

Aremco offers the most expansive range of ceramic-based materials used for the production of high power, high temperature electrical devices as well as high temperature fixtures, molds and tooling. These materials, based on alumina, magnesia, silica, zirconia, and silicon carbide ceramics, offer unique properties with respect to operating temperature, thermal conductivity and dielectric and mechanical strength.

Aremco's **hydraulic-setting castable ceramics** are used to assemble and insulate small electrical components such as gas ignitors, high power resistors and halogen lamps, and to produce large powder metallurgy molds, heat treating fixtures and insulation liners for induction coils. Castable ceramics are supplied in powder form and are mixed with water to develop a strong hydraulic bond. Parts are typically air set in 24 hours, then cured at 250 °F for 2-4 hours to provide maximum electrical and mechanical properties.

Aremco's one- and two-part **chemical setting ceramics** are used to encapsulate electrical devices such as thermocouples, oxygen sensors and resistors, and to produce small ceramic fixtures and parts. These ceramics are applied in small areas up to 1" diameter by 1" depth, then air set for 2-4 hours and cured at 200 °F prior to operation. These ceramics are typically air set for 2-4 hours, then cured at 200-350 °F.

TYPICAL APPLICATIONS

Electrical

- Temperature Probes
- Electrical Feed-Thrus
- Gas Ignitors
- Heating Elements
- PTC Devices
- Ballast Resistors
- Rheostat Resistors
- High Intensity Lights
- Halogens

Metallurgical

- Brazing Fixtures
- Melting Crucibles
- Encapsulating RF Coils
- Furnace Carriers
- Sintering Boats
- Heating Element Holders
- Welding Jigs
- Standoffs
- Induction Heating Tools

SELECTION CRITERIA

- Is the application for potting or casting?
- What is the operating temperature?
- What is the size and geometry of the component?
- What is the mold or shell material?
- Is low or high thermal conductivity required?
- What are the required electrical properties?
- Does the application require high mechanical strength?
- How will the ceramic be dispensed?
- What is the required pot life?
- What is the maximum curing time and temperature?



Ceramacast™ 575N insulates PTC device.



Ceramacast™ 576N encapsulates high temp feed thru.



Ceramacast™ 584 casts fine detail welding fixture.



Ceramacast™ 586 encapsulates aircraft engine sensor.



Ceramacast™ 646 seals a heat sink.



Ceramacast™ 673 used to mold down hole drill bits.



Ceramacast™ 586 used to assemble silicon carbide ignitor.

