



HIGH TEMPERATURE POTTING AND CASTING MATERIALS

Technical Bulletin A4

Aremco Ceramacast™ products provide the most expansive range of ceramic- and silicone-based materials for the assembly of high temperature, high power electrical devices and high temperature fixtures, molds and tooling.

PRODUCT HIGHLIGHTS

Aluminum Oxide

- 510 Coarse Grain Castable for Tooling and Induction Heating Liners
- 575 Fine Grain Potting Compound for Small Devices
- 575-N Fine Grain Castable for Potting & Tooling
- 576-N Medium Grain Castable for Large Potting & Tooling

Aluminum Nitride

- 675-N Thermally Conductive Fine Grain Compound for Small Potting

Magnesium Oxide

- 584 Two-Part, Fast-Set, Thermally Conductive Compound

Silicon Dioxide

- 645-N Low Thermal Conductivity, Low Expansion, Light-Weight
- 905 Moisture Resistant Silicone, Coarse Grain, Large Sections
- 905-FG Moisture Resistant Silicone, Fine Grain, Small Sections

Silicon Carbide

- 673 Thermally Conductive Two-Part Molding Compound
- 673-N Thermally Conductive Adhesive & Potting Compound

Zirconium Oxide

- 646-N High Density, High Strength Castable & Potting Compound

Zirconium Silicate

- 505-N High Strength Compound for Small Potting Applications
- 586 High Strength Dispensable Compound for Potting & Casting
- 900 High Density, High Strength Molding Compound

TYPICAL APPLICATIONS

Electrical

Ballast Resistors, Cartridge Heaters, Case Resistors, Ceramic Fiber Heaters, Electrical Feed-Thrus, Gas Igniters, Halogen Lamps, High Temp Air Filters, Infrared Heaters, PTC Devices, Rheostats, Temperature Sensors

Metallurgical

Brazing Fixtures, Crucibles, Encapsulating RF Coils, Furnace Carriers, Heating Element Holders, Induction Heating Tools, Molds for Powder Metallurgy, Rapid Prototype Molds, Sintering Boats, Standoffs, Welding Jigs



Ceramacast™ 586 pots high power resistor.



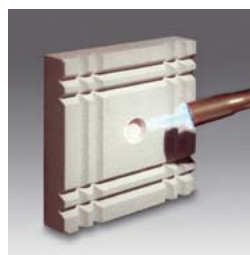
Ceramacast™ 673 mold for down-hole drill bit.



Ceramacast™ 575-N bonds Xenon arc lamp.



Ceramacast™ 586 pots ignitor and cartridge heater.



Ceramacast™ 645-N fixture resists propane torch.



Ceramacast™ 673-N bonds SiC combustion nozzle.

