

Unshaped refractory materials for heating furnace

Recently, the technology of unshaped refractory materials for vault furnace of steel rolling system has increased so much. But the strength under normal and high temperature condition is a little low, high temperature strength of low cement castable is not so satisfied. E.g. the liner materials of hot furnace tapping hole will be seriously damaged if hit by steel billets or speedy temperature, the life time of the covering materials of the water cool tube will be very short because of the mechanical vibration and thermal load. The temperature of the bricks of heating furnace changes a lot while working, so it is very easy to be damaged, if it occurs, the production will come down. The bricks of furnace bottom and edge are also easy to damage by impacting abrasion and corrosion.

Our product abio-fibre strengthen non-cement and low cement castable, can improve the high-temperature strength to fulfill the rigor requirements of the high-temperature working condition, lengthen the life time by 3 to 5 years.

Main technical index:

Product Name		Mg-Cr Castable	High Al Corundum	High Strength Low Cement Castable			
Brand		LMGeJ-50	LAMJ-1	LDJ-50	LDJ-50	LDJ-50	LDJ-50
Chemical Composition Al_2O_3 (%)		≥ 50 (MgO)	≥ 70	>50	>60	>70	75
Density(g/cm ³)		≥ 2.7	≥ 2.7	2.3	2.5	2.6	2.65
Folding Strength	110°Cx24h	≥ 25	≥ 40	≥ 25	≥ 30	≥ 40	45
	1350°Cx24h	---	---	≥ 50	≥ 60	≥ 80	≥ 85
	1500°Cx24h	≥ 40	≥ 60	---	---	---	---
Compressive Strength	110°Cx24h	≥ 4.0	≥ 7.0	≥ 7.0	≥ 7.0	≥ 9.0	≥ 9.0
	1350°Cx24h	---	---	≥ 9.0	≥ 10	≥ 10	≥ 10
	1500°Cx24h	≥ 6.0	≥ 10	---	---	---	---
Highest Working Temperature°C		---	---	1500°C	1650°C	1650°C	1700°C
Linear Variation Rate(%)	1350°Cx3h	---	---	0~+1.0	0~+1.0	0~+1.0	0~+1.0
	1450°Cx3h	0~+1.0	0~+1.0	---	---	---	---

Species

耐火材料类

Refractory materials

Unshaped castable for EAF

With the developing of high-power EAF, there are coming bigger furnace, continue producing with high temperature. However, the liner of EAF is easy to be corraded by melting slag, steel, slag, dust's stalling. What is more that the liner could be destroyed by thermo-shaking and radiated caused by high temperature, especially for the inner wall of EAF.

Xibao group choose technology introduced by Luoyang refractory institute to develop EAF castables which are based on main raw materials like mulite, sillimanite, kynite(three kinds) and with adding other kind of boned materials. It has the figure of short tempered time, anti-corrasion, resistance for thermo-shaking which can remarkably extend the life time of EAF and lower the cost of refractories.

Main index:

description	High alumina		Magnesite		Corundum	
Chemical content (%)	Al ₂ O ₃	66	MgO	84	Al ₂ O ₃	90
	MgO	8.5	CaO	3.0	Cl ₂ O ₃	6.0
	--	--	Al ₂ O ₃	6.0	--	--
	SiO ₂	22	Fe ₂ O ₃	1.0	--	--
Moisture (%)	10-12		10-13		8-10	
Attach (%)	> 90		> 90		> 92	
heats	> 7.0		> 5.0		> 10	

Purge plug for Ar purging at the bottom of ladle

Purge plug for Ar blowing at the bottom of ladle is one of our newly developed products, taking the advantages of RHI, KROSAKI, considering the practice in China, we optimized this products, with the life time is longer life and more safe.

