



CERASURF PRODUCTS

COORSTEK
Amazing Solutions.



HIGHER PRODUCTIVITY FROM HIGHER PERFORMANCE MATERIALS

It's simple: When products wear out, productivity and profits go down.

If you're using rubber, steel or even the most exotic materials in your high wear applications, this may be your opportunity to achieve a dramatic improvement in your productivity...with Coors Cerasurf™ Wear Resistant Ceramics.

Cerasurf's unique combination of hardness, abrasion resistance, corrosion resistance and high strength over a broad range of temperatures makes it the hands-down winner in the most torturous industrial applications.

THE CERASURF FAMILY

Coors offers Cerasurf in several unique formulations of alumina and silicon carbide. Coors Alumina contains alpha alumina, the hardest natural material known to man, next to diamond. Coors Silicon Carbide formulations are extremely hard, corrosion resistant synthetic materials that maximize performance in extreme wear applications.

In countless punishing environments, Coors Cerasurf products have become industrial staples. Cerasurf is the wear resistant material of choice in industries ranging from mining to mineral processing, from coal preparation to steel production, from sand and gravel to coal-fired power.

THE CHALLENGE IS CRITICAL. THE CHOICE IS COORS.

Coors is the worldwide leader in the manufacture of technical and industrial ceramics.

Our integrated network of engineering, fabrication and field services provides comprehensive support wherever industry calls for better performance through high performance materials.

Coors products are designed to meet the most exacting requirements in the most cost-effective way. We are known not only for innovations in ceramic formulations but also for advanced ceramic processing and manufacturing technology. Today's generation of Coors Cerasurf products can be pressed, cast, extruded and injection-molded into countless sizes and shapes.

For ceramic components requiring high tolerances or exacting surface finishes, Coors offers the largest grinding and finishing facilities in the world. We have helped thousands of design engineers find the best way to take advantage of today's generation of ceramics. We're ready to help you.







THE 10 TO 1 ALTERNATIVE

During the 1940's, researchers developed new synthetic silicon carbide formulations that could be bonded into extremely hard, wear resistant materials. Reaction bonded and nitride bonded silicon carbides exhibited stronger bonds and greater corrosion resistance than most ceramic alternatives. Mining, mineral processing and coal-fired power production have realized up to 10 times the life in a range of applications, from cyclone liners to scrubber spray nozzles.

Today's Cerasurf Silicon Carbides represent the most advanced formulations available. They combine the hardest synthetic material known to man with a variety of advanced bonding techniques to provide unique solutions for high abrasion/high corrosion environments.



SCRB REACTION BONDED SILICON CARBIDE

The high strength of Cerasurf SCRБ results from the finest grain structure available, as well as Coors' unique high temperature, reaction bonded process. This revolutionary technique bonds fine-grain materials into a homogeneous microstructure that provides a superior, void-free surface finish. SCRБ outwears and outlasts most common tungsten carbide and other sophisticated alloys 10 to one.

Cerasurf Reaction Bonded Silicon Carbide was developed to meet the challenges of contemporary high performance designs.

The material's low density, high strength at high temperature and high corrosion resistance far surpass conventional ceramics, making SCRБ particularly well-suited for "extreme stress" applications. Its superior hardness, durability and wear resistance assure reliable performance and long life in the most hostile environments...such as cyclone liners, valves, chokes, nozzles, thrust bearings and seals. Any job that demands the toughest material around demands Cerasurf SCRБ.

