

**R&R®**  
**DENTSPLY®**

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## MATERIAL SAFETY DATA SHEET

<b>FORM NUMBER:</b> 185	<b>ISSUE DATE:</b> 11/85	<b>REVISED DATE:</b> 02/03
<b>PRODUCT TRADE NAME:</b> Refractomix™ #1 refractory		

### SECTION I - GENERAL INFORMATION

<b>Part (Item) Number</b> <b>Chemical Name</b> <b>Synonyms</b> <b>DENTSPLY Contact</b> <b>Formula</b> <b>Chemical Family</b>	Calcined Kaolin Mullite, Clay  Inorganic mineral
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### SECTION II - PRODUCT INGREDIENTS

Chemical Name (Ingredients)	CAS #	%	TLV mg/m <sup>3</sup>	OSHA PEL mg/m <sup>3</sup>
Alumina Silicate	1302-76-7	<40	2.0*	5.0* 15.0**
Silica (Cristobalite)	14464-46-1	<20	0.05* 5.0**	0.15** 0.05*
Silica (Quartz)	14808-60-7	<10	0.05* 10.0**	0.1* 0.3**
Zircon (Zirconium Silicate)	14940-68-2	<45	5.0* 10.00**	5.0* 15.00**
Titanium Dioxide	13463-67-7		10.0** * Respirable Dust **Total Dust	10.0**
<b>OSHA PEL:</b>	Exposure to airborne crystalline silica shall not exceed an eight hour time weighted average as stated in: (See below for specifics on quartz and cristobalite.)			
<b>QUARTZ:</b>	29 CFR Section 1910.1000 Table Z-1-A, air contaminates, specifically; silica, crystalline quartz (respirable): 0.1 mg/m <sup>3</sup> .			
<b>CRISTOBALITE:</b>	29 CFR Section 1910.1001 Table Z-3 as calculated as half of the value of the mass formulae for quartz = 10 mg/m <sup>3</sup> air contaminates, specifically; cristobalite (respirable): 0.05 mg/m <sup>3</sup> .			
<b>ACIGH TLV:</b>	Cristobalite 0.05 mg/m <sup>3</sup> (respirable dust). See Threshold Limit Value and Biological Exposure Indices American Conference of Government Industrial Hygienists, April 2000.			
<b>Other Limits Recommended:</b>	National Institute for Occupational Safety and Health (NIOSH). Recommended standard maximum permissible concentrations = 0.05 mg/m <sup>3</sup> (respirable free silica) as determined by a full shift sample up to 10 hour working day, 40 hour work week. See NIOSH Criteria for a Recommended Standard Occupational Exposure to Crystalline Silica.			

**SECTION III - PHYSICAL PROPERTIES**

<b>Boiling Point</b>	N/A	<b>Specific Gravity</b>	2.6 - 3.7
<b>Vapor Pressure</b>	N/A	<b>pH</b>	8.9
<b>Vapor Density</b>	N/A	<b>Evaporation Rate</b>	N/A
<b>Critical Temperature</b>	N/A	<b>Viscosity</b>	N/A
<b>Decomposition Temperature</b>	N/A	<b>% Volatile by Volume</b>	None
<b>Melting/Freezing Point</b>	N/A	<b>Magnetism</b>	N/A
<b>Solubility in Water</b>	Insoluble	<b>Autoignition Temperature</b>	N/A
<b>Critical Pressure</b>	N/A	<b>Corrosion Rate</b>	N/A
<b>Permeable Exposure Limit</b>	N/A	<b>Molecular Weight</b>	172.04
<b>Appearance and Odor</b>	White to gray powder		

**SECTION IV - FIRE AND EXPLOSION HAZARD DATA**

<b>Flash Point (Method Used)</b>	N/A		
<b>Flammable (Explosion) Limits:</b>	<b>LEL:</b> N/A	<b>UEL:</b> N/A	
<b>Extinguishing Media -</b>	This product will not burn but is compatible with all extinguishing media. Use any media that is appropriate for the surrounding fire.		
	<b>Water Spray:</b> Y	<b>Carbon Dioxide:</b> Y	<b>Foam:</b> Y
	<b>Dry Chemical:</b> Y	<b>Other:</b> N/A	
<b>Special Fire Fighting Procedures and Equipment</b>	<b>Avoid eye and skin contact:</b> Y		
	<b>Do not breathe fumes</b> : N/A	<b>Other:</b> Do not inhale dust.	
<b>Unusual Fire and Explosion Hazards:</b>	None		

