


Refractories for Anode Baking Furnaces


碳素焙烧炉内衬耐材配置方案

PRCO Refractories Institute


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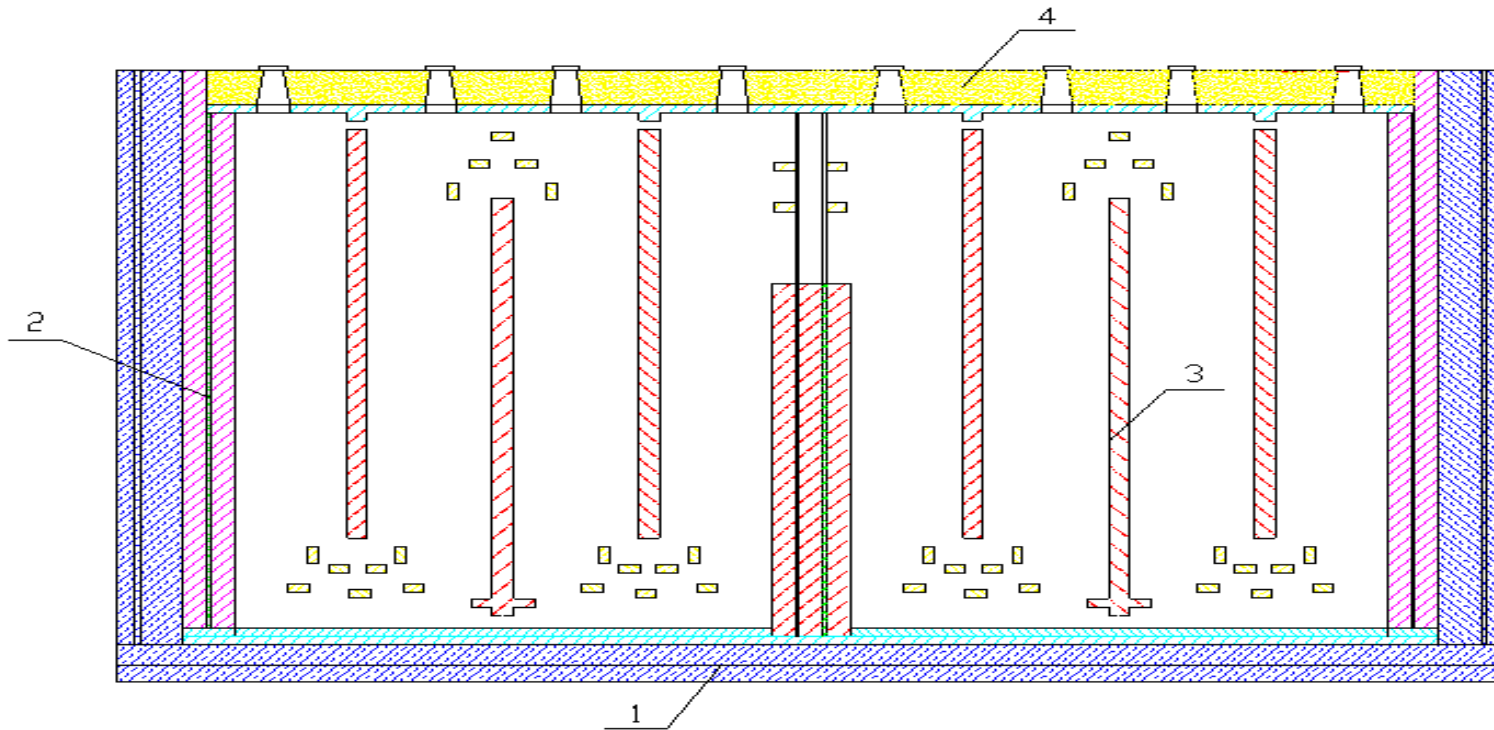
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Introduction/简介

Anode baking furnaces, one high temperature equipment is used to bake anodes for aluminum industry and is aimed to keep temperature with carbon products for at least 30 hours before discharged at a temperature of less than 250°C. In the meantime the turnover time with them is roughly 16-30 days. The refractories in anode baking furnaces will lead to deformation due to long-time high temperatures and high pressures while the refractories on flue walls will create spalling due to periodic temperature changes. Low-creep refractory bricks used in anode baking furnaces are key refractories and are normally working under a temperature span between 1300°C-1400°C.

