Skin Protection	Wear gloves, head coverings and full body clothing as necessary to prevent skin irritation. Washable or disposable clothing may be used. If possible, do not take unwashed clothing home. Work clothes should be washed separately from other clothing and the washing machine rinsed thoroughly following use. Inform the launderer of the proper procedures.
Eye Protection	Wear safety glasses or chemical goggles to prevent eye contact. Do not wear contact lenses unless chemical goggles are also worn. Do not touch eyes with soiled body parts or materials. Have eye washing facilities readily available where eye contact can occur

<sup>1</sup>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.

<sup>2</sup>During furnace tear-out activities after-service RCF removals, the manufacturer recommends, at a minimum, the use of full-face air purifying respirator equipped with a P-100 filter cartridge to control fiber exposure.

<sup>3</sup>In the absence of other objective data or when concentrations are unknown, the manufacturer recommends the use of half-face, air purifying respirator equipped with a P-100 filter cartridge.

<sup>4</sup>Situations involving a potential exposure to airborne contaminants should be evaluated by a qualified industrial hygienist for the selection of appropriate respiratory protection and air monitoring.

## Section 9: Physical and Chemical Properties

### Physical and Chemical Properties

Appearance		Odor	pH	Melting Point	Specific Gravity (Shape)
Physical State	Color				
Rigid Fibrous Shapes	White to tan	Odorless	N/A	>1760°C (3200°F)	0.19 – 0.32

Note: Odor threshold, freezing point, initial boiling point and boiling range, flash point, evaporation rate, flammability, upper/lower flammability or explosive limits, vapor pressure, vapor density, partition coefficient: n-octanol/water, auto-ignition temperature, decomposition temperature and viscosity are irrelevant and/or unavailable to/for these materials.

## Section 10: Stability and Reactivity

**Chemical Stability:** Materials are stable with no possibility of hazardous reactions or polymerization.

**Chemical Incompatibilities:** Soluble in hydrofluoric acid, phosphoric acid, and concentrated alkali.

**Hazardous Decomposition Products:** None

## Section 11: Toxicological Information

### Exposure Routes and Effects

**Inhalation:** If inhaled in sufficient quantity, may cause respiratory tract irritation. Symptoms may include scratchiness of the nose or throat, cough or chest discomfort.

**Eye Contact:** Slightly to moderately irritating. Fibers may be abrasive; prolonged contact may cause damage to the outer surface of the eye.

**Skin Contact:** Slightly to moderately irritating. Exposure may result in irritation, inflammation, rash or itching.

**Ingestion:** Ingestion is unlikely. If ingested in sufficient quantity, may cause gastrointestinal disturbances. Symptoms may include nausea, vomiting, or abdominal pain. Never induce vomiting without the advice of a physician.

**Medical Conditions Aggravated by Exposure:** 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.

### Toxicology

Aluminosilicate fiber (vitreous)	
Acute Toxicity Estimate	No Data Available
Carcinogenicity by IARC	In October 2001, the International Agency for Research on Cancer (IARC) confirmed that Group 2b (possible human carcinogen) remains the appropriate IARC classification for RCF.
Carcinogenicity by NTP	The Seventh Annual Report on Carcinogens (1994), prepared by the National Toxicology Program (NTP), classified respirable RCF and glass wool as substances reasonably anticipated to be carcinogens.
Carcinogenicity by ACGIH	The American Conference of Governmental Industrial Hygienists (ACGIH) has classified RCF as "A2-Suspected Human Carcinogen."
Carcinogenicity by European Communities (DGXI)	The Commission of The European Communities (DG XI) has classified RCF as a substance that should be regarded as if it is carcinogenic to humans.
Carcinogenicity by CEPA	The Canadian Environmental Protection Agency (CEPA) has classified RCF as "probably carcinogenic" (Group 2).
Silica (amorphous)	
Acute Toxicity Estimate	LD <sub>50</sub> : 5000 mg/kg
Carcinogenicity by IARC	Group 3: Not classifiable as to its carcinogenicity to humans
Carcinogenicity by ACGIH	Not Classified

**Description of Symptoms:** See Exposure Routes and Effects, Hazard Statement(s) and Precautionary Statement(s) sections above.

