



Kaolite 2000-HS is a general-purpose, lightweight castable for use up to 2000°F (1093°C). It maintains excellent volume stability throughout its temperature use range. This is an excellent advantage for applications where strength and low thermal conductivity are required.

Kaolite 2200 is designed for temperatures up to 2200°F (1204°C). It has excellent volume stability and good strength. This general-purpose, lightweight castable has low density, excellent resistance to thermal shock, and low thermal conductivity.

Kaolite 2200-HS is a medium weight, high strength castable that resists thermal shock, and has excellent volume stability. It possesses the best thermal conductivity-to-weight ratio in the industry.

Kaolite 2300-LI is a 2300°F (1260°C) lightweight castable which incorporates a high-purity binder for applications where hydrogen or reducing atmospheres are present.

Kaolite 2500-LI is a high-strength lightweight castable that contains an intermediate-purity calcium-aluminate cement. Total iron oxide contents of 0.9% enables use where hydrogen or reducing atmospheres are present. Its low thermal conductivity and density produces the most economical 2500°F (1371°C) insulating castable on a per cubic foot basis.

Kaolite 2500-HS is a medium weight, high-strength, insulating castable for use where strength and thermal stability are required. It has excellent casting characteristics.

Kaolite 2600-LI is designed specifically for use in petrochemical applications. It incorporates a cement of sufficient purity for low iron content and high-intermediate temperature strengths.

Carbon Monoxide Disintegration Test - Kaolite 2300-LI

The special low-impurity materials were formulated especially for oil refinery and chemical units as well as other applications operating in hydrogen or highly reducing atmospheres. In order to test Kaolite 2300-LI, a 700 hour carbon monoxide disintegration test was conducted. ASTM C 288-62 procedure was followed, with the exception that the samples tested were dried rather than fired. The lack of firing of the samples tends to hasten the attack of carbon monoxide attack. Firing at 2300°F before testing in carbon monoxide atmospheres is specified by ASTM procedure to lessen the carbon monoxide attack. This was omitted because it is not reasonable from a practical standpoint, as no castable, will be subjected to 2300°F throughout its structure.

The samples were rated merely as "Affected" because of slight cracking which occurred between 500 and 700 hours in one of the two samples. At the end of 500 hours, which is the specified testing time of ASTM, no effect was shown by either sample. As a result of this severe test, it is recommended that Kaolite 2300-LI be used in applications where carbon monoxide or other reducing atmospheres are present.

Features

- Light weight and low thermal conductivity reduce both the quantity of heat storage and heat transfer producing significant savings in furnace fuel consumption
- Lower densities reduce the amount of supporting furnace steelwork required and provide more insulation with a thinner lining.

Applications

- Backup insulation in two component linings in petrochemical process units
- Hot face lining in ductwork from waste heat recovery boilers and process unit
- F.C.C.U. linings - regenerator.
- Hydrogen or reducing atmosphere linings
- Radiant section in steam flood generators.
- Hydrogen or reducing atmosphere linings.
- Steam flood generator convection sections and target walls
- Cat cracker regenerator linings
- Petrochemical applications

Instructions For Using

Casting

Highest strength is obtained with castable refractory by using the least amount of clean mixing water. This will allow thorough working of material into place by vibrating or rodding. A mechanical mixer is required for proper placement (paddle-type mortar mixers are best suited). After achieving a ball-in-hand consistency, mix for 6 minutes. Place material within 30 minutes after mixing.

Gunning

Use suitable gunite equipment. Material should be predampened uniformly with approximately 10 - 12 % by weight of clean water in a mechanical mixer before placing into gun. This will reduce rebound and dust. Add required water at nozzle for effective placement. Suggested air pressure at the nozzle is 30 to 45 psi.

Precautions

Store bagged castables in a dry place, off the ground and, when possible, with the original shrink wrapping intact. Normal shelf life is 12 months if properly stored.

