CoorsTek

Wear Resistant Ceramic Components

WEAR MATERIALS

WEAR RESISTANT CERAMICS

CoorsTek has been producing ceramic materials for over 100 years. We have the knowledge, capabilities, and experience to solve the most troublesome material handling wear problems.

With the most extensive wear resistant ceramic material product portfolio available in today's marketplace, CoorsTek specializes in providing advanced wear resistant ceramic materials and solutions that increase material handling wear life and reduce unnecessary downtime.

Advanced Ceramics for Industrial Wear Applications

CoorsTek engineered technical ceramics offer higher strength, abrasion and corrosion resistance than traditional wear materials, such as wear resistant steel, by as much as 10:1.

Our technical ceramics exhibit long-lasting wear in the most abrasive environments.

CoorsTek offers a broad range of aluminas and silicon carbides to ensure ideal fit, form, and function. Let our wear experts will help you choose the best material for your particular wear conditions and budget.

Aluminas

Used in heavy industry for years as a cost-effective, wear-resistant solution, aluminas are lightweight and offer high durability, strength, and excellent abrasion and corrosion resistance.

AD-90, AD-92, AD-94 or AD-96

Each of these grades provides outstanding wear resistance for all types of material handling applications. All alumina grades offer the flexibility of being produced in standard rectangular shapes and a variety of monolithic components.

AD-92 and AD-96 are premium grade aluminum oxide ceramic materials engineered by CoorsTek for increased wear resistance. Regardless of the application, CoorsTek engineers will specify the correct aluminum oxide material for increased wear life in even the most demanding material handling systems.

Zirconia-Toughened Alumina (ZTA)

ZTA offers high strength and durability with the benefit of increased impact resistance through the addition of zirconium oxide.

Silicon Carbide

Available in fine or coarse-grained forms for varying applications, CoorsTek silicon carbide offers superior wear at high temperatures, yielding a long life in the most abrasive environments.

Fine-Grained, Direct-Sintered Silicon Carbide (SC-DS)

Direct-sintered, SC-DS is a fine-grained silicon carbide offering the highest chemical and abrasion resistant properties for the most challenging applications.

Fine-Grained Reaction-Bonded Silicon Carbide (SC-RB-210)

Specifically designed for thin-wall applications, this fine-grained, reaction-bonded silicon carbide offers very high wear resistance, and facilitates complex designs with tighter tolerances for monolithic elbow segments, burners, and tubes.

Coarse-Blend, Reaction-Bonded Silicon Carbide (SC-RBX)

SC-RBX is a coarse-grained, reaction-bonded silicon carbide with the ability to endure the most abrasive environments and stronger impacts. SC-RBX is used to produce thicker wall components such as large hydrocyclone liners.

Rubber Vulcanization

CoorsTek advanced wear resistant aluminum oxide materials are extensively utilized to extend material handling equipment life in the world's largest mineral processing super mines. AD-92 is typically vulcanized into rubber to enhance impact resistance, providing increased wear life to keep operations at peak performance.

Materials

- Alumina ceramics
- Zirconia toughened alumina (ZTA)
- Transformation toughened zirconia (TTZ)
- Reaction-bonded silicon carbide
- Direct-sintered silicon carbide
- Durall tile adhesives
- Durall ceramic beaded wearing compounds
- High-strength RTV silicones

Industries Served

- Coal-fired power
- Mineral processing
- Grain handling
- Asphalt
- Iron & steel
- Cement
- Chemical processing
- Powder & bulk solid
- Aggregates
- Pulp & paper
- Glass
- Foundries

SPECIFICATIONS

PLAIN 1/8" THICK	ITEM AD-90	QTY/BOX	WT.
1" x 4" x 1/8"	74254	700	47
1" x 1" x 1/8"	09565-1	2000	35
1" x 0.5" x 1/8"	09566-1	as ordered	–
2" x 4" x 1/8"	04009	90	15
4" x 4" x 1/8"	74205	150	47

PLAIN 1/4" THICK	ITEM AD-90	QTY/BOX	WT.
1" x 4" x 1/4"	74217	360	47
1" x 1" x 1/4"	75012	1000	35
1" x 0.5" x 1/4"	06566-3	as ordered	–
2" x 6" x 1/4"	74255	90	35
4" x 6" x 1/4"	74218	45	35
4" x 4" x 1/4"	74219	90	47

PLAIN 1/2" THICK	ITEM AD-90	QTY/BOX	WT.
4" x 6" x 1/2"	72086	45	70
2" x 6" x 1/2"	72092	90	70
4" x 3" x 1/2"	24322	64	46
4" x 4" x 1/2"	32331	45	46