1. Compared with ordinary purge plug, our product is better in:

- a. High strength, especially under high temperature condition;
- b. Good capacity of anti-slag and anti-soak;
- c. Good density stability;
- d. Better anti-corrasion abitity;

2. Main properties:

Product Name		Purge Plug	Seating Block
Brand		Pp-I	WB-I
Chemical Composition (%)	AL ₂ O ₃	≥ 85-92.4	≥ 90
	MgO	≥ 4.5	≥ 3.6
	Cr ₂ O ₃	≥ 1.2-4.5	≥ 1.0
Density (g/cm ³)	110°Cx24h	≥ 3.0	≥ 3.0
	1550°Cx3h	≥ 3.0	≥ 3.0
Compressive Strength (Mpa)	110°Cx24h	≥ 70	≥ 60
	1650°Cx4h	≥ 150	≥ 190.4
High Temperature Folding Strength (Mpa)	1450°Cx1h	≥ 18	≥ 14
Type of aperture	Narrow aperture		
Note: The width, length, number and position can be adjusted according to requirement.			

Spray castable for converter

The main figures to level refractory spray castable are: attaching, sticking, sintering capacity and strength.

According to these points, we developed this product by using different special materials with different properties, e.g. we added low melting point metals such as Si, Al, Mg into it, these metals will react with oxygen to perform the role of deoxidants, as well as give out heat; added special mineral materials which will expand to balance the thermal shrink of the spray castable under high temperature condition, it will also reduce the probability of flaking off; added a suitable quantity of converter slag to increase the capacity of attaching and anti-corrosion; in addition, we used abio and organic binder and other materials to enhance its capacity of strength, sintering, attaching, etc. The average life time of furnace is more than 15 heats, consumption of refractory materials is lower, which results in a higher efficiency.

Main physical and chemical properties:

No		I	II	III	IV
Chemical composition (%)	MgO	80	96	76	93
	CaO	3		20	5
	SiO ₂	4	1.6	2.3	
Folding strength (Mpa)	1100°C	7	6.4	7.8	4.2
	1500°C	6.4	8.0	9.	5.6
Sticking strength (Mpa)	1400°C	2.0	3.2	3.6	3.4
Density(g/cm ³)		2.45	2.70	2.66	2.58

LONG NOZZLE

Long nozzle are also called protective tube sused to prevent stell which between steel ladle and tundish are oxidized again, and avoid splash and slag coiled. Our corporation made sev-eral times test, developed $\text{Al}_2\text{O}_3\text{-ZrO}_2\text{-C}$ long nozzle, main use corundum and alumina, squama graphite, less pollute, especially suit special steel .Long nozzle have several advantages,even structure, well anti-thermo-shaking Stability, strong anti-corrade stability, enough mechanical intension, and so on.

Main Index:

Items		Index			
		CLT-A		CLT-B	ZSLT-A ZSLA-B
		body	Gas-Per meable Ring	50	
Al_2O_3 not less		52	85	52	
C% not less		27			
$\text{ZrO}_2\%$ not less					
Apparent Porosity %		≤ 20		12-20	
Compressing Strength under Room Temperature		25		25	
Anti-Bending Strength und Room Temperature		7.5		7.5	
Thermo-shaking Stability		5.0		5.0	
Gas-Permeable Volume			100		
Allowable Variation of Dimensions	Dimension $\leq 100\text{mm}$	± 1.5	± 1.5		± 1.5
	101-200mm	± 2.0	± 2.0		± 2.0
	201-300mm	± 3.0	± 3.0		± 3.0
	301-400mm	± 4.0	± 4.0		$\pm 上$
	> 400	$\pm 1.5\%$	$\pm 1.5\%$		$\pm 1.5\%$
	Wall thickness Relatine Variation	2.5	2.5		
Edgeless Depth	Working Face	≤ 5.0	≤ 5.0		± 5
	Non-Working Face	± 7.0			
Cracks		无	无		无
Distorting Deformation	Hight Direction	≤ 0.55	$\leq 0.5\%$		$\pm 0.5\%$
Nondestructive Testing		Consulting by Supplier &Customer			

耐火材料类 Refractory materials

Amorphous Refractory Materials Used in Tundish

In recent years, as the development of secondary steel-melting and steel-melting techniques, refractory dopes have been widely used in tundish. It is wellknown that there are usually two kinds of tundish liners, they are: (1) Bricking up liner, which is used little because that the adhered steel and slag after use is hard to be cleaned and high consumption of refractory materials and labor intensity and low handling speed of the ladle, although it is not easy to be dismantle and can line rebricking. (2). Heat insulation plate liner, which can reach the aim of casting with cold ladle, but it has a high cost.