Watertight forms must be used when placing material. All porous surfaces that will come in contact with the material must be waterproofed with a suitable coating or membrane. For maximum strength, cure 24 hours under damp conditions before initial heat-up. Keep freshly placed castable warm during cold weather, ideally between 70°F and 80°F. New castable installations must be heated slowly the first time.

Freshly placed lightweight castables are prone to a deteriorating condition called alkali hydrolysis when they are kept in a non-dried state for a sustained period of time in a warm, humid environment. Under these conditions, the castables should be force-dried soon after placement or coated with Kao-Seal to resist the possible deterioration effects.

Kaolite Insulating Castables

Product Information

Physical Properties ³	2000-HS	2200	2200-HS	2300-LI	2500-LI	2500-HS	2600-LI
Recommended use limit, °F (°C) ¹	2000 (1093)	2200 (1204)	2200 (1204)	2300 (1260)	2500 (1371)	2500 (1371)	2600 (1427)
Avg. lb req. to place one cubic ft ² , (kg)	58 (26)	58 (26)	71 (32)	56 (25)	68 (31)	82 (37)	82 (37)
Nominal density, fired, pcf (kg/m ³)							
@ use limit	55 - 64 (881 - 1026)	55 - 64 (881 - 1026)	68 - 78 (1090 - 1250)	55 - 64 (881 - 1026)	64 - 73 (1026 - 1170)	80 - 88 (1282 - 1410)	80 - 88 (1282 - 1410)
@ 1500°F (816°C)	53 - 63 (849 - 1010)	53 - 63 (849 - 1010)	67 - 78 (1074 - 1250)	54 - 65 (865 - 1042)	59 - 72 (946 - 1154)	78 - 88 (1250 - 1410)	78 - 88 (1250 - 1410)
Method of installation	cast/gun	cast/gun	cast/gun	cast/gun	cast/gun	cast/gun	cast/gun
Recommended Water Ranges, % by weight ³							
Casting (by vibrating)	44 - 54	44 - 54	38 - 44	48 - 55	41 - 48	30 - 35	31 - 35
Pounds per bag (kg)	40 (18)	40 (18)	50 (23)	40 (18)	50 (23)	50 (23)	50 (23)
Shelf life, months	12	12	12	12	12	12	12
Modulus of rupture, psi (MPa) ASTM C 133, cast, gunned							
Dried 18-24 hrs. @ 220°F (104°C)	90 - 150 (0.62 - 1.03)	90 - 150 (0.62 - 1.03)	250 - 400 (1.72 - 2.76)	120 - 200 (0.83 - 1.38)	200 - 300 (1.38 - 2.07)	250 - 400 (1.72 - 2.76)	300 - 500 (2.07 - 3.45)
Fired 5 hrs. @ 1500°F (816°C)	85 - 150 (0.59 - 1.03)	85 - 150 (0.59 - 1.03)	150 - 250 (1.03 - 1.72)	90 - 250 (0.62 - 1.72)	150 - 300 (1.03 - 2.07)	175 - 325 (1.21 - 2.24)	175 - 325 (1.21 - 2.24)
Fired 5 hrs. @ use limit	80 - 150 (0.59 - 1.03)	80 - 200 (0.59 - 1.38)	200 - 300 (1.38 - 2.07)	150 - 300 (1.03 - 2.07)	200 - 300 (1.38 - 2.07)	400 - 600 (2.76 - 4.14)	500 - 900 (3.45 - 6.21)
Cold Crushing strength, psi (Mpa)							
Dried 18-24 hrs. @ 220°F (104°C)	350 - 650 (2.41 - 4.48)	350 - 650 (2.41 - 4.48)	850 - 1400 (5.86 - 9.66)	350 - 500 (2.41 - 3.45)	500 - 800 (3.45 - 5.52)	700 - 1000 (4.83 - 6.90)	800 - 1200 (5.52 - 8.28)
Fired 5 hrs. @ 1500°F (816°C)	350 - 900 (2.41 - 6.21)	3500 - 900 (2.41 - 6.21)	900 - 1600 (6.21 - 11.03)	350 - 1000 (2.41 - 6.90)	600 - 1200 (4.14 - 8.28)	800 - 1600 (5.52 - 11.03)	700 - 1400 (4.83 - 9.66)
Fired 5 hrs. @ use limit	450 - 900 (3.10 - 6.21)	450 - 900 (3.10 - 6.21)	700 - 1200 (4.83 - 8.28)	400 - 950 (2.76 - 6.55)	900 - 1500 (6.21 - 10.34)	900 - 1500 (6.21 - 10.34)	1200 - 1800 (8.28 - 12.41)
Perm. linear change, % (ASTM C 113) ⁴							
Dried 18-24 hrs. @ 220°F (104°C)	0 to -0.2	0 to -0.2	0 to -0.2	0 to -0.2	0 to -0.2	0 to -0.2	0 to -0.2
Fired 5 hrs. @ 1500°F (816°C)	-0.1 to -0.65	-0.1 to -0.65	-0.1 to -0.55	-0.1 to -0.55	-0.1 to -0.5	-0.1 to -0.3	-0.1 to -0.3
Fired 5 hrs. @ use limit	-0.3 to -1.0	-0.3 to -1.1	-0.3 to -1.0	-1.0 to -2.0	-0.5 to +0.5	-1.5 to -1.5	-0.5 to -1.5
Chemical Analysis, %⁵							
Alumina, Al ₂ O ₃	38	38	43	41	44	44	46
Silica, SiO ₂	37	37	28	37	35	35	36
Ferric oxide, Fe ₂ O ₃	2.4	2.4	3.2	0.9	0.9	2.6	1.4
Titanium oxide, TiO ₂	0.8	0.8	0.8	1.7	1.8	1	1.7
Calcium oxide, CaO	20 (12)	20 (12)	25 (18)	19 (10)	17 (11)	17 (13)	14 (11)
Magnesium oxide, MgO	0.1	0.1	0.1	0.4	0.2	0.1	0.2
Alkalies, as, Na ₂ O	1.4	1.4	0.2	0.3	1.3	0.7	0.7

