ALMATIS
PREMIUM ALUMINA

Global Product Data

Alphabond 300

Chemical Composition [%]	Min	Max
Al_2O_3*	88	
CaO		0.1
Na_2O		0.5
SiO_2		0.3
MOI (% loss 25 – 250 °C)		4.1
LOI (% loss 250 – 1100 °C)	5.0	7.0

Particle Size Distribution	Min	Max
d90 [µm][1)]		30
d50 [µm][1)]	4	8

* Al_2O_3 by difference = [100 % – (sum of impurities) – (LOI) – (MOI)]
1) Microtrac SRA 150

Overview:

Almatis' hydratable alumina binder, Alphabond, is an engineered binder for use in no-cement refractory castable formulations. Alphabond has been developed for applications where the chemistry of the refractory matrix is critical to product performance. Alphabond 300 contains < 0.1% CaO which reduces the formation of low melting point silicates in the matrix. Such silicates can have a significant deleterious impact on high temperature properties, notably strength (particularly creep) and resistance to slag attack.

Alphabond 300

General:

Although Alphabond behaves similarly to high purity calcium aluminate cement based castables with respect to working time, setting times, water demand and flow properties, it has some unique characteristics that will be further described in this applications brochure.

Alphabond products are hygroscopic and must be handled with care. When not in use, the product should be stored in closed packaging in cool, dry conditions. Under normal circumstances, with Alphabond's special packaging, a shelf life of twelve months should be expected.

Batching, mixing and casting:

Alphabond is recommended for use in no-cement castables, with binder content in the range 3 - 7 wt%. Almatis' dispersing aluminas ADS-1, ADS-3 and ADW-1 may be used in varying concentrations to control set time and water demand. As with calcium aluminate cements, variation in castable pH will alter casting life.

Generally, dense castables using Alphabond require slightly extended mixing to fully "wet out". In general, the temptation to add additional water beyond that recommended by the refractories manufacturer should be resisted. When placing the castable, take the normal amount of care to avoid laminations by planning appropriate batch sizes and working time. Vibration levels and times used for high purity calcium aluminate cement based castables should be applied to those castables containing Alphabond.

Curing, drying and firing, with particular attention to the avoidance of explosive spalling:

Alphabond has a distinctly different mechanism of hydration when compared to calcium aluminate cement. A castable containing Alphabond does not need surface moisture during strength development; in fact, presence of moisture may inhibit full strength development, particularly at the surface of the castable. A castable containing Alphabond needs only air-drying until sufficient strength has been developed for handling. However, in very dry or dusty environments, placed castable should be covered with plastic to prevent crazing or dusting.

If cast parts require moving to another location before firing, this should be performed before the part has set, in order to minimize internal damage. Some drying in the mold may be required to develop suitable strength prior to demolding.

For optimum strength development and to avoid explosive spalling, it is essential to understand the dewatering associated with cast parts containing Alphabond. This is best accomplished using thermogravimetric (TGA) data for pure Alphabond. Such data show the critical points where water vapor is released.
Characteristic TGA data of hydrated pure Alphabond is shown in the Figure.

Alphabond 300

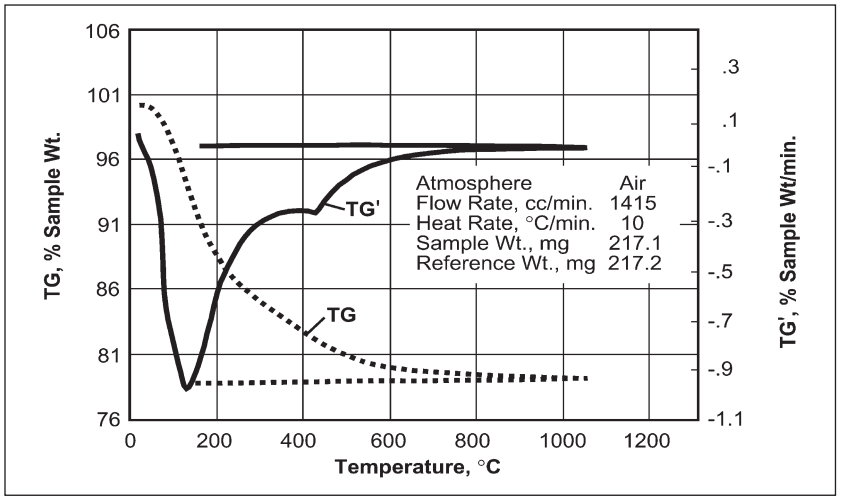

Figure: Thermogravimetric Analysis of Alphabond 300 (neat) hydrated 24 hours before heating

Relative rates of dewatering are shown in the curve TG' and indicate the relative rate of dewatering as a function of increasing temperature. The most rapid weight loss is apparent around 140 °C and becomes relatively stable at >350 °C. Studies of Alphabond castables containing microsilica indicate that such castables have extremely low levels of permeability in this temperature range. Once the complete part has passed this temperature range, the part can be heated more rapidly. Small amounts of water vapor still evolve at higher temperatures (350 °C to 600 °C) but this should not contribute to an explosive spall.

The addition of organic fibers that melt or shrink at or below 150 °C should be used to vent the matrix to reduce the tendency for explosive spalling.

To determine safe rates of heat input during firing, it is recommended that part temperature be used to govern firing schedules by embedding thermocouples in the part and at the surface at the thickest cross section. The □□ between part and free air should be minimized until the point of maximum vapor release has been passed. For very thick sections, the heating rate should not exceed 1-2 °C/hour until the center of the part has passed 200 °C. In the case of cast-in-place pieces, the cold face of the refractory should be considered equivalent to the center of a precast piece. Such installations should, in all circumstances, be fired at the recommended 1-2 °C/hour until a temperature of > 250 °C is reached at the cold face.

General:

This bulletin is intended to provide guidelines for general use of Alphabond in refractory castables. It is strongly recommended that an Almatis Applications Manager be consulted regarding proper use of this product.

Alphabond is packaged in foil-lined 25 kg moisture resistant bags. For price and shipment information, contact your Almatis Regional Account Manager, or Customer Service Representative.

Nothing herein shall be construed as an invitation to use processes covered by patent without proper arrangements with the individuals or companies owning those patents.

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