The tundish dope of various brick-dope composite liner researched and developed by the Company enjoys the advantages of the above-noted two types and excludes their defects. The product researched and developed by the Company has an excellent slag and spalling resistance and it has a good adherence with its lining bricks under normal temperature and it is easy to dismantle after use. It has won good effective after used in over 10 steel plants.

Using Methods: Before the use of it, build liner of firebrick or clean the inclusion at first, then add water to make dope with equipment such as trowel or big shovel and make beat it hard. The thickness of dope at the bottom of tundish should be 20-30 mm, the thickness of dope in the well of tundish should be 20-50 mm, among which, slag line region should be a little thicker than other regions. When dopes it with liner, the liner temperature should be under 60°C. The tundish liner after dope should be maintained 12-14h, then it can be baked with gas and it can be used when the temperature is about 1200°C. The total baking time is usually over 3h.

Main Technique Indexes:

Product Name		挡渣堰冲击板		中间包喷涂				中间永久衬
		Mullite	Magnesite	Magnesite		Mg—Ca		High alumina
Brand		LDG-80	LMJ-82	LBMT-86	LBMT-82	LMCT-1	LMCT-2	LDJ-60
Chemical Composition (%)	AL ₂ O ₃ (%)	> 80						> 60
	MgO(%)			> 85	> 86	> 82	> 75	> 60
	CaO(%)						≤ 10	≤ 30
Density (g/cm ³)		> 2.8	≥ 2.6	≤ 2.2	≤ 2.1	≤ 2.2	≤ 2.1	≥ 2.5
Compressive Strength(Mpa)	110°Cx24h	≥ 50	≥ 25	≥ 12	≥ 8	≥ 6	≥ 5	≥ 40
	1500°Cx3h	≥ 90	≥ 40	≥ 10	≥ 6	≥ 5	≥ 4	≥ 60
Folding Strength(Mpa)	110°Cx24h	≥ 8	≥ 5					≥ 6
	1500°Cx3h	≥ 10	≥ 7					≥ 8
Linear Variation Rate(%)		± 0.5	± 0.5	-1.5 ~ -3.0		-1.5 ~ -3.0		± 0.5
Highest Working Temperature		1800°C	1800°C	1750°C		1750°C		1650°C
用途		挡渣堰冲击板		工作衬				永久衬

Converter Taping hole castable

It is mainly made of fused magnesite as main raw material , which is bonded by some chemical materials. Not only it has good effects of castable in high temperature higher density, but also has a good ability of resistance of stalling and intensiling . It is considered to be best expected refractory of taping hole castable.

1. chemical and physical index

Mode No		MX-1	MX-2
Chemical content (%)	MgO	≥ 87	≥ 85
	Cr ₂ O ₃	--	≥ 3
Bulk density (g/cm ³)	110°Cx24h	≥ 2.6	≥ 2.6
	1550°Cx3h	≥ 2.5	≥ 2.5
CCS (Mpa)	110°Cx24h	≥ 20	≥ 20
	1550°Cx3h	≥ 30	≥ 40

2. usage

Protecting the converter taping hole and extend the life time

耐火材料类 Refractory materials

Drying Free Castable For Iron Trough

AL₂O₃-SiC-C ultra low cement refractory castable, main materials are high purification fused corundum, added drier fast and anti-explode, used in big blast furnace, iron thread can reach 100,000 tons every time. It have well Thermo-shaking Stability, strong anti-erode stability against molten steel and molten slags, small change in dead burn bulk, strong anti-oxidation, easy construct, drying fast and non blowout, easy mending and backout, in use, didn't bring baleful gas and adhesive slags.