阳极焙烧炉是用来焙烧电解铝用炭阳极的高温设备,焙烧炭素制品保温30小时左右,250°C以下出炉,一般16-30天为一个周期.阳极焙烧炉用耐火材料长期经受高温、高压而产生变形和周期性的温度变化而造成火道墙耐火材料的剥落,该炉所用低蠕变砖是阳极焙烧炉的关键耐火材料,低蠕变砖的使用温度一般在1300°C-1400°C。

REFRACTORIES DISTRIBUTION IN ANODE BAKING FURNACE 内衬耐材配置简图



- 1、炉底/Bottom 2、侧墙/Side Wall 3、火道墙/Flue Wall 4、炉顶/Furnace Roof

1、Bottom/炉底

- **Fireclay bricks with high strength and high RUL are used as working lings on bottom**
炉底工作层采用具有较高耐压强度和较高荷重软化温度的粘土砖。
- **Light weight mullite bricks are used as insulation lining on bottom**
保温层采用轻质莫来石砖。



Low porosity
fireclay bricks /
低气孔粘土砖



Low weight mullites
bricks/ 轻质莫来石砖

Table 1

Name	Items						
	Al ₂ O ₃ (%)	Fe ₂ O ₃ (%)	BD (g/cm ³)	AP (%)	CCS (MPa)	RUL (T0.6) (°C)	TC(1000°C) (W/m•k)
Low porosity fireclay bricks	≥42	≤2.0	≥2.2	≤20	≥40	≥1420	----
Light weight mullites bricks	≥60	≤0.8	≤0.8	----	≥2.5	----	≤0.4
high alumina light weight bricks	≥45	≤2.0	≤0.6	----	≥1.5	----	≤0.27

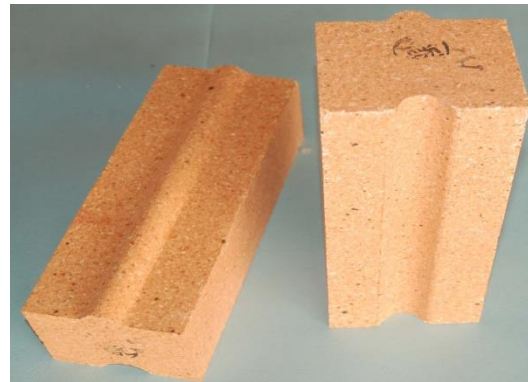
2、Flue Wall / 横墙

Flue walls request refractory bricks low creeping changes, high R.U.L. and excellent thermal shock resistance as well.

横墙部位要求耐火材料高温蠕变率低, 荷重软化点高, 同时还要有比较好的热震稳定性。



Fireclay bricks
粘土砖



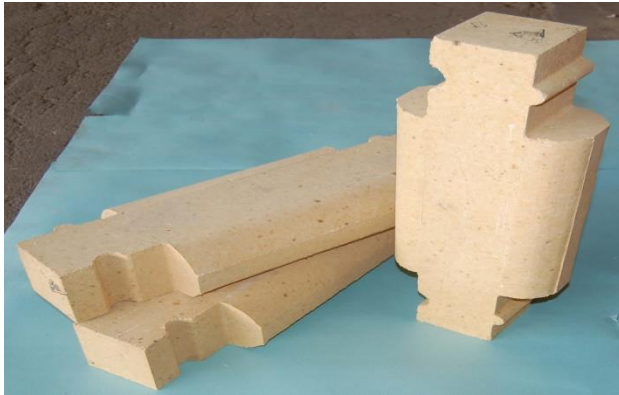
Low creep
fireclay bricks
低蠕变粘土砖

Table 2

Name	Items							
	Al ₂ O ₃ (%)	Fe ₂ O ₃ (%)	BD (g/cm ³)	AP (%)	CCS (MPa)	RUL(T0.6) (°C)	MOR (1350°C,MPa)	Creep (0.2MPa,1280°C×25h,%)
fireclay bricks	≥42	≤2.0	≥2.1	≤18	≥40	≥1400	----	----
low creep fireclay bricks	≥45	≤1.8	≥2.2	≤19	≥50	≥1450	≥4	≤0.4
low creep mullites bricks	≥50	≤1.6	≥2.3	≤18	≥60	≥1470	≥5	≤0.3

3、火道墙/Flue Wall

火道墙用耐材需具有高温抗折强度高、抗热震性好及荷重软化点高等性能。
Refractory bricks used on flue walls should take on high rapture strength at high temperature, excellent thermal shock resistances and high R.U.L .