SCNB-15 NITRIDE BONDED SILICON CARBIDE

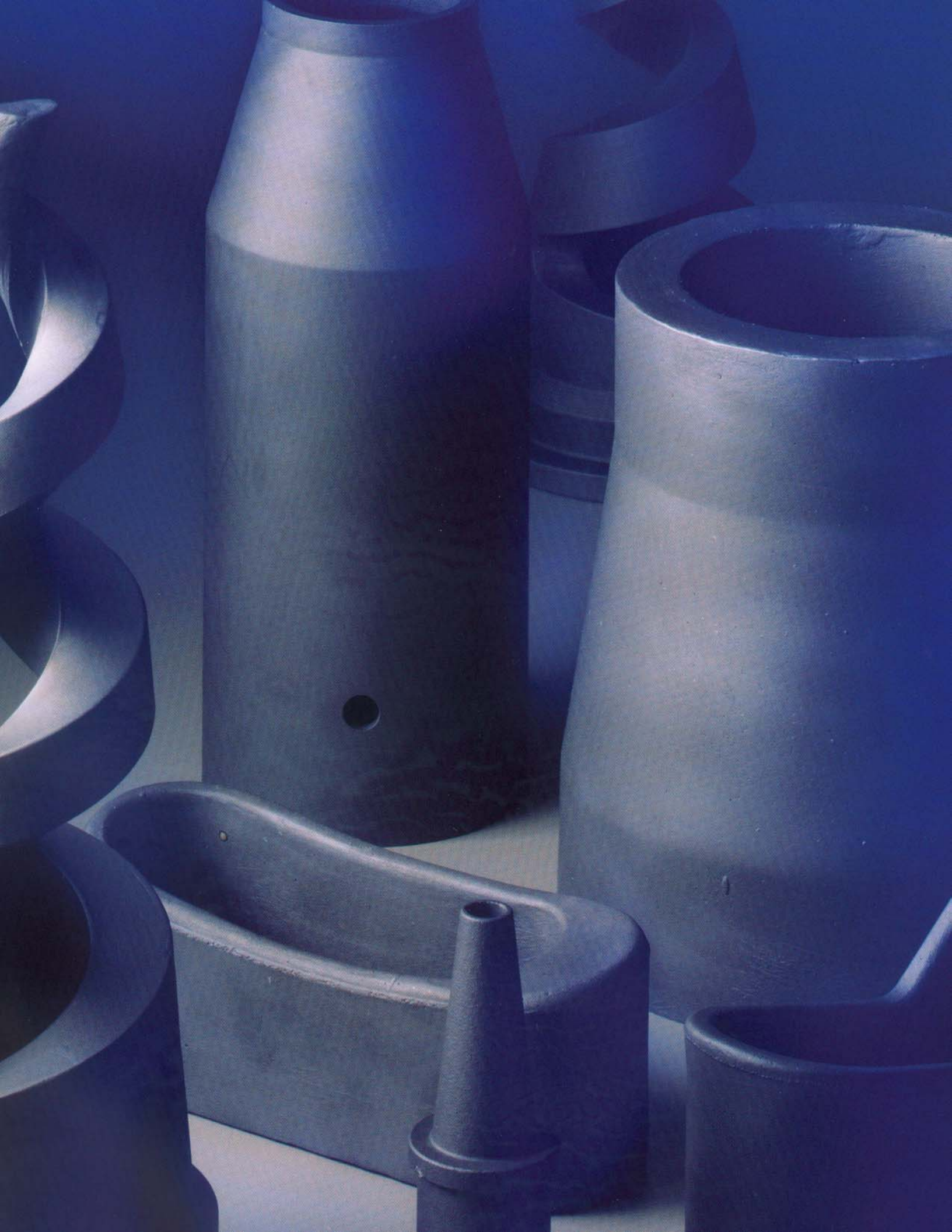
Cerasurf SCNB-15 excels in a small particle, high velocity impingement environment because it combines the abrasion resistance of silicon carbide with an extremely strong silicon nitride bond. SCNB-15 also has outstanding chemical and thermal shock resistance due to its inherent refractory properties and ability to withstand most acidic environments, including resistance to wetting by non-ferrous materials.

Through advanced fabrication techniques, Cerasurf SCNB-15 can be cast into complex shapes, making it particularly well-suited for original equipment components duplication.

