

DuPont™ Florida Zircon Sands

DuPont's Florida zircon sands are naturally occurring rounded grain sands mined from our heavy mineral deposits in Starke, Florida. The zircon sands are washed to give clean products free from dirt and ultrafines and then calcined to reduce water and other volatile content. The sands are separated from other heavy minerals by physical processes to produce uniform high-quality products.

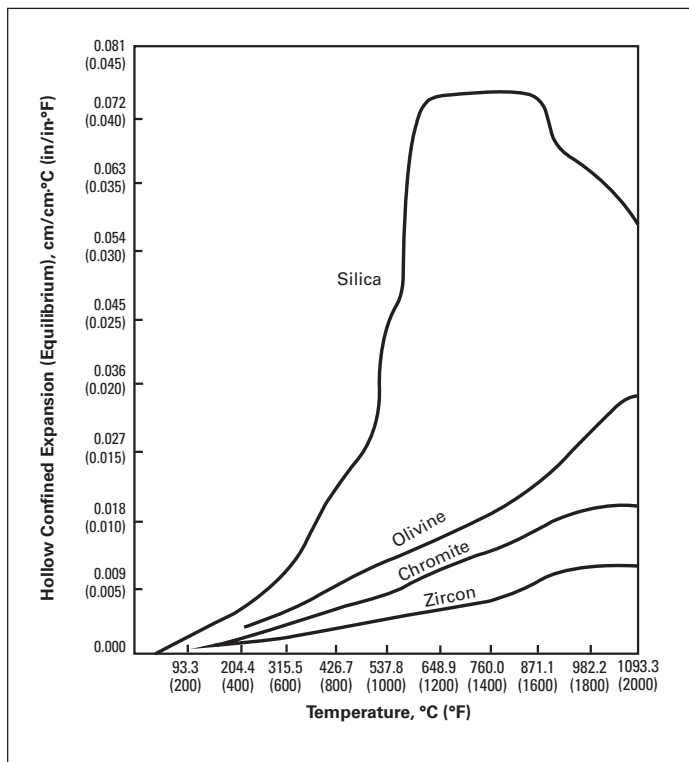
Physical and Chemical Properties

DuPont offers five grades of Florida zircon sands that vary in the level of zircon (zirconium silicate) and other mineral content.

Solubility and Reactivity Information

- Insoluble in water, dilute acids, and hot concentrated sulfuric acid
- Very slight solubility in hydrofluoric acid
- Reacts with hot concentrated alkali solutions
- Does not react with cold dilute alkali solutions

Figure 1. Thermal Expansion Coefficients of Mineral Sands



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Table 1
Chemical, Mineral, and Physical Properties

Typical Screen Analysis**

U.S. Sieve No.*	Sieve Opening, μm	% Retained on Sieve									
		Premium Zircon		Low Alumina Zircon		Standard Zircon		Zircon T		Zircon M	
		Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
50	300	<1		<1		<1		<1		<1	
70	212	<1		<1		1	0.8	1	0.8	<1	
100	150	8	2.7	10	4.0	14	5.8	13	5.7	7	3.6
140	106	71	2.3	68	3.0	63	3.1	62	3.7	61	4.3
200	75	21	3.1	21	4.1	21	4.6	23	4.6	29	5.0
270	53	1	0.3	1	0.4	1	0.5	1	0.7	2	1.6
PAN	<53	<1		<1		<1		<1		<1	
AFS Grain Fineness Number		107	2.1	106	3.0	105	4.1	107	4.1	112	4.0
D50 (Mean)		120 Mesh (125 μm)		120 Mesh (125 μm)		120 Mesh (125 μm)		121 Mesh (124 μm)		125 Mesh (120 μm)	

Chemical Composition

	Premium Zircon		Low Alumina Zircon		Standard Zircon		Zircon T		Zircon M	
	Spec. %	Typ. %**	Spec. %	Typ. %**	Spec. %	Typ. %**	Spec. %	Typ. %**	Spec. %	Typ. %**
ZrO ₂ ***	66.5 min.	66.7	66.3 min.	66.5	65.0 min.	65.9	64.0 min.	65.2	60.5 min.	62.5
TiO ₂	0.15 max.	0.13	0.25 max.	0.21	0.35 max.	0.27	2.0 max.	1.00		2.6
Al ₂ O ₃	0.50 max.	0.24	0.80 max.	0.50	2.00 max.	1.15	2.5 max.	1.10		0.8
Fe ₂ O ₃	0.05 max.	0.02	0.05 max.	0.04	0.05 max.	0.04	0.5 max.	0.07		0.5
Free Silica***	0.05 max.	0.01	0.10 max.	0.05	0.20 max.	0.10	0.5 max.	0.10		0.1

