

## THERMOTECT™ :

**THERMOTECT™ is a new kind of good thermal insulation and high heat resistant materials developed by AGC Ceramics Co., Ltd (AGCC) which helps to reduce fuel consumption of the various glass melting furnaces**

AGC Ceramics Co., Ltd.

### 1. Introduction

Refractory materials used in the glass and steel industrial furnaces, which continuously are exposed to high temperature, require very good thermal insulation and high heat resistance to ensure high energy efficiency and lasting performance.

Until recently, the most common materials used in the glass and steel industrial furnaces are normal insulation bricks, silica board or RCF (Refractory Ceramics Fiber) insulation materials. The insulation structure constructed by these materials has many joints and has a weak point in view of protection of heat emission from the furnace. THERMOTECT™ is monolithic insulation materials, so they can materialize the almost complete sealing structure with less joints and shows good performance for energy efficiency throughout the furnace campaign.

THERMOTECT™, a new kind of insulation material for the furnaces which has both good heat durability & high energy efficiency, has been launched to the market of glass and steel industries since 2010. It helps to overcome almost all the weak points of the common insulation materials.

### 2. Main characteristics of THERMOTECT™

THERMOTECT™ has a variety of materials which can be applied to the various portions of the glass melting furnace. Materials can be used in various temperature ranges from 700 to 1,600 . THERMOTECT™ can be expected to withstand for a long period with less change of their physical properties. In comparison with THERMOTECT™, the common insulation structure should deteriorate after certain period resulting in decreased insulation efficiency due to heat leakages from the joint openings and deterioration of the materials.

THERMOTECT™ is of monolithic type, so casting or trowelling method is applicable for installation after being mixed with water. It shows good fluidity for casting, so it can be installed even into a narrow or complex-shaped space. (Fig.1)

It is very effective to maintain heat efficiency throughout the whole campaign. We can propose the design of the insulation structure to the customers for the crown of Oxy-fuel furnace and the wall of the regenerator chamber etc.



Fig.1 THERMOTECT™ after being mixed with water

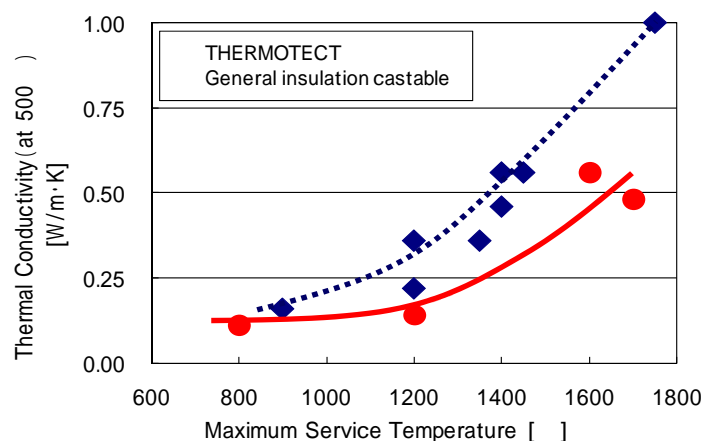


Fig.2 Comparison of Thermal Conductivity

The purpose of THERMOTECT™ is to help customers to reduce energy consumption at the same time to conserve the fossil fuel of our planet.

There are two series of THERMOTECT™.

TMT-700, 1000 series show good performance of thermal insulation. (Table1, 2)

TMT-1500, 1600 series show good performance of thermal insulation & high heat resistance.(Table3)

**Table1 Typical properties of TMT-700 series**

Products		TMT- 7 00	TMT- 7 00T	TMT- 7 00G
Installation		Casting	Trowelling	Gunning
Maximum Service Temperature [ °C ]		800		
Installation Quantity [ton/m <sup>3</sup> ]		0.29	0.26	0.28
Mixing Water [wt%]		180-200	130-160	135-155 (Nozzle mix)
Chemical Composition [%]	SiO <sub>2</sub>	46	60	54
	Al <sub>2</sub> O <sub>3</sub>	29	22	21
Cold Crushing Strength[MPa] ( Bending Strength[MPa] )	110 × 24h	0.5 ( 0.3 )	0.2 ( 0.1 )	0.2 ( 0.1 )
	700 × 3h	0.3 ( 0.2 )	0.2 ( 0.1 )	0.1 ( 0.1 )
Permanent Linear Change [%]	700 × 3h	-1.5	-0.7	-0.9
Thermal Conductivity[W/m · K]	at R.T.	0.06	0.06	0.07
	at 500	0.11	0.11	0.12