HIGH TEMPERATURE POTTING & CASTING MATERIALS PROPERTIES

Chemical-Setting													
Hydraulic-Setting													
Product No.	510	575N	576N	586	645N	646N	673N	675N	512N	584	589	668	672
Trade Name	Ceramacast	Ceramacast	Ceramacast	Ceramacast	Ceramacast	Ceramacast	Ceramacast	Ceramacast	Ceramacoat	Ceramacast	Ceramacast	Ceramabond	Ceramacast
Description	Coarse grain castable for producing large hi-temp tooling.	Fine grain castable for potting and producing small tools.	Medium grain castable ceramic similar to 575.	Castable ceramic for ceramic and metal assemblies. Excellent handling, fast curing.	Castable ceramic with low thermal conductivity	Castable ceramic with high dielectric and physical strength.	Single-part castable ceramic exhibiting high strength and thermal conductivity.	Fine grain aluminum nitride castable with high thermal conductivity	Single-part adhesive, coating and potting compound for small electrical parts assembly.	Two-part, quick-set ceramic for small parts.	Two-part, quick-set ceramic with high bond strength for glass, ceramics and metals.	Single part ceramic for potting areas up to 1" Ø x 3/4" deep.	Two-part, dielectric compound for areas up to 3/4" Ø x 1/2" deep.
Major Constituent	Alumina	Alumina	Alumina	Zirconia Silicate	Silica	Zirconia	Silicon Carbide	Aluminum Nitride	Silica	Magnesia	Silica	Alumina-Silica	Magnesia
Temp. Limit, °F (°C)	3200 (1760)	3000 (1650)	3000 (1650)	2800 (1535)	3000 (1650)	3000 (1650)	3200 (1760)	2200 (1200)	2400 (1316)	2800 (1535)	2400 (1316)	2500 (1371)	2800 (1535)
CTE, in/in/°F x 10 ⁻⁶ (°C)	3.9 (7.0)	4.3 (7.7)	4.1 (7.4)	2.7 (4.9)	1.5 (2.7)	3.1 (5.6)	2.9 (5.2)	2.9 (5.2)	5.5 (9.9)	6.5 (11.7)	5.5 (9.9)	4.0 (7.2)	6.5 (11.7)
Volume Resistivity, ohm-cm @RT	10 ⁹	10 ⁹	10 ⁹	10 ¹¹	10 ⁹	10 ⁹	—	10 ¹³	10 ⁹	10 ⁹	10 ⁹	10 ⁸	10 ⁹
Dielectric Strength, volts per mil @ RT	75	150	150	125	300	250	—	300	250	100	225	245	258
Compressive Strength, psi	8,000	11,800	10,200	8,000	7,000	11,500	5,000	2,000	—	4,500	2,400	2,000	1,500
Porosity, %	7.0	<2.0	<2.0	<2.0	<5.0	<2.0	<4.0	<3.0	—	6.0	<1.0	<1.0	2.0
Moisture Resistance	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent	Good	Good	Excellent	Excellent	Excellent	Excellent
Alkali Resistance	Good	Good	Good	Good	Good	Good	Good	Good	Excellent	Good	Excellent	Excellent	Excellent
Acid Resistance ^①	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Excellent	Good	Good
Handling	No. Components	1 + H ₂ O	1 + H ₂ O ^②	1 + H ₂ O ^②	1 + H ₂ O ^②	1 + H ₂ O	1 + H ₂ O	1 + H ₂ O	1	2	2	1	2
	Mixed Viscosity, cps	12,000	11,000	9,000	15,000	10,000	12,000	15,000	Paste	18,000	Paste	90,000+	30,000
	Shrinkage, % @1000 °F	<1.0	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<4.0	<0.3	<1.0	<1.0
	Pot Life, hrs	2-3	2	2	1-2	1-2	1-2	2	1-2	N/A	1	N/A	4-5
Shelf Life, months	12	12	12	12	12	12	12	12	6	12	6	6	6
Color	light gray	white	white	off white	off white	off white	blue-gray	light gray	off white	off white	off white	white	light gray
Density, lbs/gallon	13	15	13	15	14	15	15	15	15	11 Powder 10 Liquid	10 Powder 4 Liquid	17	12 Powder 11 Liquid

① All attacked by HF

② These products can be mixed alternatively with 5xx-L Liquid Binder to achieve higher moisture resistance. Example: 586-L.

APPLICATION PROCEDURES

Mixing

When using a two-part system, blend powder thoroughly prior to adding water or the required activator. Use the following mix ratios adding the liquid portion into the powder and mixing thoroughly until the product is smooth and creamy.

Product	Major Constituent	Weight Ratios			
		Powder	Liquid	Min	Max
510	Alumina	100	Water	15	19
575N	Alumina	100	Water [ⓐ]	13	15
576N	Alumina	100	Water [ⓐ]	12	14
584	Magnesia	100	Activator	25	30
586	Zirconia/Silicone	100	Water [ⓐ]	13	15
589	Silica	100	Activator	35	40
645N	Silica	100	Water [ⓐ]	18	20
646N	Zirconia	100	Water	14	17
672	Magnesia	100	Activator	35	50
673N	Silicon Carbide	100	Water	9	11
675N	Aluminum Nitride	100	Water	16	18

[ⓐ] These products can be mixed alternatively with 5xx-L Liquid Binder to achieve higher moisture resistance. Example: 586-L. Final cure at 450 °F for 30 minutes is recommended.