Because of its superior corrosion, thermal and abrasion resistance, nitride bonded silicon carbide has become the industry standard for pollution control spray nozzles in limestone slurry scrubber systems. It is often the material of choice to line cyclones, pumps and pulverized fuel components.

Call on Coors for answers to your severe wear application questions. We can help you determine if SCRБ, SCNB-15 or one of the other Coors Silicon Carbide formulations is the most cost-effective product for you.







INDUSTRIAL APPLICATIONS

MATERIAL HANDLING APPLICATIONS	CEMENT			COAL-FIRED POWER			COAL PREPARATION			GRAIN			MINING			SAND & GRAVEL			STEEL				
	A	N	R	A	N	R	A	N	R	A	N	R	A	N	R	A	N	R	A	N	R		
Ball Mill Liners	A			A									A										
Bins – Burners, Hoppers	A			A			A			A			A			A					A		
Burner Liners	A	N		A	N											A	N						
Conveyor Skirt Boards/ Transfer Points	A		R				A			A			A			A					A		
Chemical Reactors/Vessels				A	N	R							A	N	R						A	N	R
Chokes and Valves	A	N		A	N		A	N	R	A	N	R	A	N	R	A	N	R			A	N	R
Chutes Systems	A			A	N	R	A			A			A			A					A		
Classifiers	A			A	N	R	A	N	R	A			A	N	R	A					A	N	
Cyclone Dust Collectors	A			A	N	R				A			A			A					A		
Exhausters/ID Fans	A			A	N	R				A	N		A	N		A	N				A	N	
Feeders/Vibrating Tables	A			A	N	R	A			A			A			A					A		
Ferrules				A	N	R							A								A		
Gas Scrubber Liners				A	N	R							A	N							A	N	
Hydrocyclone Liners				A	N	R	A	N	R				A	N	R	A	N	R					
Mechanical Seals	A		R	A	N	R	A		R				A		R	A		R			A		R
Mixers, Blenders and Mullers	A			A	N	R	A						A			A					A		
Nozzles, Sandblast/Spray	A	N	R	A	N	R	A	N	R				A	N	R	A					A	N	R
Orifices and Spouts	A	N	R	A	N	R	A	N	R	A	N	R	A	N	R	A	N	R			A	N	R
Pipe Elbows/Liners, Pneumatic Handling	A			A	N	R	A						A	N		A					A	N	
Plow Blades/Scrapers	A			A	N	R	A			A			A			A					A		
Pulverizer Liners	A	N		A	N	R							A	N		A	N				A	N	
Pump Impellers/Liners/ Shaft Sleeves	A	N	R	A	N	R	A	N	R				A	N	R	A	N	R			A	N	R
Screw Conveyor – Flight Tile and Troughs	A	N	R	A	N	R	A	N	R	A			A	N	R	A					A	N	R
Separator – Liquid/Solid/ Magnetic	A	N		A	N	R	A	N		A			A	N		A	N				A	N	
Skid Rails/Guides	A	N	R	A	N	R							A	N	R	A					A	N	R
Skips and Buckets	A			A	N	R	A			A			A			A					A		
Slurry/Ash Piping	A	N		A	N	R	A	N					A	N		A	N				A	N	
Troughs and Launderers	A	N		A	N	R	A	N					A	N		A	N				A	N	