**Table2 Typical properties of TMT-1000 series**

Products		TMT-1000		TMT-1000S		TMT-1000G	TMT-1000P
Installation		Casting	Trowelling	Casting	Trowelling	Gunning	Pump
Maximum Service Temperature [ °C ]		1200					
Installation Quantity [ton/m <sup>3</sup> ]		0.36	0.40	0.45	0.58	0.44	0.43
Mixing Water [wt%]		80-100	60-90	90-110	50-70	70-90 (Nozzle mix)	90-110
Chemical Composition [%]	SiO <sub>2</sub>	45		39		47	45
	Al <sub>2</sub> O <sub>3</sub>	34		39		32	34
Cold Crushing Strength[MPa] ( Bending Strength[MPa] )	110 × 24h	0.3 ( 0.1 )	0.4 ( 0.2 )	1.3 ( 0.3 )	3.3 ( 0.7 )	0.8 ( 0.3 )	0.4 ( 0.2 )
	1000 × 3h	0.4 ( 0.2 )	0.7 ( 0.3 )	0.9 ( 0.2 )	2.2 ( 0.3 )	1.2 ( 0.4 )	0.6 ( 0.3 )
Permanent Linear Change [%]	1000 × 3h	-1.1	-0.9	-1.2	-0.9	-1.0	-0.8
Thermal Conductivity[W/m · K]	at R.T.	0.08	0.09	0.09	0.16	0.11	0.11
	at 500	0.14	0.15	0.16	0.20	0.16	0.16
	at 1000	0.28	0.28	0.31	0.33	0.27	0.29

**Table3 Typical properties of TMT-1500, 1600 series**

Products		TMT-1600	TMT-1500	TMT-1500S
Installation		Casting		
Maximum Service Temperature [ °C ]		1700	1600	1600
Installation Quantity [ton/m <sup>3</sup> ]		1.05	1.00	1.20
Mixing Water [wt%]		25-27	28-32	25-28
Chemical Composition [%]	SiO <sub>2</sub>	1	1	1
	Al <sub>2</sub> O <sub>3</sub>	82	83	83
	ZrO <sub>2</sub>	6	5	4
Cold Crushing Strength[MPa] ( Bending Strength[MPa] )	110 × 24h	9.9 ( 1.8 )	8.0 ( 2.0 )	16.0 ( 4.0 )
	1000 × 3h	2.1 ( 0.3 )	3.0 ( 1.0 )	7.0 ( 1.0 )
	1300 × 3h	-	5.0 ( 1.0 )	9.0 ( 1.5 )
	1400 × 3h	2.3 ( 1.1 )	-	-
	1500 × 3h	-	7.0 ( 3.0 )	8.0 ( 3.5 )
	1600 × 3h	2.6 ( 0.7 )	-	-
Permanent Linear Change [%]	1000 × 3h	-0.2	-0.2	-0.2
	1500 × 3h	-	-0.2	-0.2
	1600 × 3h	0.0	-	-
Thermal Conductivity[W/m · K]	at 500	0.48	0.56	0.60
	at 1000	0.54	0.57	0.60

### 3. Application to Glass Furnace

THERMOTECT™ is developed and produced to be used in various temperature ranges to replace normal insulation bricks.

By using “Free Form – Formable into any shape “ of the character of monolithic materials, it materializes less-joint structure after installation, not like common insulation bricks or boards of which structure has many joints after installation.

It therefore provides a higher insulation and good sealing performance, especially on the walls and crowns of the furnace melter and regenerator which has wide area of heat emission.

Better energy saving can be expected in case of using THERMOTECT™ for furnace insulation.