Mineral Composition (Typical %)**

	Premium Zircon	Low Alumina Zircon	Standard Zircon	Zircon T	Zircon M
Zircon (ZrSiO ₄)	99.3	99.0	97.0	97.0	93.0
Kyanite (Al ₂ SiO ₅)	0.5	0.8	2.0	1.5	1.3
Rutile (TiO ₂)	0.1	0.2	0.3	1.0	0.5
Miscellaneous Minerals	<0.1	<0.1	<1.0	<1.0	<1.0

Physical Properties

	Range
Bulk Density (Uncompacted)	2643–2804 kg/m ³ (165–175 lb/ft ³)
Specific Gravity	4.62–4.67
Hardness (Mohs)	7.0–7.5
Melting Point	2100–2300°C (3810–4170°F)
Coefficient of Linear Expansion	7.2×10^{-6} cm/cm·°C (4.0×10^{-6} in/in·°F)
pH	5.5–7.0

* U.S. Sieve Series according to ASTM E-11-70.

** These columns give typical values based on historical production performance. DuPont does not make any express or implied warranty that future production will conform to these typical values.

*** Values calculated based on concentrations of other elements.

Table 2
Uses of Zircon Sands

Industry	Application	Features
Foundry	Sand mold and cores	Excellent casting surface
	Metal chills	Resists metal penetration and “burn in” Low thermal expansion aids dimensional accuracy (see Figure 1) Resists metal reaction with most alloys Reduced cleaning and machining Low binder requirements High thermal conductivity High bulk density
Precision Investment Casting	Prime coat slurry (flour form)	Excellent casting surface
	Back-up slurry and stucco	Low reactivity with most alloys
	Cores	Exhibits nonwetting surface to molten metals
	Shell molds	Low thermal expansion Excellent refractory properties Dimensional accuracy
Refractory	Ladle brick	Reduces erosion
	Coatings, mortars, and linings	Extends ladle lining life
	Ladle nozzle fill	Resists reaction with molten metal and slag Excellent refractory properties for higher temperature alloys Reduces refractory inclusions in high-performance steel Reduced spalling due to low thermal expansion Longer life High bulk density High thermal conductivity Clean flow on release of slide gate
Ceramic	Glazes	Improves opacity
	Sanitary ware	Increases craze resistance
	Wall tile	Glaze texture control
	Dinnerware	
	Electrical porcelain	
	Glazed brick and industrial tile	
	Artwork	
Other		
• Glass	High performance refractory	Reduced erosion Longer glass tank life
• Welding Rod	Special weld rod coatings	With other mineral ingredients, forms slag to shield weld pool
• Zirconium Metal	Source of zirconium element	High zirconium content

Personal Safety

DuPont Florida zircon sands, as shipped, do not pose an inhalation health hazard because they contain practically no particles in the respirable dust size range. However, if in handling or use, the sands are broken down, inhalation of the dust from DuPont zircon products may be harmful to the respiratory system. The U.S. Department of Labor (OSHA)* has ruled that an employee's exposure to airborne zirconium compounds in any 8-hr work shift of a 40-hr week shall not exceed a time weighted average of 5 mg/m³ of material as Zr (equivalent to 10 mg/m³ as zircon).

* Due to changing governmental regulations, such as those of the Department of Transportation, Department of Labor, U.S. Environmental Protection Agency, and the Food and Drug Administration, references herein to governmental requirements may be superseded. Each user should consult and follow the current governmental regulations, such as Hazard Classifications, Labeling, Food Use Clearances, Worker Exposure Limitations, and Waste Disposal Procedures for the products described in this literature.

Avoid breathing dust. Wash thoroughly after handling. In emergencies or when dust levels exceed OSHA time weighted average limit, dust masks or respirators approved by NIOSH for nuisance dusts must be used. Florida Zircon Sand is not recommended for use in abrasive blasting applications.

Packaging

The five grades of Florida zircon sand are available in 22.7-kg (50-lb) multiwall paper bags, semi-bulk (2-ton) bags, or in bulk hopper railcars or trucks. Department of Transportation (DOT) Hazard Classification*: NOT REGULATED.

DuPont Titanium Technologies

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H-69479-4 (04/06) Printed in the U.S.A.

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