A = Cerasurf Alumina Ceramic N = Cerasurf SCNB-15 R = SCRB-2



WEAR RESISTANT MATERIALS

PROPERTIES		UNITS	TEST	AD-85 (A4)	AD-90 (90S)	TTZ	AD-995 (9951)	SCRB (210)	SCNB- 15
SPECIFIC GRAVITY			ASTM C20	3.41	3.60	5.75	3.89	3.10	2.60
HARDNESS	Rockwell Knoop	R45N GPa	ASTM E18 ASTM C849	73 10.2	79 10.8	74-79 11.8	83 14.7	88 24.5* (100g)	— 27.0* (100g)
SURFACE FINISH	As-Fired Ground Polished	Micrometres (Microinches)	Profilometer (0.75mm cutoff)	1.6 (63) 1.0 (39) 0.2 (8)	1.6 (63) 0.5 (20) 0.1 (4)	— — —	0.9 (35) 0.5 (20) 0.1 (4)	2.0 (100) .38 (10-3) .05 (2)	As Cast Surface
CRYSTAL SIZE	Range Average	Micrometres (Microinches)	Thin Section	2-16 (79-632) 6 (236)	2-10 (79-394) 4 (158)	— — —	2-16 6	N/A	N/A
WATER ABSORPTION		Percent	ASTM C373	0.0	0.0	0.0	0.0	0.0	8% <small>Nominal Apparent Porosity</small>
GAS PERMEABILITY				None	None	None	None	None	
COMPRESSIVE STRENGTH	25°C	MPa (kpsi)	ASTM C773	1930 (280)	2480 (360)	1750 (254)	2620 (380)	2500 (362)	>140 (20)
FLEXURAL STRENGTH	TYP. 25°C	MPa (kpsi)	ASTM F417	317 (46)	338 (49)	620 (90)	379 (55)	275 (40)	46 (6.7)
TENSILE STRENGTH	25°C	MPa (kpsi)	ACMA Test #4	155 (22)	221 (32)	352 (51)	262 (38)	307 (44.5)	—
MODULUS OF ELASTICITY		GPa (10 ⁴ psi)	ASTM C674	228 (33)	276 (40)	200 (29)	372 (54)	393 (57)	—
SHEAR MODULUS		GPa (10 ⁴ psi)		96 (14) .22	117 (17) .22	76 (11) .30	152 (22) .22	166 (24.1) .19	— —
POISSON'S RATIO									
MAXIMUM USE TEMPERATURE	(No-Load Conds.)	°C (°F)	Estimated	1400 (2550)	1500 (2730)	500 (932)	1750 (3180)	1400 (2550)	1590 (2900)
COEFFICIENT OF LINEAR THERMAL EXPANSION	-200-25°C 25-200°C 25-500°C 25-800°C 25-1000°C	10 ⁻⁶ /°C	ASTM C372	3.1 6.3 7.0 7.6 7.9	3.4 6.1 7.0 7.7 8.0	— — — — 10.1	3.4 7.1 7.6 8.0 8.3	— 3.0 3.7 4.2 4.3	— 2.4 3.2 3.7 3.9
THERMAL CONDUCTIVITY	20°C 100°C 400°C 800°C 1000°C	W/m-K (g-cal)(sec)(cm ²) (°C/cm)	ASTM C408	16.0 (.038) 13.0 (.031) 7.8 (.018) 6.4 (.013) —	16.7 (.039) 13.4 (.031) 7.9 (.018) 5.0 (.0115) —	2.2 — — — —	32 (.075) 25.9 (.059) 12.1 (.028) 6.3 (.0145) —	124 (.286) 110 (.254) 73 (.160) 48 (.111) —	— — — — 15.9 (.367)

*Principal Crystal.

NOTICE: All of the above statements, recommendations, suggestions and data concerning the subject material are based on laboratory and field results and, although we believe the same to be reliable, we expressly do not represent, warrant or guarantee the accuracy, completeness or reliability of same, of the material or the results to be obtained from the use thereof, neither do we warrant that any such use, either alone or in combination with other materials, shall be free of the rightful claim of any third party by way of INFRINGEMENT or the like, and COORS DISCLAIMS ALL WARRANTIES, EXPRESS OR IMPLIED, OF MERCHANTABILITY and FITNESS FOR A PARTICULAR PURPOSE.

These formulas represent the standard wear resistant materials offered; however, Coors has a variety of ceramic compositions that are available upon request.