PLAIN 1" THICK	ITEM AD-90	QTY/BOX	WT.
4" x 6" x 1"	72085	24	70
2" x 6" x 1"	11121-85	44	70
4" x 3" x 1"	02539	32	35
4" x 4" x 1"	11121-49	24	48
PLAIN 2" THICK	**ITEM AD-90**	**QTY/BOX**	**WT.**
4" x 6" x 2"	72084	12	70
2" x 6" x 2"	15408	24	70
4" x 3" x 2"	30.00038	12	36
WELD 1/2" THICK	**ITEM AD-90**	**QTY/BOX**	**WT.**
4" x 6" x 1/2"	75208	44	70
2" x 6" x 1/2"	11152-7	89	70
4" x 3" x 1/2"	11152-52	62	47
4" x 4" x 1/2"	11153-16	44	47
WELD 1" THICK	**ITEM AD-90**	**QTY/BOX**	**WT.**
4" x 6" x 1"	72087	23	70
2" x 6" x 1"	11152-12	43	65
4" x 3" x 1"	72094	30	46
4" x 4" x 1"	72093	23	46

WELD 2" THICK	ITEM AD-90	QTY/BOX	WT.
4" x 6" x 2"	72088	11	66
2" x 6" x 2"	11153-25	22	66
4" x 3" x 2"	21109	11	35
9" PIPE – 1/2" THICK	**ITEM AD-90**	**QTY/BOX**	
2.1" x 9" x 1/2" x 4-1/2"	33674	as ordered	
2.1" x 9" x 1/2" x 6"	19317	as ordered	
2.1" x 9" x 1/2" x 9"	28123	as ordered	
9" PIPE – 1" THICK	**ITEM AD-90**	**QTY/BOX**	
2.1" x 9" x 1" x 4.5"	37466	as ordered	
2.1" x 9" x 1" x 6"	41566	as ordered	
2.1" x 9" x 1" x 7"	21389	as ordered	
2.1" x 9" x 1" x 8"	19374	as ordered	
2.1" x 9" x 1" x 9"	22794	as ordered	
2.1" x 9" x 1" x 10"	18261	as ordered	

SEALANTS AND ADHESIVES

CoorsTek offers a full line of silicone sealants and specially formulated adhesives designed to work in conjunction with wear resistant ceramics.

RTV-HT High-Temperature Industrial Silicone Sealant & Adhesive

Premium-grade, one-component, room-temperature vulcanizing, and acetoxy cure silicone sealant and adhesive is ideal for use with CoorsTek wear ceramics in high-temperature environments. Operating temperature ranges between -62° F and 500° F with intermittent range to 650° F.

RTV-4500 HS High-Strength Industrial Silicone Sealant & Adhesive

Ideal for use with wear ceramics in severe-duty environments, RTV-HS is a premium-grade, one-component, room-temperature vulcanizing, and acetoxy cure silicone sealant and adhesive. Operating temperature ranges between -62° F and 350° F with intermittent range to 400° F.

RTV-6500 HT High Temperature Industrial Silicone Sealant & Adhesive

Ideal for use with wear ceramics in severe-duty environments, RTV-HT is a premium-grade, one-component, room-temperature vulcanizing, and acetoxy cure silicone sealant and adhesive. Operating temperature ranges between -62° F and 500° F with intermittent range to 650° F.

Durall™ 5-15 Fast-Set Ceramic Beaded Compound

A fast-setting compound with small black ceramic beads, Durall™ 5-15 is designed to provide immediate, emergency protection of surfaces subjected to wear & abrasion.

Durall™ 55 Ceramic Beaded Compound

Compound with small black ceramic beads designed to provide a durable barrier for surfaces subjected to wear and abrasion in environments up to 200° F.

Durall™ 65 High-Temp, Large-Beaded Compound

Compound with large black ceramic beads designed to provide a durable, waterproof, and chemically resistant barrier of protection up to 450° F.

Durall™ 10 Ceramic Tile Adhesive

This two-part epoxy tile adhesive is a thixotropic gel designed to adhere tiles applied to vertical and overhead surfaces in environments up to 200° F. Providing a tenacious bond to most ceramic, metal, concrete, fiberglass, or wood surfaces, Durall™ 10 is moisture resistant and cures underwater.

DuraShield 93 High-Temperature Tile Adhesive

A thixotropic gel for use in environments up to 400°F, DuraShield 93 provides a tenacious bond to most ceramic, metal, concrete, fiberglass, or wood surfaces. DuraShield 93 is moisture resistant and will cure underwater.