高铝砖/
high alumin bricks



红柱石砖/
andalusite bricks

Table 3

Name	Items								
	Al ₂ O ₃ (%)	Fe ₂ O ₃ (%)	BD (g/cm ³)	AP (%)	CCS (MPa)	RUL (T0.6) (°C)	MOR (1350°C,MPa)	Creep(0.2MPa, 1280°C×25h,%)	TSR(H ₂ O) (cycles)
high aluminaconnect ion brick	≥70	≤2.0	≥2.45	≤22	≥50	≥1550	≥4	≤0.4	≥10
andalusite connection brick	≥60	≤1.6	≥2.40	≤20	≥60	≥1600	≥6	≤0.3	≥20

4、Furnace roof / 炉顶

COMPOUNDED PRECAST BLOCKS ON ROOF ARE DESIGNED TO REDUCE THERMAL CONDUCTIVITY AND CUT THERMAL LOSSES
炉顶采用复合炉面预制块，降低导热系数，减少热损失。



Precast blocks / 预制炉面块

Table 4

Name	Items										
	Al ₂ O ₃ (%)	BD (g/cm ³)	PLC (%)		CCS(MPa)		MOR (MPa)			TSR(H ₂ O) (cycles)	TC (W/m•k)
			500℃	1000℃	110℃	1000℃	110℃	500℃	1000℃		
Heavy weight castables	≥50	≥2.45	±0.3	-0.3	≥60	≥55	≥10	≥10	≥10	≥30	----
light weight castables	≥36	≥0.8	800℃ -0.1		≥6	800℃ ≥3	---	---	---	---	800℃≤0.2

PRODUCTION FACILITY 生产设备



2500t LAVIS-BRAND HYDRAULIC PRESSOR MADE IN GERMANY
德国Lavis 2500t液压机



111m-LONG SUPER-HIGH-TEMPERATURE CHANNEL
111m超高温隧道窑

Reference 使用业绩

Refractories materials for anode baking furnaces produced by our company have been widely used in China, such as Aluminum Corporation of China (CHALCO), Qingtongxia Aluminum Co.,Ltd, Xinjiang DongfangXiwang Nonferrous Metal Company, MCC Tiangong Group Corporation limited, Qinghai Qiaotou Aluminum&Powder Co.,Ltd. The performance of refractory materials supplied by our company have reached between 8 years and 10 years.

我公司生产的碳素焙烧炉用耐材制品在中国有着广泛的应用，如中国铝业股份有限公司、青铜峡股份有限公司、新疆东方希望有色金属有限公司、中冶天工集团有限公司和青海桥头铝电有限公司等40多家知名企业，使用寿命通常为8-10年，处于领先水平。

Customer	Refractory items	Quantity(t)
Xinfu Group Xinjiang plant (54 chambers)	All the refractories including alumina brick, castable, mortar, insulation brick ,castable and mortar.	15121.957
Xinjiang Orient Hope Carbon Com (54 chambers)	All the refractories including alumina brick, castable, mortar, insulation brick ,castable and mortar.	25706.0275
Qingtongxia Aluminum	Alumina brick TZ-3,TZ-2、 special shape alumina brick、 1-3, 1-4, 2-4, 2-1	4216.3028
Shangxi Meixin Investment Industry (54 chamber)	Bricks for bottom, flue walls.	14349.991
Jiayuguan Suotong Carbon (72 chambers)	Bricks for flue wall and castable and insulation refractories, Andalusite brick	8569.232

customer	Refractory items	Quantity(t)
Mongolia huoning carbon company	Low creep fireclay brick and special alumina brick	3411.815
Shanxi nonferrous Yulin new material company	Low creep fireclay brick and special alumina brick Andalusite brick	17545.34
Xinjiang Qiya aluminum company (54 chambers)	Low creep fireclay brick and special alumina brick	8696.514
Yunnan yuanxin carbon (54 chambers)	Refractory brick 1-3、1-4、2-4、insulation brick3-3、3-4、3-5、3-6、3-7、and mortar	17108
Chalco liancheng plant	Fireclay brick, alumina brick and insulation brick	7971
Xinfa group Chiping plant	Special brick for flue wall and side wall, insulation brick	22302

Customer	Refractory item	Quantity (t)
Huanghe Dydropower development company (36 chambers)	High strength dense castable and light weight insulation castable	7456
Henan Shenhuo Aluminum company (54 chambers, phase2)	Fireclay brick , insulation brick and precast refractory	4614
Jiasu Suling Anode carbon company	Castable for roof and precast refractory	4130
Jinan Haichuan carbon company (54 chambers)	Fireclay brick, alumina brick for flue wall, castables.	14737
Chalco Qinghai branch (54 chambers)	Fireclay brick, special alumina brick , castable.	12000
Jiangsu Dadun Aluminum Copmany (54 chambers)	Fireclay brick, special alumina brick ,andalusite brick Castable and mortar.	9210