1. Product Identification

Group 1	**Synonym:** Yttrium Oxide Textiles and Bulk Fiber **Types**: YK-15,YW-15,YW-30,YBF, YF-50,YF-100	**Molecular Formula**: Y_2O_3
Group 2	**Synonym:** Hafnium Oxide Textiles and Bulk Fiber **Types:** HfK-15,HfW-15,HfW-30,HfBF,HfF-50,HfF-100	**Molecular Formula:** HfO_2
Group 3	**Synonym:** Aluminum Oxide Textiles, Blankets, Boards and Bulk Fiber **Types:** ALK-15,ALW-15,ALW-30, ALBF,ALF-50,ALF-100, Buster Mat & Blanket, BusterF	**Molecular Formula:** Al_2O_3
Group 4	**Synonym:** Cerium Oxide Textiles and Bulk Fiber **Types:** CeK-15,CeW-15,CeW-30,CeBF, CeF-50,CeF-100	**Molecular Formula:** CeO_2

2. Composition

Component	Formula	% by Weight	Molecular Weight	CAS Number
Yttrium Oxide	Y_2O_3	99+	225.81	7440-65-5
Hafnium Oxide	HfO_2	99+	210.49	7440-58-6
Aluminum Oxide	Al_2O_3	97+	101.96128	1344-28-1
Cerium Oxide	CeO_2	99+	172.12	1306-38-3

3. Physical/Chemical Properties

	Group 1	Group 2	Group 3	Group 4
Form	Solid	Solid	Solid	Solid
Appearance	White: textile of bulk fiber	White: textile of bulk fiber	White: textile	Yellow to Orange: textile of bulk fiber
Odor	Odorless	Odorless	Slightly acidic	Odorless
Solubility in H_2O	Insoluble	Insoluble	Insoluble	Insoluble
Melting Point	2410° C (4370°F)	2812° C (5090°F)	2038° C (3700°F)	2600° C (4712°F)
% Volatile	0	0	0	0

4. Hazard Identification

Target Organs: Skin, eyes, and lungs
Caution: Handling or machining of these products may produce respirable dust particles. Dust may irritate eyes, skin and respiratory tract.
Inhalation: Dust may cause irritation or soreness of throat and nose.
Eye Contact: Dust may cause temporary irritation or inflammation.
Skin Contact: May cause temporary dryness, irritation or rash.
Ingestion: Ingestion is unlikely. May cause gastrointestinal disturbances. Never induce vomiting without the advise of a physician.
Medical Conditions Aggravated by Exposure: Respiratory effects may be aggravated by smoking. Pre-exiting respiratory problems may be aggravated by dust.

5. Exposure Guidelines

Yttrium Oxide	
OSHA PEL as 8 hr TWA	15mg/m^3 Total Dust, 5mg/m^3 Respirable Fraction,
ACGIH PEL as 8 hr TWA	10mg/m^3 Total Dust
Hafnium Oxide	
OSHA PEL as 8 hr TWA	15mg/m^3 Total Dust, 5mg/m^3 Respirable Fraction,
ACGIH PEL as 8 hr TWA	10mg/m^3 Total Dust
Aluminum Oxide	
OSHA PEL as 8 hr TWA	10mg/m^3 Total Dust, 5mg/m^3 Respirable Fraction,
ACGIH PEL as 8 hr TWA	10mg/m^3 Total Dust
Cerium Oxide	
OSHA PEL as 8 hr TWA	10mg/m^3 Total Dust, 5mg/m^3 Respirable Fraction,
ACGIH PEL as 8 hr TWA	10mg/m^3 Total Dust

6. Exposure Controls

Engineering Controls: Use dust suppression. Local exhaust ventilation, point of generation dust collection, and/or down-draft work stations to minimize airborne dust generation is recommended when machining product.
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 < 1.0 /cc: No specific recommendation, use personal protective equipment based on local conditions.
PPE 1.0 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.