### Additional Toxicology Information

A number of toxicological studies designed to identify any potential health effects from RCF exposure have been completed. In one study, conducted by the Research and

Consulting Company, (Geneva, Switzerland), rats and hamsters were exposed to 30 mg/m<sup>3</sup> (about 200 fibers/cc) of specially-prepared RCF for 6 hours/day, 5 days/week, for up to 24 months. In rats, a statistically significant increase in lung tumors was observed; two mesotheliomas (cancer of the pleural lining between the chest wall and lung) were also identified. Hamsters did not develop lung tumors; however, interstitial fibrosis and mesothelioma was found. Some, in the scientific community, have concluded that the "maximum tolerated dose" was exceeded and that significant particle contamination was a confounding issue; therefore, these study findings may not represent an accurate assessment of the potential for RCF to produce adverse health effects.

In a related multi-dose study with a similar protocol, other rats were exposed to doses of 16 mg/m<sup>3</sup>, 9 mg/m<sup>3</sup>, 3 mg/m<sup>3</sup> which corresponds to about 115, 75, and 25 fibers per cubic centimeter respectively. This study found no statistically significant increase in lung cancer. Some cases of pleural and parenchymal fibrosis were seen in the 16 mg/m<sup>3</sup> dose group. Some cases of mild fibrosis and one mesothelioma were observed in the 9 mg/m<sup>3</sup> group. No acute respiratory effects were seen in the rats in the 3 mg/m<sup>3</sup> exposure group, which suggests that there may be a dose/response threshold, below which irreversible respiratory impacts do not occur.

Other toxicological studies have been conducted which utilized non-physiological exposure methods such as intrapleural, intraperitoneal and intratracheal implantation or injection. Some of these studies have found that RCF is a potential carcinogen. Some experts, however, suggest that these tests have limited relevance because they bypass many of the biological mechanisms that prevent fiber deposition or facilitate fiber clearance.

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

## Section 12: Ecological Information

**Eco toxicological Information:** No information available suggesting any negative ecological impact.

**Distribution:** Aluminum oxide and silica are naturally occurring and are widely distributed in igneous rock. Secondary deposits in sedimentary rock may be found.

**Chemical Fate Information:** The relative inertness of these materials indicates that they may be highly persistent in the environment. No information regarding any negative effects of this persistence has been noted.

## Section 13: Disposal Consideration

**Disposal:** Consult with local, state and federal regulations. In most cases these materials may be land filled safely.

**Hazardous Waste Classification:** As manufactured, materials are not regulated hazardous materials. Not listed as a RCRA Hazardous waste (40 CFR 261.31). Not listed under SARA, CERCLA, or the Clean Air Act. Any processing, use, alteration or chemical additions to the product, as purchased, may alter the disposal requirements.



Under Federal regulations, it is the waste generator's responsibility to properly characterize a waste material, to determine if it is a "hazardous" waste.

**Empty Containers:** Empty containers may contain product dust or residue. Do not re-use.

Disposal regulations vary. Consult with all applicable regulations prior to disposal. Refer to Section 8 for instructions regarding Exposure Controls/Personal Protection.

## Section 14: Transportation Information

Materials are not regulated hazardous substances, no specific regulations apply.

## Section 15: Regulatory Information

### **U.S. FEDERAL 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) - All substances in this product are listed, as required, on the TSCA inventory. RCF has been assigned a CAS number; however, it is a simple mixture and therefore not required to be listed on the TSCA inventory. The components of RCF are listed on the 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 (airborne particles of respirable size)" is 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.

### **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 Substance 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."

## Section 16: Other

### **After-Service RCF Removal:**

As manufactured, RCF products are vitreous aluminosilicates which do not contain respirable crystalline silica. However, following sustained, high temperature (>1800°F) use, it is possible for portions of the exposed RCF to devitrify into mullite or crystalline phase silica (cristobalite or quartz). Chronic exposure to respirable crystalline silica may lead to lung disease. IARC has concluded that: "Crystalline silica inhaled in the form of quartz or cristobalite from occupational sources is carcinogenic to humans (Group 1)" [IARC Monograph 68, June 1997, p. 210-211]. The Occupational Safety and Health Administration (OSHA) has adopted a permissible exposure limit (PEL) for respirable cristobalite at 0.05 mg/m<sup>3</sup>. When needed, the use of proper exposure controls and respiratory protection is recommended to reduce potential health risks and to ensure compliance with OSHA requirements. 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.

### **Product Stewardship Program:**

The RCFC member companies have established a program to provide customers with up-to-date information regarding the proper use and handling of refractory ceramic fiber. In addition RCFC member companies have also established a program to monitor airborne fiber concentrations at customer facilities. If you would like more information about this program, please contact the RCFC Product Stewardship Information Hotline.

### **Disclaimer:**

The information presented herein is based on data considered to be accurate as of the date of preparation of this 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. In addition, no responsibility can be assumed by 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.