Main index:

Brand		LASCJ-1	LASCJ-2	LASCJ-3	LASCJ-4	LASCJ-5	LASCJ-6	LASCJ-7	LASCJ-8
AL ₂ O ₃ (%) ≥		70	60	65	60	70	65	65	60
SiC+C(%) ≥		10	20	10	15	14	10	10	14
B.D after drying (g/cm ³)		≥ 2.85	≥ 2.80	≥ 2.65	≥ 2.50	≥ 2.80	≥ 2.65	≥ 2.50	≥ 2.40
C.MOR (Mpa)	110°Cx24 ≥	4.0	4.0	4.0	4.0	4.0	3.0	4.0	3.0
	1450°Cx3 ≥	7.0	6.0	7.0	5.0	8.0	6.0	6.0	5.0
C.C.S (Mpa)	110°Cx24 ≥	25	20	25	20	25	20	20	5.0
	1450°Cx3 ≥	40	30	40	30	50	50	30	20
L.C.R.(%)	1450°Cx3h	0 ∞ +0.5	0 ∞ +0.5	0 ∞ +0.5	0 ∞ +0.5	0 ∞ +0.5	0 ∞ +0.5	0 ∞ +0.5	0 ∞ +0.5
Application		Iron line of main iron through	Slag line of main iron through	Branch iron through	Branch slag through	Main iron through and swing through	Branch iron through	Main through	Slag through
Note		For upper 2000m ³ B.F				For upper 1000- 2000m ³ B.F		For lower 1000m ³ B.F	

Species

耐火材料类

Refractory materials

Stemming

Follow development of pudding technology, our corporation developed new products——stemming without water and water stemming, products absorbed advantages from overseas corporation, like RHI and KROSAKI. We can produce top grade, medium grade, low grade stemming. It have well plasticity and sinter property, easy crush and fill up interspace,easy open and have well scour property, and ensured molten iron and run slags outflow by even speed. At the same time ,workers were reduced work intension.

Main property:

No	Intension Mpa	Bulk Density (g/cm ³)	Apparent Porosity (%)	Anti-shaking Strength (Mpa)
1	1.4	1.83	1.6	3.3
2	0.8	1.78	1.6	3.6

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SEN

Install in the bottom of tundish, and insert endure pipe which under casting steel liquid. It main function is prevent steel oxidized again and avoid splash, prevent protection slag engulf steel liquid, improve steel flow estate and distributing, urge billet carapace in casting mold growth evenly, and in favor of eliminate steel liquid 's gas and sundries.

Our company developed Al_2O_3 sen whose, main materials are corundum and graphite, added metal Si, carbon and so on, molding in suppress machine, then, by protect agglomeration. Slag line Area used complex ZrO_2-C . It have advantages, even structure nozzle, low inrush, strong counteract cautery, fit for most kinds steel.

Main Index:

Items		Index				
		QLT-A			QLT-B	
		body	Slag line Area	Gas-Permeable part	body	Slag line Area
$Al_2O_3\%$ not less		55		56	55	
C% not less		25	15	15	25	15
$ZrO_2\%$ not less			75			76
Apparent Porosity%		≤ 20			≤ 20	
Compressing Strength under Room Temperature		25			25	
Anti-Bending Strength und Room Temperature		7.5			7.5	
Thermo-shaking Stability		5			5	
Allowable Variation of Dimensions	尺寸 $\leq 100mm$					± 1.5
	01 \sim 200mm					± 2
	201 \sim 300mm					± 3
	301 \sim 400mm					± 4
	$> 400mm$					$\pm 1.5\%$
	Wall thickness Relative Variation					
Edgeless depth	Working Face					≤ 5
	Non-Working Face					≤ 7
Distorting Deformation		Hight Direction				$\leq 0.5\%$
Nondestructive Testing		Consulting by Supplier & Customer				

High strength self-flow castable

Required by the development of the technics and production of steel making, there will be some problems of the traditional converter self-flow castable: long sinter duration, weak felt strength, weak erode strength, these problems will cause the short life time of the tapping hole. So we need another Mg-C based fast-self-flow castable with the same property of tapping hole. Our product high strength self-flow castable, which is made of high purity MgO, mixed with binder and other materials, has the property of short sinter duration, good spread capacity, anti-corrasion, can shorten the period of fixing furnace, improve the production efficiency.