HIGH TEMPERATURE POTTING AND CASTING MATERIALS PROPERTIES

Product Number	510	575	575-N	576-N	675-N	584	645-N	905 ³	905-FG ³	673	673-N	646-N	505-N	586	900
Trade Name	Ceramacast™														
Binder	CaO-Al ₂ O ₃		MgO-P ₂ O ₅		MgO-P ₂ O ₅	SiO ₂	MgO-P ₂ O ₅	Silicone		CaO-Al ₂ O ₃	MgO-P ₂ O ₅	MgO-P ₂ O ₅	K ₂ -SiO ₂	MgO-P ₂ O ₅	CaO-Al ₂ O ₃
Temperature Limit, °F (°C)	3200 (1760)	3000 (1650)	3000 (1650)	3000 (1650)	2200 (1200)	2800 (1535)	3000 (1650)	900 (482)	900 (482)	2500 (1371)	2500 (1371)	3000 (1650)	2800 (1535)	2800 (1535)	2800 (1535)
CTE, in/in/°F × 10⁻⁶ (°C)	3.9 (7.0)	4.3 (7.7)	4.3 (7.7)	4.1 (7.4)	2.9 (5.2)	6.5 (11.7)	1.5 (2.7)	2.0 (3.8)	4.0 (7.2)	3.8 (6.8)	2.9 (5.2)	3.1 (5.6)	2.7 (4.9)	2.7 (4.9)	2.8 (4.0)
Volume Resistivity, ohm-cm @ RT	10 ⁹	10 ⁹	10 ⁹	10 ⁹	10 ¹³	10 ⁹	10 ⁹	10 ¹¹	10 ¹¹	NA	NA	10 ⁹	10 ⁹	10 ⁹	10 ⁹
Dielectric Strength, volts/mil @ RT	75	150	150	150	300	100	300	> 250	> 250	NA	NA	250	100	125	125
Compressive Strength, psi	8,000	7,500	11,800	10,200	2,000	4,500	7,000	NM	NM	5,000	5,000	11,500	23,000	8,000	8,000
Porosity, %	< 7.0	< 6.0	< 2.0	< 2.0	< 3.0	< 6.0	< 5.0	< 0.5	< 0.5	< 9.0	< 4.0	< 2.0	< 2.0	< 2.0	< 2.0
pH	3-4	3-4	2-3	2-3	2-3	11-12	2-3	NM	NM	5-6	2-3	2-3	10-11	2-3	5-6
Moisture Resistance	Good	Good	Good	Good	Good	Good	Good	Excellent	Excellent	Good	Good	Good	Excellent	Good	Good
Alkali Resistance	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good
Acid Resistance¹	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good
No. Components	1 + H ₂ O	1 + H ₂ O	1 + H ₂ O ²	1 + H ₂ O ²	1 + H ₂ O ²	2	1 + H ₂ O ²	2	2	2	1 + H ₂ O ²	1 + H ₂ O ²	1 + H ₂ O	1 + H ₂ O ²	2
Mix Ratio, powder:liquid	100 : 15-19	100 : 19-22	100 : 13-15	100 : 12-14	100 : 16-18	100 : 25-30	100 : 21-23	2 : 1	3 : 1	100 : 17-20	100 : 13-14	100 : 12-14	100 : 10-12	100 : 13-15	100 : 15-17
Mixed Viscosity, cP	12,000	16,000	11,000	9,000	15,000	18,000	10,000	Paste	Paste	16,000	12,000	9,000	10,000	15,000	20,000
Shrinkage, % at 1000 °F	< 1.0	< 1.0	< 0.3	< 0.3	< 0.3	< 4.0	< 0.3	< 1.0	< 1.0	< 1.0	< 0.3	< 0.3	< 0.3	< 0.3	< 1.0
Pot Life, hrs	2-3	2-3	1-2	1-2	1-2	< 10 mins	1-2	NA	NA	< 20 mins	1-2	1-2	1-2	1-2	< 30 mins
Shelf Life, months	12	12	12	12	12	1	12	905-L:6 905-P:12	12	12	12	12	12	12	12
Color	Light Gray	White	White	White	Light Gray	Off-White	Off-White	Off-White	White	Gray	Gray	Tan	Off-White	Off-White	Off-White
Approximate Powder Density, lbs/gal	15	12	12.5	14.5	10.5	12	11	P-9.6/L-4.8	P-9.6/L-3.2	12	14.5	15.5	14.0	14	13

Reference Notes

- ¹ All products are attacked by hydrofluoric acid.
- ² These products can be mixed alternatively with HLB-1 Hydrophobic Liquid Binder to achieve higher moisture resistance.
- ³ Ceramacast™ 905 and 905-FG moisture resistance, porosity and shrinkage were tested at 900 °F only.

Abbreviations

- NA Not Applicable
- NM Not Measured

APPLICATION PROCEDURES

Mixing

Blend powder thoroughly prior to adding water or liquid binder. Use the following mix ratios adding the water or liquid binder into the powder and mixing thoroughly until smooth and uniform. Pour the mixture carefully from one side of the part. Vibrate and/or degas as required to help eliminate air bubbles. Agitate continuously or refrigerate to extend the pot life.

Product	Major Constituent	Weight Ratios			
		Powder	Liquid	Min	Max
505-N	Zirconium Silicate	100	Water	10	12
510	Aluminum Oxide	100	Water	15	19
575	Aluminum Oxide	100	Water	19	22
575-N	Aluminum Oxide	100	Water, HLB-1	13	15
576-N	Aluminum Oxide	100	Water, HLB-1	12	14
584	Magnesium Oxide	100	584-L	25	30
586	Zirconium Silicate	100	Water, HLB-1	13	15
645-N	Silicon Dioxide	100	Water, HLB-1	21	23
646-N	Zirconium Oxide	100	Water, HLB-1	12	14
673	Silicon Carbide	100	673-L	17	20
673-N	Silicon Carbide	100	Water, HLB-1	13	14
675-N	Aluminum Nitride	100	Water, HLB-1	16	18
900	Zirconium Silicate	100	900-L	15	17
905*	Silicon Dioxide	100	905-L	45	55
905-FG*	Silicon Dioxide	100	905-FG-L	30	35

*Ceramacast™ 905 and 905-FG are offered primarily in two part kits consisting of a powder and liquid binder. The kit for 905 includes the 905-P powder and 905-L liquid; the kit for 905-FG includes the 905-FG-P powder and 905-FG-L liquid.

The liquid portion of these kits can also be supplied as a powdered binder and the user would add the solvent methyl ethyl ketone in a 1:1 ratio by weight at the time of use. The powdered binder is recommended for customers that prefer not to incur hazardous freight charges associated with shipping solvents. Use part numbers 905X and 905-FGX to order powder binder kits.

Note that Ceramacast™ 905 is coarse grain product that is not pourable. After the powder is thoroughly wet-out by the liquid binder, it is recommended to load the mixture to a filter bag and to squeeze out the residual liquid. Afterwards, the mixture should be ladled into the part and cured as recommended to obtain a dense, moisture resistant result.

