



## Alumina Type PATI

### General Information

ZIRCAR Ceramics' Alumina Type PATI is a unique combination of polycrystalline alumina fiber and continuous-filament reinforcing fiber tightly bonded into a mullite matrix. PATI, an extension of ZIRCAR Ceramics' Alumina Type SALI is a high-strength, low-density, rigid refractory structure that brings a new level of utility to the most demanding of high-temperature applications. It is known that all rigid ceramic fiber products will crack under extreme thermal shock conditions. PATI's reinforcing fibers work to hold it in its originally installed configuration even after numerous stressful thermal cycles. PATI is pre-fired, contains no organics and is being successfully applied in advanced thermal systems operating to a temperature of 1720°C (3128°F). Its fine open-pore structure enables PATI to be cut to precision tolerances. PATI shows excellent resistance to chemical attack and is not affected by oil or water. It is however affected by hydrofluoric acid, phosphoric acids and strong alkalis.



### Characteristics & Properties

Typical Composition, %	
Al <sub>2</sub> O <sub>3</sub>	80
SiO <sub>2</sub>	20
Moisture & Organic Content	0
Bond	Silica
Density, g/cc (pcf)	0.48 (30)
Open Porosity, %	84
Maximum Use Temperature*, °C (°F)	1720 (3182)
Melting Point, °C (°F)	1870 (3392)
Color	White
Linear Shrinkage‡, %	
3 hrs at 1700°C (3092°F)	-1.13
Flexural Strength**, MPa (psi)	3.34 (485)
Compressive Strength**, MPa (psi) at 10% Compression	1.35 (195)
Specific Heat, J/kg°K (BTU/lb°F)	1047 (0.25)
Coefficient of Thermal Expansion (CTE)‡, a, Room Temperature to 1100°C (1832°F), x 10 <sup>-6</sup> /°C (10 <sup>-6</sup> /°F)	8.0 (4.5)
SAG/Distortion, 6" x 1" x 1", 5" Span, % after 24 hrs. at 1650°C (3002°F)	2

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Technical Data Bulletin  
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## Characteristics & Properties Continued

Thermal Conductivity,** ASTM C177-76 W/m <sup>2</sup> K (BTU/hr ft <sup>2</sup> °F/in)	
400°C (752°F)	0.20 (1.3)
525°C (977°F)	0.25 (1.7)
800°C (1472°F)	0.31 (2.1)
1100°C (2012°F)	0.34 (2.4)
1400°C (2552°F)	0.39 (2.9)
Softening Temperature <sup>8</sup> , °C (°F)	
SALI Matrix	1100 (2012)
Reinforcing Fiber	1260 (2300)

The data presented herein is intended to help the user to determine the appropriateness of this material for their application.

This data is a nominal representation of this product's properties and characteristics and therefore should not be used in preparing specifications.

\* Maximum use temperature is dependent on variables such as stresses, both thermal and mechanical, and the chemical environment that the material experiences. \*\* Properties expressed parallel to thickness. ‡ Properties expressed perpendicular to thickness. <sup>8</sup> CTE per ASTM C-372, 0.5 psi load on 1/2" square sample, 3°C/min. heating / cooling rate, air atmosphere. <sup>8</sup> Temperature sample yields under load of push rod in CTE determination.



An example of the extra toughness PATI delivers is evident in the image above left. Bars used in 3-point bend (MOR) test break but do not separate as does other non-reinforced, rigid-fiber insulation as shown above right.



Shown in the image to the left is a PATI cylinder after being removed from the 1600°C (2912°F) high-temperature thermal process system it is used in. Unique to PATI is its ability to remain intact despite exhibiting typical thermal shock cracks. PATI's reinforcement enabled this cylinder to be used for many cycles, removed from the system intact, reinstalled with other new components and reused for many more cycles. The end result is lower cost of ownership.



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## Suggested Applications

Primary thermal insulation in low-mass furnaces and thermal process systems operating to 1720°C (3128°F).

Primary thermal insulation in advanced microwave based thermal process systems.

Backup thermal insulation in furnaces and thermal process systems operating to temperatures exceeding 2000°C (3632°F).

High-temperature setters, supports and process fixtures.

Electrical insulation in high-temperature systems operating to 1700°C (3092°F).

## Availability of Standard Boards

ITEM #	DESCRIPTION
A60A-01	PATI, 18"W x 24"L x 0.50"T
A60A-02	PATI, 18"W x 24"L x 0.75"T
A60A-03	PATI, 18"W x 24"L x 1.00"T
A60A-04	PATI, 18"W x 24"L x 1.50"T
A60A-05	PATI, 18"W x 24"L x 2.00"T

## To Order

**Standard boards:** order online or specify quantity, item # and description.

Standard boards are available for immediate shipment from stock.

**Standard tolerances** for boards are +/- 1/8" on length and width and +/- 1/16" on thickness.

**Custom boards** as large as 18"W x 24"L x 3"T have been manufactured.

**Custom shapes:** our state-of-the-art tight-tolerance machining techniques allow a wide variety of sizes and shapes to be made.

**Cylinders** can be manufactured with IDs from 1" to 18" with 1/2" to 2" wall thickness and length up to 36".

**Surface treatments** including rigidization with colloidal alumina (AL-R/H) or colloidal silica (SI-RIG) or coating with alumina cement (AL-CEM) are all available.



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