1. Main physical and chemical index:

Chemical Composition	MgO	≥ 70
	C	≥ 5
Folding Strength	1500°Cx3h C Buried	≥ 4
	1500°Cx3h	≥ 4
Compressive Strength	1500°Cx3hC Buried	≥ 10
	1500°Cx3h	≥ 10
Density	1500°Cx3hC Buried	≥ 2.20
	1500°Cx3h	≥ 2.20

2. Usage:

No additional equipments required while using this product, for it will be molten by the high temperature inside the furnace and bind with the former furnace body along with the movement of the furnace, and the furnace will be ready for job within 10-15 minutes after the castable concretes.

3. Main user:

Jinan Steel Group, Tonghua Steel Company, etc.

耐火材料类 Refractory materials

Monolithic Stopper Rod

Monolithic Stopper Rod be used in on-off of the tundish. To adjust the molten steel flux of entering into the mould through control the area from the top of stopper to nozzle of tundish pot. Also through blowing argon from the center of monolithic stopper rod to SEN of tundish pot. To prevent plugging nozzle. The traditional stopper is combined and be set up by steel pipe which be in series of the sleeve brick and stopper brick. Molten steel, furnace slag be easy immerge into the joint seam and lead to the rod break or stopper fall off, accident rate is very high because of the more joint seam.

Our company developed a well property monolithic stopper recently. Stopper body and stopper joint together directly without seam. Can prevent the molten steel eroded and furnace slag washed, well antistrip performance, not drop pieces, well resistance to thermo-shaking, enough mechanical strength etc. Can reduce the plugging nozzle accident effectually. Profit to improve the output of casting machine.

Main Index:

Items	Index		
	ZSLT-A	ZSLT-B	
$Al_2O_3\% \geq$	60	55	
$C\% \geq$	10	25	
$ZrO_2\% \geq$			
Apparent Porosity %	≤ 17	≤ 18	
Compressive Strength under Room Temperature Mpa. \geq	30	25	
Anti-Bending Strength und Room Temperature Mpa. \geq	7.5	6	
Thermo-shaking Stability \geq	5	5	
Allowable Variation of Dimensions	Dimension $\leq 100mm$		± 1.5
	101 \sim 200mm		± 2
	201 \sim 300mm		± 3
	301 \sim 400mm		± 4
	$> 400mm$		$\pm 1.5\%$
	Wall thickness Relatine Variation		
Nondestructive	Consulting by Supplier & Customer		

MgO-Carbon material converter thermo castables

In the process of steel making, sometimes it will cause partial destroy of converter body which are result in short life time and and unsafe situtation.common thermo castables take too much times and unstable effection. Focusing on this problem, we develop the MgO-C material to solve.

The product has figures as high temperature, resistance for errosion, and easy to handle. It is not necessary to need more equipments but to add it directly into furnace which will be heated by furnace melting into dent area or errosion area sticking with the moving of furnace.

Generally speaking, it will be finished after 40-60 minutes in order to make easier repairment.

It is also honored by steel's technicians.