**SECTION V - HEALTH HAZARD DATA**

<b>Route(s) of Entry</b>	<b>Inhalation:</b> Yes	<b>Skin:</b> Not likely route of exposure
	<b>Ingestion:</b> Not likely route of exposure	
<b>Health Hazards (acute and chronic):</b>	<p><b>Crystalline Silica</b> - Prolonged exposure to respirable crystalline silica may cause delayed (chronic) lung injury (silicosis, pneumoconiosis). Acute or rapidly developing silicosis may occur in a short period of time in heavy exposure in certain occupations such as sandblasters. Silicosis is a form of disabling pulmonary fibrosis which can be progressive and may lead to death. There is evidence that individuals with silicosis may also experience incidences of scleroderma (immune system disorder), tuberculosis and nephrotoxicity (kidney lesions).</p> <p><b>Titanium Dioxide</b> - Inhalation of excessive amounts of titanium dioxide dust are reported to produce mild and temporary respiration tract irritations with cough, sneezing, and shortness of breath. Grossly excessive and prolonged exposure may lead to lung injury (non-progressive lung fibrosis). Titanium Dioxide is considered to have a low degree of oral and dermal toxicity and to be practically non irritating to skin.</p> <p><b>Zirconium Silicate</b> - Contains trace quantities of naturally occurring radio active uranium, thorium, and radium (106-120 picocuries/gram) over-exposure to respirable dusts containing radioactive uranium, thorium and radium may cause lung cancer.</p> <p>Zircon is exempt from NRC regulations for source material per 10 CFR 40, since it falls under the definition of unprocessed material containing less than 0.05% uranium or thorium. However, calculations show that observance of 2.2-2.8%mg/m<sup>3</sup> of respirable dust will, under voluntary guidelines ensure that intake is less than 10% of the annual limits on intake (ALIS) specified in 10 CFR 20.1502(B) and NRC standards for protection against radiation for uranium, thorium, radium and radioactive daughter decay products.</p>	
<b>Carcinogenicity:</b>		
<b>NTP:</b> Yes	The National Toxicology Program (NTP) published its Ninth Annual Report on Carcinogens	

	which concludes that "silica, crystalline (respirable)" is known to be a human carcinogen. The NTP conclusion is based on sufficient evidence for the carcinogenicity of respirable crystalline silica in experimental animals and limited evidence in humans.
<b>IARC:</b> Yes	IARC Monographs Volume 68: Silica, silicates, coal dust and para-aramid fibrils states that there is sufficient evidence in humans for the carcinogenicity of inhaled crystalline silica in the forms of quartz and cristobalite from occupational sources. Crystalline silica is categorized in the "Group 1" category which the IARC defines as the agent in carcinogenic to humans.
<b>OSHA:</b>	Not regulated by OSHA.
<b>OTHER:</b> California Proposition 65	Crystalline Silica (quartz) is classified as a substance known to the State of California to be a carcinogen.
<b>Signs and Symptoms of Exposure:</b>	<b>Crystalline Silica:</b> Symptoms may not appear until significant injury has occurred. Silicosis (onset may be from 2-30 years); cancer (unknown). Silicosis (onset may be from 2-30 years); cancer (unknown). Acute signs of exposure may be cough, tightness in chest, shortness of breath, eye irritation, wheezing and sputum production. Lung scarring produced by such inhalation may lead to a progressive massive fibrosis of the lung, which may aggravate other pulmonary tuberculosis. Progressive, massive fibrosis may be accompanied by right heart enlargement, heart failure and pulmonary failure. Smoking aggravates the effects of exposure.
<b>Medical Conditions Aggravated:</b>	Any pre-existing respiratory or pulmonary disease or condition, such as, but not limited to, bronchitis, emphysema and asthma. Individuals with silicosis are predisposed to develop tuberculosis.
<b>Emergency First Aid:</b>	If symptoms of discomfort or irritation occur due to material, remove affected persons to fresh air. If powder enters eyes, flush with plenty of water. If discomfort or irritation persists, consult a physician.

### SECTION VI - REACTIVITY DATA

<b>Stability</b>	<b>Stable:</b> Y	<b>Unstable:</b> N
<b>Conditions to avoid (Stability):</b>	None	
<b>Incompatibility (Materials to Avoid):</b>	None	
<b>Hazardous Decomposition Products:</b>	When heated to decomposition may emit fumes of NO <sub>x</sub> , NH <sub>3</sub> . Zircon disassociates to zirconium oxide (ZrO <sub>2</sub> ) and silicosis dioxide (SiO <sub>2</sub> ) when heated above 1540°C.	
<b>Hazardous Polymerization:</b>	<b>Will Occur:</b> N	<b>Will Not Occur:</b> Y
<b>Conditions to Avoid (Polymerization):</b>	N/A	

### SECTION VII - PRECAUTIONS FOR HANDLING AND USE

<b>Steps to be taken if material is spilled:</b>	Use dustless methods (vacuum) and place into closable container for disposal, or flush with water. Do not dry sweep. Wear protective equipment specified below.
<b>Waste disposal:</b>	Dispose in accordance with Federal, State and Local regulations.  Zircon may contain traces of radioactive materials, such as uranium and thorium. The combined content of uranium and thorium is less than the 500 ppm limit for source material as set by the Nuclear Regulatory Commission. Zircon mineral products are not currently regulated by the EPA as hazardous wastes, but individual states and localities do have disposal regulations, so it is advisable to check with them for specific disposal instruction.
<b>Precautions to be taken in handling and storage:</b>	Avoid breakage of bagged material or spills of bulk material. See control measures in Section VIII.