Pour the mixture carefully from one side of the part. Vibrate and/or degas to help eliminate air bubbles.

The mixed pot life for two-part systems can be extended by agitating constantly and storing the mixture in a closed reservoir. Single-part systems will skin rapidly in an open container and should be stored in a closed system.

Curing

Ceramacast™ 510:

- 1) Cover mold with polyethylene sheet or locate in a humidity chamber for 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 under 5 minutes – to extend pot life, chill material not lower than 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™ 589:

- 1) Air dry at room temperature for 5-6 hours, or
- 2) Bake at 200 °F for 10-15 minutes.

Ceramacoat™ 512N, Ceramabond™ 668:

- 1) Air dry for a minimum of 4-6 hours.
 - 2) Bake at 200 °F for 3-5 hours.
 - 3) Final cure at 300 °F for 1 hour.
- Ceramacoat 512N also sets in thin cross sections at room temperature in 24 hours.

Ceramacast™ 672:

- 1) Air dry for a minimum of 15 minutes at room temperature.
- 2) Final cure at 200 °F for 1-2 hours.

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

- 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.

Special Notes

- 1) Surface cracks may appear after curing a hydraulic-setting ceramic system. Primary causes include:
 - A) Excessive water is added to the mixture. Larger aggregates settle to the bottom leaving fine mesh material and water on the surface resulting in voids and reduced part strength.
 - B) The casting is not air dried in a humidified environment. As a result, the water evaporates too quickly thereby preventing the mixture from completely reacting.
 - C) The initial cure temperature exceeds 200 °F. This causes residual moisture to escape too rapidly resulting in cracks and/or blistering.
- 2) For hydraulic-setting ceramics, when a lower viscosity mix ratio is used, make sure to follow the additional steps listed below:
 - A) Overfill the mold with the ceramic mixture.
 - B) Allow the mixture to stand for 10 minutes and scrape off excess ceramic.
 - C) Place the mold in a humidity chamber or cover with a polyethylene sheet for 24 hours. Bake at 200 °F for a minimum of 4 hours and follow the remaining steps outlined in the *Curing* section.
- 3) Some hydraulic-setting ceramics tend to react with aluminum. An alternative mold compound such as rubber or silicone is commonly used with hydraulic-setting ceramics.
- 4) Residual, chemically absorbed water will still remain in all products even after final curing at 250 °F. According to thermogravimetric analysis performed on Ceramacast 586, it is expected that virtually 100% of chemically absorbed water will be driven off in the 800-1000 °F range. Curing at higher temperatures in the 400-700 °F range is therefore recommended for applications in which high electrical resistance is required.

Safety Precautions

Refer to the appropriate Material Safety Data Sheets before using any of Aremco's Ceramacast™, Ceramabond™, Cera-Fab™ or EZ-Cast™ materials.

When using a ceramic-based system, prolonged skin contact should be avoided due to possible irritation. Wear a dust mask and provide suitable ventilation when mixing a ceramic powder base. If any material gets in the eyes, flush with plenty of water and consult a physician.

EZ-Cast™ should be handled in a well-ventilated area wearing rubber gloves. Any spillage can be cleaned up with lacquer thinner. If any material gets onto the skin, wash with lacquer thinner or other such solvent, followed by a soap and water rinse. If there is eye contact, flush with water for 10 - 15 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

Temp. Limit, °F (°C)	392 (200)	
Flexibility	High	
Hardness, Durometer, Shore A	40	
Tensile Strength, psi	700 Min	
Tear Strength, Die B lb/in	110 Min	
Elongation, %	350 Min	
Handling	No. of Components	2
	Mixed Viscosity, cps	60,000
	Specific Gravity, gms/cc	1.5
	Mix Ratio, resin:catalyst	10:1
	Pot Life, mins	30
Shelf Life, @RT, months	6	
Color	White resin, Maroon 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.