Skin Protection: Wear gloves and full body clothing to prevent skin irritation. Store work clothes and street clothes separately.
Eye Protection: Wear safety glasses or goggles. Do not wear contact lenses without goggles. Do not get into eyes. Have eye wash available.
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.

7. First Aid

Inhalation: Remove to fresh air. Rinse mouth to clear throat and expel liquid. Blow nose to evacuate dust. Consult a physician if irritation persists.
Eye Contact: Do not rub eyes. Keep hands or contaminated body parts away from eyes. Remove contact lenses. Flush with water. If irritation persists, consult a physician.
Skin Contact: Wash with soap and water. For dryness, a skin cream may be helpful. Do not apply anything to a rash. Consult a physician if irritation persists.
Ingestion: Do not induce vomiting without advice of a physician. Seek medical attention.

8. Fire Fighting Measures: Materials are not combustible.

9. Accidental Release Measures

Spill Procedures: Clean up procedures should minimize formation of airborne dusts. Remove dust by vacuuming using HEPA filtration where possible. Liquid and moist products (groups 2 & 3) should be cleaned up with sponge, mop or cloth.
Release into Air: Prevent release of airborne particulates where possible. Not a regulated hazardous substance.
Release into Water: Release into water is not appropriate. Not a regulated hazardous substance. Landfill dusts and debris consistent with local regulations.

10. Handling & Storage

Storage: These materials are stable and may be stored indefinitely. Physical abrasion may produce small amounts of respirable dusts. Liquid and moist products (groups 2 & 3) should be stored in a sealed container.
Normal Use: Materials are stable under normal use and are not expected to produce significant hazardous by-products or emissions.
Machining and Cutting: These materials may produce respirable and nuisance dusts when machined or cut.
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: Product removal must consider the possibility of usage above design temperatures.

11. Stability & Reactivity

Stability: Materials are stable.
Chemical Incompatibilities: Powerful oxidizers; fluorine, chlorine trifluoride, manganese trioxide, oxygen difluoride, etc.
Hazardous Decomposition Products: None.

12. Disposal Information

Disposal: Consult with local, state and federal regulations. In most cases these materials may be land filled safely.
Hazardous Waste Classification: Not listed as a RCRA Hazardous Waste (40 CFR 261.31). Not listed under SARA, CERCLA, or the Clean Air Act.
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.

13. Transportation Information: Not regulated hazardous substances, no specific regulations apply.

14. Toxicology & Ecological Information

Toxicological Information: No information available.
Epidemiology: No information available.
Ecotoxicological Information: No information available.
Distribution: Aluminum Oxide is naturally occurring and widely distributed in igneous rock. Deposits in sedimentary rock may be found. Hafnium Oxide occurs naturally with zirconium oxide in concentrations of 1-2% and is widely distributed in this form. Cerium and Yttrium Oxides are “rare earth” oxides and have limited distributions.
Chemical Fate Information: The relative inertness of this material indicate that it may be highly persistent in the environment. No information regarding any negative effects of this persistence has been noted.

15. Regulatory Information

WHMIS Status: (All Groups) This is a Class D2 controlled product based on an IARC 2B Classification for ceramic fibers. (Group 4) Aluminum oxide (CAS No. 1344-28-1) is subject to disclosure under the Hazardous Products Act.
California Proposition 65: On July 1, 1990 the state of California added "ceramic fibers (airborne particles of respirable size)" to the list of Proposition 65 chemicals which are "known to cause cancer" by the state. Proposition 65 lists all substances classified by the IARC as a Category 1, 2A or 2B carcinogen.
SARA Section 313: The listed substance requires reporting under Section 313 of SARA Title III of the Emergency Planning and Community Right to Know Act, annually if above the de minimus concentration and threshold quantity: Aluminum Oxide (CAS 1344-28-1).

16. Other: The information contained herein is based on data considered to be accurate as of the preparation or revision date. It is provided in good faith and in compliance with state and federal regulations. No warranty or representation, express or implied is made as to the accuracy or completeness of this information. Other national, state and/or local regulations may apply.