



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, fixtures, molds and tooling.

PRODUCT HIGHLIGHTS

Aluminum Oxide Systems

- 510 Coarse Grain Castable for Tooling and Induction Heaters
- 515 Fine Grain, High Strength Potting Compound
- 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 System

- 675-N Thermally Conductive Fine Grain Compound for Potting

Magnesium Oxide System

- 584 Two-Part, Fast-Set, Compound for Casting & Potting

Silicon Dioxide Systems

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

Silicon Carbide Systems

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

Zirconium Oxide System

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

Zirconium Silicate Systems

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



Ceramacast™ 900-N casts small, dense part.



Ceramacast™ 645-N insulates metal collar.



Ceramacast™ 673 mold for down-hole drill bit.



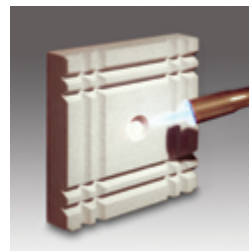
Ceramacast™ 673-N bonds SiC combustion nozzle.



Ceramacast™ 575-N bonds Xenon arc lamp.



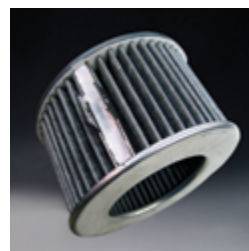
Ceramacast™ 586 pots ignitor and cartridge heater.



Ceramacast™ 645-N fixture resists propane torch.



Ceramacast™ 505-N is used in high temp filter assembly.



Ceramacast™ 586 is used in high temp filter assembly.



Ceramacast™ 586 pots high power resistor.



CERAMACAST™ HIGH TEMPERATURE POTTING AND CASTING MATERIALS PROPERTIES

Product Number	510	515	575	575-N	576-N	675-N	584	645-N	905 ³	905-FG ³	673	673-N	646-N	505-N	586	900-N
Major Constituent	Aluminum Oxide				Aluminum Nitride		Magnesium Oxide		Silicon Dioxide		Silicon Carbide		Zirconium Oxide		Zirconium Silicate	
Binder	CaO-Al ₂ O ₃	K ₂ -SiO ₂	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	MgO-P ₂ O ₅
Temperature Limit, °F (°C)	3200 (1760)	3000 (1650)	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)	4.5 (8.1)	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)	2.0 (3.8)	3.8 (6.8)	2.9 (5.2)	3.1 (5.6)	2.7 (4.9)	2.7 (4.9)	2.8 (5.0)
Volume Resistivity, ohm-cm @ RT	10 ⁹	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	250	150	150	150	300	100	300	> 250	> 250	NA	NA	250	100	125	125
Compressive Strength, psi	8,000	11,000	7,500	11,800	10,200	2,000	4,500	7,000	NM	NM	5,000	5,000	11,500	12,800	8,000	11,200
Porosity, %	< 7.0	< 2.0	< 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	11-12	3-4	2-3	2-3	2-3	11-12	2-3	NM	NM	5-6	2-3	2-3	10-11	2-3	2-3
Moisture Resistance	Good	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	Good
Acid Resistance¹	Good	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	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 : 12-14	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 : 11-13	100 : 13-15	100 : 11-13
Mixed Viscosity, cP	12,000	10,000	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	< 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	2-3	1-2	1-2	1-2	< 10 mins	1-2	NA	NA	< 20 mins	1-2	1-2	1-2	1-2	< 45 mins
Shelf Life, months	12	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	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	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	13	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 liquid into the powder and mixing thoroughly until smooth and uniform. Pour the mixture carefully into one side of the part. Vibrate as required to eliminate air bubbles. Agitate continuously or refrigerate to extend the pot life.

Product	Weight Ratios			
	Powder	Liquid	Min	Max
505-N	100	Water	11	13
510	100	Water	15	19
515	100	Water	12	14
575	100	Water	19	22
575-N	100	Water, HLB-1	13	15
576-N	100	Water, HLB-1	12	14
584	100	584-L	25	30
586	100	Water, HLB-1	13	15
645-N	100	Water, HLB-1	21	23
646-N	100	Water, HLB-1	12	14
673	100	673-L	17	20
673-N	100	Water, HLB-1	13	14
675-N	100	Water, HLB-1	16	18
900-N	100	Water	11	13
905*	100	905-L	45	55
905-FG*	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 international customers for which hazardous freight charges associated with shipping solvent-based systems can be cost prohibitive. Use part numbers 905X and 905-FGX to order powder binder kits.

Note that Ceramacast™ 905 and 905-FG are not pourable. After the powder is thoroughly wet-out by the liquid binder, load the mixture to a filter bag and squeeze out the residual liquid. Ladle the mixture into the part and cure as recommended to obtain a dense, moisture resistant part.

Curing

Ceramacast™ 505-N, 515

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

Ceramacast™ 510, 575, 673

1. Dry for 16–24 hours at room temperature..
2. Bake at 200 °F for 3–4 hours.
3. Final cure at 250 °F for 1 hour.

Ceramacast™ 584

1. Material will set in approximately 10 minutes.
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, 900-N

1. Dry for 8 hours minimum at room temperature.
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 if using HLB-1 Hydrophobic Liquid Binder.

Ceramacast™ 905, 905-FG

1. Dry for 24 hours room temperature to allow solvent to evaporate.
2. Bake at 150 °F for 1 hour.
3. Bake at 250 °F for 1 hour.
4. Bake at 350 °F for 1 hour.
5. Final cure at 450 °F for 1 hour.

Special Notes

1. Chemically absorbed water will remain in all products even after curing at 250–350 °F. TGA studies indicate that chemically-absorbed water will be fully removed after exposure to 800–1000 °F. Curing at higher temperatures than recommended in the Curing section should be performed to obtain optimal electrical resistance and mechanical strength.
2. If cracking occurs, possible causes include (a) excessive water or liquid binder was used, (b) curing occurred too rapidly, or (c) the cross-sectional thickness of the casting is too high. Contact Aremco for assistance if cracking persists.
3. Ceramacast™ products tend to react with aluminum molds. Use Aremco's **EZ-Cast™ 580-N Flexible Silicone Rubber Molding Compound** to avoid problems when casting ceramic parts.
4. Refer to Safety Data Sheet prior to use.





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 $\frac{3}{8}$ " – $\frac{1}{2}$ " 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.

T-E-Klebetchnik

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