Curing

Ceramacast™ 505-N

1. Air dry for 16–24 hours.
2. Bake at 200 °F for 1 hour.
3. Bake at 250 °F for 1 hour.
4. Bake at 350 °F for 1 hour.
5. Final cure at 500 °F for 1 hour.

Ceramacast™ 510, 575, 673, 900

1. Cover part with a plastic sheet or locate in a humidity chamber for 16–24 hours.
2. Bake at 200 °F for 3 hours.
3. Final cure at 250 °F for 3 hours.

Ceramacast™ 584

1. Material will set in less than 10 minutes. Extend pot life by chilling the liquid to ~50 °F.
2. Air dry for a minimum of 2 hours.
3. Bake at 200 °F for 2 hours.
4. Final cure at 250 °F for 3 hours.

Ceramacast™ 575-N, 576-N, 586, 645-N, 646-N, 673-N, 675-N

1. Air dry for a minimum of 8 hours.
2. Bake at 200 °F for 2–4 hours.
3. Final cure at 250 °F for 3 hours.
4. Final cure at 450 °F for 30–60 minutes when using the HLB-1 Hydrophobic Liquid Binder.

Ceramacast™ 905, 905-FG

1. Air dry for 12–16 hours at room temperature.
2. Bake at 150 °F for 30 minutes.
3. Bake at 250 °F for 30 minutes.
4. Bake at 350 °F for 30 minutes.
5. Final cure at 450 °F for 30 minutes.

Special Notes

1. Chemically absorbed water will remain in all products even after final curing at 250 °F. Based on thermogravimetric studies, it is expected that 100% of chemically absorbed water will be driven off in the 800–1000 °F range. Curing at higher temperatures should be performed to obtain optimal electrical resistance and mechanical strength.
2. Possible causes of cracking include (i) excessive water or liquid binder, (ii) curing is too rapid, or (iii) cross-sectional thickness is too high. Contact Aremco for assistance if cracking persists.
3. Ceramacast™ products tend to react with aluminum molds. Use EZ-Cast™ 580-N Flexible Silicone Rubber Molding Compound to avoid problems when casting ceramic parts.

Safety Precautions

1. Refer to Material Safety Data Sheets before using Aremco's Ceramacast™ or EZ-Cast™ compounds.
2. For Ceramacast™ products, avoid prolonged skin contact to prevent irritation. Wear a dust mask and work in a well-ventilated area. If any material enters the eyes, flush with plenty of water and consult a physician.
3. EZ-Cast™ should be handled in a well-ventilated area wearing rubber gloves. Any spillage can be cleaned up using isopropyl alcohol. If any material gets onto the skin, wash with isopropyl alcohol or other solvent, followed by a soap and water rinse. If there is eye contact, flush with water for 10 minutes and consult a physician.

SILICONE MOLDING COMPOUNDS

Aremco's EZ-Cast™ 580N is an ideal compound for producing high reliability master molds. This silicone rubber compound exhibits high tear strength, very low shrinkage and high flexibility, all requirements for detailed reproduction.

PROPERTIES		
Upper Temp. Limit, °F (°C)	400 (204)	
Lower Temp. Limit, °F (°C)	-76 (-60)	
Flexibility	High	
Hardness, Durometer, Shore A	45	
Tensile Strength, psi	600 Min	
Tear Strength, Die B lb/in	110 Min	
Elongation, %	400 Min	
Linear Shrinkage, %	< 0.1	
Handling	No. of Components	2
	Mixed Viscosity, cP	30,000
	Specific Gravity, g/cc	1.3
	Mix Ratio, resin:catalyst	10:1
	Pot Life, mins	30
Shelf Life, @RT, months	6	
Color	Beige Resin; Deep Red Catalyst	
Weight/Gal	10 lbs resin, 1 lb catalyst	

Instructions For Use

1. Machine a master pattern from aluminum and secure master into an aluminum box with removable sides. If a wooden mold is used, make sure that the mold is sealed with wax and that tapers are included to facilitate removal. *Mold should allow for a cast part wall thickness of 3/8" – 1/2" minimum.*
2. Premix base and activator thoroughly before blending the components together in a ratio of 10 parts base to 1 part activator.
3. Vacuum degas at 29 in Hg. The mixture will rise to about 3–4 times its original volume, then collapse. Hold vacuum for another 1–2 minutes then release.
4. Pour slowly into a master, to fill all details and prevent air entrapment. Cure for 16–24 hours at room temperature, or 3–4 hours at 120 °F, or 1–2 hours at 150 °F. In humid atmosphere, heat cure for best results.

EZ-CAST™ FLEXIBLE MOLDS IN TWO EASY STEPS



Place the machined master, a duplicate of the finished casting, into a pan, and pour the EZ-Cast™ over the master.



Cure the EZ-Cast™ mold and peel out your finished pliable mold.

Refer to Price List for complete order information.

Aremco Products makes no warranty express or implied concerning the use of this product.

The user assumes all risk of use or handling whether or not in accordance with directions or suggestions, or used singly or in combination with other products.