<b>Other precautions:</b>	<p>Use dustless systems for handling, storage and clean up so that airborne dust does not exceed the PEL. Use adequate ventilation and dust collection. Practice good housekeeping. Do not permit dust to collect on walls, floors, sills, ledges, machinery or equipment. Maintain, clean and fit test respirators in accordance with OSHA regulations. Maintain and test ventilation and dust collection equipment. Wash or vacuum clothing which has become dusty. See also control measures in Section VIII.</p> <p>See OSHA Hazard Communication Rule 29 CFR Sections 1910.1200, 1915.99, 1917.28, 1918.90, 1926.59 and 1928.21, and state and local worker or community "right to know" laws and regulations. We recommend that smoking be prohibited in all areas where respirators must be used. <b>WARN YOUR EMPLOYEES (AND CUSTOMERS-USERS IN CASE OF RESALE) BY POSTING AND OTHER MEANS OF THE HAZARD AND OSHA PRECAUTIONS TO BE USED. PROVIDE TRAINING FOR YOUR EMPLOYEES ABOUT THE OSHA PRECAUTIONS.</b></p> <p>See also American Society for Testing and Materials (ASTM) Standard Practice E1132-86, "Standard Practice for Health Requirements Relating to Exposure to Quartz Dust."</p>
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### SECTION VIII - OCCUPATIONAL PROTECTION MEASURES

<b>Respirator Protection:</b> The following chart specifies the types of respirators which may provide respiratory protection for crystalline silica.	
<b>CONDITION</b> Particulate Concentration	<b>RESPIRATORY PROTECTION FOR CRYSTALLINE SILICA MINIMUM RESPIRATORY PROTECTION*</b>
Up to 5 x PEL	Any dust respirator.
Up to 10 x PEL	Any dust respirator, except single-use or quarter mask respirator. Any fume respirator or high efficiency particulate filter respirator. Any supplied-air respirator. Any self-contained breathing apparatus.
Up to 50 x PEL	A high efficiency particulate filter respirator with a full face piece. Any supplied-air respirator with a full face piece, helmet, or hood. Any self-contained breathing apparatus with a full face piece.
Up to 500 x PEL	A powered air-purifying respirator with a high efficiency particulate filter. A Type C supplied-air respirator operated in pressure-demand or other positive pressure or continuous-flow mode.
Greater than 500 x PEL or entry and escape from unknown concentrations	Self-contained breathing apparatus with a full face piece operated in pressure-demand or other positive pressure mode.  A combination respirator which includes a Type C supplied-air respirator with a full face piece operated in pressure-demand or other positive pressure continuous-flow mode and an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.
Abrasive Blasting	Any Type CE, supplied-air respirator with a full face piece, hood, or helmet, operated in a positive-pressure mode. (See 29 CFR Section 1910.94 (a).)
<b>*Only NIOSH-approved equipment should be used. (See 29 CFR Section 1910.134).</b>	
See also ANSI standard Z88.2 (latest version) "Practices for Respiratory Protection."	
<b>Ventilation:</b>	
<b>Local Exhaust:</b>	Use sufficient local exhaust to reduce the level of respirable dust to the PEL. See ACGIH "Industrial Ventilation, A Manual Recommended Practice," the latest edition.
<b>Mechanical Exhaust:</b>	See "Other Precautions" under Section VII.

<b>Special:</b>	See "Other Precautions" under Section VII.
<b>Other:</b>	See "Other Precautions" under Section VII.
<b>Protective Gloves:</b>	Optional - Impervious cloth, rubber or leather.
<b>Eye Protection:</b>	Wear protective shield (safety glasses) when exposed to dust particles.
<b>Other Protective Clothing:</b>	Boots, aprons, or chemical suits should be used when necessary to prevent skin contact.
<b>Work/Hygiene Practices:</b>	Avoid inhalation and ingestion of this material, avoid eye contact. Avoid creating dust.

### SECTION IX - TRANSPORTATION INFORMATION

<b>U.S. DOT Hazard Classification</b>	
<b>Proper Shipping Name:</b> Not regulated	<b>Hazard Class/Packing Group:</b> N/A
<b>Technical Name:</b> N/A	<b>Labels Required:</b> None
<b>UN Number:</b> N/A	<b>DOT Packaging Requirements:</b> N/A
<b>Exceptions:</b>	

### SECTION X - ECOLOGICAL INFORMATION

No ecotoxicity data is available. This product is not expected to present an environmental hazard.

### SECTION XI - OTHER INFORMATION

<b>NFPA Hazard Rating</b>	<b>Health:</b> 1	<b>Flammability:</b> 0	<b>Reactivity:</b> 0
<b>HMIS Hazard Rating</b>	<b>Health:</b> 3	<b>Flammability:</b> 0	<b>Reactivity:</b> 0
	<b>Personal Protection:</b> Use NIOSH/OSHA approved respirator.		

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