Main chemical and physical index:

Description	Index
MgO+C+Al ₂ O ₃ (%)	>80
Refractoriness (°C)	>1790
Sintering temperature (°C)	>1100
Density (g/cm ³)	>2.9

Castable for Ladle

Along with the requirement of steel making technics, development of continuous casting and refining, the period when molten steel stays in the ladle will be much longer than before, its damage to the liner of ladle so serious, and the life time of the ladle is much shorter. A solution to this problem is that, bring high quality castable materials into effect. After test and research, Luoyang Institute of Refractories Research and our company developed a kind of high strength refractory castable materials. It is made of high purity fused corundum, mixed with high purity spinel, suitable binder and additives and so on. It has a good property of anti-slag, anti-peeloff, volume stability, high strength, short sinter duration, etc. It can efficiently lengthen the life time of the ladle: 134 heats compared with 80 heats before.

Main technical index:

Material		Corundum-Spinel			Corundum -Spinel -Chrome	Magnesite
Type		LAM-1	LAM-2	LAM-3	LAMCR-1	LGP
Chemical Composition	Al ₂ O ₃ (%)	>90	>85	≥ 80	≥ 50	
	MgO(%)	>5.0	>6.0	≥ 8.0	≥ 30	≥ 82
	Cr ₂ O ₃ (%)	--	--		≥ 2.0	
Density(g/m ³)	110°Cx24h	≥ 3.0	≥ 2.9	≥ 2.85	≥ 2.7	≥ 2.2
Folding Strength (Mpa)	110°Cx24h	≥ 6.0	≥ 6.0	≥ 6.0	≥ 6.0	
	1500°Cx24h	≥ 10	≥ 10	≥ 10	≥ 15	
Compressive Strength (Mpa)	110°Cx24h	≥ 30	≥ 30	≥ 30	≥ 30	
	1500°Cx24h	≥ 80	≥ 75	≥ 70	≥ 60	
Linear Variation Rate(%)	1500°Cx24h	0~+1.0	0~+1.0	0~+1.0	0~+1.0	+1.0~+1.5
Function		Wall and bottom of big size ladle and refining ladle			Slag line of big size ladle and refining ladle	Liner of ladle

耐火材料类 refractory materials

Castable for hot metal mixer

Hot metal mixer is used for keeping heat and homogenizing the component of molten iron, It is a very important equipment for transporting molten iron for steel making. Taphole, cheeks and slag line, are the most important parts, the main requests from these parts are: anti-slag, high strength, good anti-thermal, low conglutination, low thermal conductivity, low transformation after dead burning.

Our product Al_2O_3 -Spinel-SiC castable, can fulfill the rigor requirement of low consumption, cost efficient, long life.

Main technical index:

Item	Index	
Al_2O_3 (%)	≥ 60	
MgO (%)	≥ 4	
SiC (%)	≥ 6	
Compressive Strength Mpa	110°Cx24h	≥ 35
	1450°Cx3h	≥ 40

Mg-Ca based dope for continuous casting tundish

Continuous casting tundish is the last container of molten steel before casting, so it's very important to the steel quality, so we request the dope not to pollute the molten steel, while absorb the non-metal impurities. The new type Mg-Ca based dope can work under the principle of that: CaO which is included in the dope has a very strong capacity to absorb the Al, Si, S and other impurities in the molten steel. We solved the problem of that: CaO can not melt and exist in the format of educt in the molten steel. We made the Mg-Ca based dope very plastic, thixotropy and cohesive, easy to construct without much water, no rupture during roasting, anti-hydrate and anti-corrasion, the heat preservation capacity is very good. After use, the dope will fall off during cooling. This product can also purify the molten steel, there is no problem to take the place of traditional Si based, Mg based, Mg-Cr based dope.

1. Main physical and chemical properties:

Chemical composition%	MgO	≥ 40-50
	CaO	≥ 20-30
Refractoriness(°C)	1790°C	
Density(g/cm ³)	110°C × 24h	≤ 2.1
Compression strength (Mpa)	110°C × 24h	≥ 3.0
	1550°C × 3h	≥ 20
Linear variation after burning(%)	1550°C × 3h	0-3.0
Modulus of thermal conductivity(W/m.k)	≤ 0.65	

2. Usage:

For daubing or spraying in tundish as the liner.