MATERIAL PROPERTIES

				ALUMINA			ZIRCONIA-ALUMINA	SILICON CARBIDE	
				AD-90	AD-94	AD-96	ZTA-10%	SC-RB (SC-210)	UltraSiC™ (SC-30)
PROPERTIES*		**UNITS**	**TEST**	Nom. 90% Al_2O_3	Nom. 94% Al_2O_3	Nom. 96% Al_2O_3	Zirconia Toughened Alumina	Reaction Bonded Silicon Carbide	Direct Sintered Silicon Carbide
Density		gm/cc	ASTM-C20	3.60	3.70	3.72	4.01	3.10	3.15
Crystal Size	Average	MICRONS	ASTM-E112	4	8	6	2	12	4
Water Absorption		%	ASTM-373	0	0	0	0	0	0
Gas Permeability		–	–	0	0	0	0	0	0
Color		–	–	WHITE	WHITE	WHITE	WHITE	BLACK	BLACK
Flexural Strength (MOR)	20° C	MPa (psi x 10^3)	ASTM-F417	338 (49)	352 (51)	358 (52)	450 (65)	462 (67)	480 (70)
Elastic Modulus	20° C	GPa (psi x 10^6)	ASTM-C848	276 (40)	303 (44)	303 (44)	360 (52)	393 (57)	410 (59)
Poisson's Ratio	20° C	–	ASTM-C848	0.22	0.21	0.21	0.30	0.20	0.21
Compressive Strength	20° C	MPa (psi x 10^3)	ASTM-C773	2482 (360)	2103 (305)	2068 (300)	2900 (421)	2700 (392)	3500 (508)
Hardness		GPa (kg/mm^2)	KNOOP 1000 gm	10.4 (1058)	11.5 (1175)	11.5 (1175)	14.5 (1475)	24.5 (2500) ❸	27.4 (2800) ❸
		R45N	ROCKWELL 45 N	75	78	78	85	–	–
Tensile Strength	25° C	MPa (psi x 10^3)	ACMA TEST #4	221 (32)	193 (28)	221 (32)	290 (42)	307 (44.5)	–
Fracture Toughness	K(I c)	Mpa $m^{1/2}$	NOTCHED BEAM	3 - 4	4 - 5	4 - 5	5-6	4	4
Thermal Conductivity	20° C	W/m K	ASTM-C408	16.7	22.4	24.7	27.0	125.0	150.0
Coefficient of Thermal Expansion	25-1000° C	1X 10^{-6}/°C	ASTM-C372	8.1	8.2	8.2	8.3	4.3	4.4
Specific Heat	100° C	J/kg*K	ASTM-E1269	920	880	880	885	800	800
Thermal Shock Resistance	Δ Tc	°C	❶	250	250	250	300	400	300
Maximum Use Temperature		°C	NO-LOAD COND.	1500	1700	1700	1500	1000	1600
Dielectric Strength	6.35mm	ac-kV/mm (ac V/mil)	ASTM-D116	8.3 (210)	8.3 (210)	8.3 (210)	9.0 (228)	–	–
Dielectric Constant	1 MHz	25° C	ASTM-D150	8.8	9.1	9.0	10.6	–	–
Dielectric Loss (tan delta)	1 MHz	25° C	ASTM-D150	0.0004	0.0004	0.0002	0.0005	–	–
Volume Resistivity	25° C	ohm-cm	ASTM-D1829	> 10^{14}	> 10^{14}	> 10^{14}	> 10^{14}	< 10^3	> 10^5
	500° C	ohm-cm	ASTM-D1829	4 x 10^8	4 x 10^9	4 x 10^9	2 x 10^9	< 10^3	> 10^3
	1000° C	ohm-cm	ASTM-D1829	5 x 10^5	5 x 10^5	1 x 10^6	3 x 10^6	< 10^3	> 10^2
Impingement		–	❷	0.45	0.52	0.50	0.41	0.14	0.12
Rubbing		–	❷	0.36	–	0.60	0.49	–	–

Notes:

❶ Thermal Shock Resistance – Tests are run by quenching samples into water from various elevated temperatures. The change in temperature where a sharp decrease in flexural strength is observed is listed as DTc.

❷ Wear Resistance – Impingement tests are run using a dry fused alumina abrasive. Rubbing tests are run using a dry 240 grit fused alumina abrasive. The indices in the chart are calculated by dividing the material volume loss by the volume loss of an AD-85 alumina control. The lower in the index, the better the wear resistance.

❸ 100 gm load

❹ Four point bend modulus of rupture

*Ceramic property values vary somewhat with method of manufacture, size, and shape of part. Close control of values of most properties can be maintained if specified.

Wear Applications Experts

Contact a CoorsTek wear specialist for a free consultation and quote on your next reline or new construction project at info@coorstek.com or +1 303 271 7100.

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