REFRACTORY CERAMIC COMPOSITES

Types RS-99-45 and RS-99-60

ZIRCAR Refractory Composites, Inc. produces a comprehensive range of advanced high performance ceramic-ceramic composites and related products. Our materials are used around the world in demanding thermal, structural and electrical insulating applications at temperatures from 600°C(1112°F) to 1650°C(3002°F). For over twenty-five years we have been a problem solver working with many industries to resolve their thermal management problems.

ZRCI Refractory Sheet Type RS-99-60 and RS-99-45 are comprised of 99% alumina. These "All-Alumina" materials are strong, uniform, rigid, refractory structure composed of alpha alumina fibers and high purity inorganic binders. Type RS-99-60 and RS-99-45 have a high purity alumina bond making them well suited for use in high vacuum and reducing enviroments where silica cannot be tolerated, such as power metal and MIM furnaces with H_2 atmospheres. They also have high electrical resistivity at elevated temperatures allowing them to be used in direct contact with resistance heating elements. They exhibite superior hot strength and dimensional stability to 1650°C (3000°F).

RS-99-60 has a density of 60 lbs/ft³ (1 gm/cc) and RS-99-45 has a density of 45 lbs/ft³ (.72 gm/cc)

ZRCI Refractory Sheet low density fiber reinforced ceramic composites are available as boards, cylinders and custom shapes. They have a fine open pore structure, high porosity and low thermal conductivity.

These materials are fabricated as true composite laminates. They can be constructed into near net complex shapes. They can also be machined to tight exacting tolerances with ordinary shop tools and equipment. Their superior machinability and dimensional stability plus low heat capacity make them ideal for use as setters, supports and process fixtures in both continuous and batch firing furnaces.

They contain no organic binders and will not smoke or produce odors when heated. They show excellent resistance to chemical attack and are not affected by oil or water. They are, however, affected by hydrofluoric acid, phosphorous acid and strong alkalis.

SUGGESTED APPLICATIONS

- Primary thermal insulation in low mass furnaces and thermal process systems operating to 1650°C (3002°F)
- Thermal insulation, supports and process fixtures in Hot Isostatic Presses (HIP) furnaces and other thermal process systems operating to 1650°C (3002°F).
- High temperature setters, supports and process fixtures.
- Thermal insulation in bright annealing furnaces and other thermal process systems with hydrogen gas atmospheres operating to 1550°C (2822°F).
- Thermal insulation, supports and fixtures Solid Oxide Fuel Cells operating to 1550°C (2822°F).
- Backup thermal insulation in furnaces and thermal process systems operating to temperatures exceeding 2000°C (3632°F).
- Launders, distribution boxes, pouring spouts, hot tops and others involving molten metal contact.
- Electrical insulation in high temperature systems operating to 1550°C (2822°F).

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Types RS-99-45 and RS-99-60

TYPE	RS-99-60	RS-99-45
Nominal Composition, wt%		
Al_2O_3	99	99
SiO_2	1	1
Organic content	0	0
Density, gm/cc(pcf)	1.0(60)	0.72(45)
Porosity, %	65	85
Max. Use Temp. *, °C(°F)	1650(3002)	1650(3002)
Modulus of Rupture**, MPa(psi)	5.00(730)	2.07 (300)
Compressive Strength**, MPa (psi) at 10% compression	4.00(580)	1.31 (190)
Thermal Conductivity,		
W/m°K(BTU/hr. ft² °F/in)		
427°C(800°F)	0.27 (2.00)	0.12 (0.85)
900°C(1652°F)	0.32 (2.40)	0.16 (1.10)
1200°C(2192°F)	0.44 (3.20)	0.22 (1.50)
1650°C(3992°F)	0.52 (3.70)	0.29 (2.00)
Thermal Expansion,	7.0×10^{-6}/°C	7.0×10^{-6}/°C
RT-400°C(752°F)	(4×10^{-6}/°F)	(4×10^{-6}/°F)
Linear Shrinkage‡, % after 4 hrs. at 1200°C(2192°F)	1	1

* Maximum use temperature is dependent on variables such as stresses, both thermal and mechanical, and the chemical environment that the material experiences.
**Properties expressed parallel to thickness.
‡ Properties expressed perpendicular to thickness.

Item #	Description	Item #	Description
DS60	RS-99-60, 12" X 12" X 0.25"	DS80	RS-99-45, 12" X 12" X 0.25"
DS61	RS-99-60, 24" X 24" X 0.25"	DS81	RS-99-45, 24" X 24" X 0.25"
DS62	RS-99-60, 12" X 12" X 0.5"	DS82	RS-99-45, 12" X 12" X 0.5"
DS63	RS-99-60, 24" X 24" X 0.5"	DS83	RS-99-45, 24" X 24" X 0.5"
DS64	RS-99-60, 12" X 12" X 0.75"	DS84	RS-99-45, 12' X 12" X 0.75"
DS65	RS-99-60, 24" X 24" X 0.75"	DS85	RS-99-45, 24" X 24" X 0.75"
DS66	RS-99-60, 12" X 12" X 1"	DS86	RS-99-45, 12" X 12" X 1"
DS67	RS-99-60, 24" X 24" X 1"	DS87	RS-99-45, 24" X 24" X 1"
DS70	RS-99-60, 1"ID X 2"OD X 12"L	DS90	RS-99-45, 1"ID X 2"OD X 12"L
DS71	RS-99-60, 1"ID X 2"OD X 24"L	DS91	RS-99-45, 1"ID X 2"OD X 24"L
DS72	RS-99-60, 2"ID X 3"OD X 12"L	DS92	RS-99-45, 2"ID X 3"OD X 12"L
DS73	RS-99-60, 2"ID X 3"OD X 24"L	DS93	RS-99-45, 2"ID X 3"OD X 24"L
DS74	RS-99-60, 3"ID X 4"OD X 12"L	DS94	RS-99-45, 3"ID X 4"OD X 12"L
DS75	RS-99-60, 3"ID X 4"OD X 24"L	DS95	RS-99-45, 3"ID X 4"OD X 24"L
DS76	RS-99-60, 5"ID X 6"OD X 12"L	DS96	RS-99-45, 5"ID X 6"OD X 12"L
DS77	RS-99-60, 5"ID X 6"OD X 24"L	DS97	RS-99-45, 5"ID X 6"OD X 24"L
DS78	RS-99-60, 6"ID X 7"OD X 12"L	DS98	RS-99-45, 6"ID X 7"OD X 12"L
DS79	RS-99-60, 6"ID X 7"OD X 24"L	DS99	RS-99-45, 6"ID X 7"OD X 24"L

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