Thermal Conductivity, BTU•in./hr•ft²•°F (w/m•k), ASTM C 417

mean temperature

@ 500°F (260°C)	1.48 (0.21)	1.48 (0.21)	1.90 (0.27)	1.46 (0.21)	1.86 (0.27)	2.8 (0.40)	2.7 (0.39)
@ 1000°F (538°C)	1.63 (0.23)	1.63 (0.23)	2.02 (0.29)	1.65 (0.24)	2.05 (0.30)	3.0 (0.43)	2.9 (0.42)
@ 1500°F (816°C)	1.79 (0.26)	1.79 (0.26)	2.11 (0.30)	1.82 (0.26)	2.25 (0.32)	3.2 (0.46)	3.0 (0.43)
@ 2000°F (1093°C)	1.97 (0.28)	1.97 (0.28)	2.19 (0.32)	2.00 (0.29)	2.46 (0.35)	3.5 (0.5)	3.2 (0.46)

1 Properties indicated are for vibratory cast materials only unless specified otherwise.

2 Gunite installation may require 10 - 30% more material due to compaction and rebound loss.

3 Water requirements indicated are offered as a guide. Actual water required may be subject to field conditions. Consult your Thermal Ceramics sales representative for assistance.

4 Fired linear change values reflect samples taken from a dried to fired state.

5 Chemical analysis % for CaO in parentheses indicates the % of reactive CaO present if less than the total. The balance is calcia from the anorthite aggregate.

Compliance data sheets for specific applications or job requirements are available upon request.

The values given herein are typical average values obtained in accordance with accepted test methods and are subject to normal manufacturing variations. They are supplied as a technical service and are subject to change without notice. Therefore, the data contained herein should not be used for specification purposes. Check with your Thermal Ceramics office to obtain current information.

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