

## Calcium-Aluminate Binder: CA50 series

CA50 series of Calcium Aluminate refractory binder are made of high-purity bauxite and limestone or lime which mixed in a certain proportion, sintered with proper ratio at high temperature (or fused in arc furnace ). The clinker will be pulverized to form calcium aluminate binder whose main mineralogy phases are CA and CA<sub>2</sub>. With low content of Fe<sub>2</sub>O<sub>3</sub>(2.5%). Therefore, it can be used in the furnace with CO reducing atmosphere.

CA50-G5; CA50-G6; CA50-G7 is a common type of calcium aluminate binder, which needs to be made through selected materials and intensive process management. It is suitable for the preparation of medium and low cement castables, such as fluidized bed boiler linings; Cement plant preheater、wicket cover、cooler lining, alumina fluidized calciner lining、heating furnace、soaking pit linings and so on.

CA50-N, CA50-electrofuson, is an early strong calcium aluminate binder, were tested according to GB201-2000, its compressive strength can reach 20-30Mpa within 6-hour. It can be detached from the mold in one day when preparing medium and low cement castables.

CA-65-H is a high-strength and high-aluminum calcium aluminate binder, was amde by sintered at high temperature and grinding. The main mineral phase of this product is CA<sub>2</sub>, which is a hydraulic binder with good high temperature resistance. It is mainly used to prepare the low ablation rate and durable concrete for the diversion channel of satellite launching platform.



### Physicochemical Properties:

Item			CA50-G5(A500)	CA50-G6(A600)	CA50-G7(A700)	CA50-G8(A800)	CA50-G9(A900)	CA50-G10	CA50-N	CA50-电熔
Refractoriness	Pyrometric cone equivalent of cement paste (°C)		1420-1460							
Chemical composition	Al <sub>2</sub> O <sub>3</sub>		≥50	≥50	≥50	≥51	≥51	≥52	≥50	≥50
	CaO <sub>2</sub>		≥32.5	≥33	≥33	≥33	≥33.5	≥33.5	≥34.5	≥38
	SiO <sub>2</sub>		≤8.0	≤8.0	≤8.0	≤7.0	≤6.5	≤6.5	≤7.0	≤6.0
	Fe <sub>2</sub> O <sub>3</sub>		≤2.5							
	Na <sub>2</sub> O+K <sub>2</sub> O		≤0.4							
Mineral composition	Main crystalline phase		CA、CA <sub>2</sub>	CA、CA <sub>2</sub>	CA、CA <sub>2</sub>	CA、CA <sub>2</sub>	CA、CA <sub>2</sub>	CA、CA <sub>2</sub>	CA	CA

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	Subcrystalline phase		CT, C <sub>2</sub> AS	CT, C <sub>2</sub> AS	CT, C <sub>2</sub> AS	CT, C <sub>2</sub> AS	CT, C <sub>2</sub> AS	CT, C <sub>2</sub> AS	CA <sub>2</sub> , CT	CA <sub>2</sub> , C <sub>2</sub> AS
Bulk Density (g/cm <sup>3</sup> )			2.95-3.05							
Fineness (GB/T 1345-2005)	325Sieve (%)		<20	<20	<20	<16	<8	<6	<10	<8
	BET (m <sup>2</sup> /kg) (GB/T 8074-2008)		≥300	≥300	≥300	≥350	≥400	≥450	≥350	≥400
	Laser determination of particle size distribution-d50 (um)		18.0	18.0	18.0	12.0	10.0	8.0	12.0	10
	Laser determination of particle size distribution-d90 (um)		50	50	50	50	40	35	50	40
Property of cement mortar	Formulation of cement mortar		Cement:sand=1:3 cement 450g, sand 1350g, water-cement ratio =0.45			Cement: sand =1:3 cement 450g, sand 1350g, water- cement ratio =0.44	Cement: sand =1:3 cement 450g, sand 1350g, water-cement ratio =0.43		Cement: sand =1:3 cement 450g, sand 1350g, water-cement ratio =0.41	Cement: sand =1:3 cement 450g, sand 1350g, water- cement ratio =0.40
	Flow value after 30 minutes (%)		>30							
	Setting time(min)	Initial setting time (GB201-2000附录A)	≥30	≥30	≥30	≥60	≥90	≥90	≥30	≥120
		Final setting time	≤360	≤360	≤360	≤360	≤360	≤360	≤360	≤480
	Flexural strength (MPa) (GB/T 17671-1999)	6小时							4.0	3.0
		24小时	5.5	6.0	6.5	7.0	8.0	9.0	6.0	10.0
		72小时	6.5	7.0	7.5	9.0	10.0	11.0	7.0	11.0
	Compressive strength (MPa) (GB/T 17671-1999)	6小时							30	25
		24小时	40	45	50	60	70	80	50	75
		72小时	50	55	60	70	80	90	60	80
Refractory castable properties	Type		Clay castables			Clay castables、Low cement castables				
	Formulation		15% cement			15% cement 6% cement				
		Water addition (%)	11	11	11 7	11 7	11 7	11 7	11 7	11 7
	Flow value (mm)	Initial flow value	195	197	201 169	204 108	203 181	206 184	207 158	195 178
		30min	214	214	235 158	196 169	203 162	199 166	154 148	112 145
		60min	175	180	193 157	190 155	130 131	165 142		
	Working hours (min) - time of vibration within 20secs		75	81	86 101	93 93	63 63	71 68	50 45	25 40
	Compressive strength (MPa)	normal temperature strength(24h)	20.3	24	24.7 13.2	30.9 19.3	34.5 21.5	37.7 25.3	37.4 27.3	45.6 36
		Dry for 110℃ (24h)	48.3	58.1	61.2 49.4	63.2 56.6	65.5 75.6	68.8 78	66.9 82.5	76.6 91
		Calcination for 110℃(6h)	29.1	31.6	32.4 83.2	32.6 86.6	32.7 89.5	32.8 93.8	32.9 96	36.8 92.5

## Pure Calcium-Aluminate Binder

Pure calcium aluminate binder is mainly used to confect refractory castables that require refractoriness reach 1500-1800°C or even 1800°C or above, especially low cement castables and ultra-low cement castables. Such as ladle lining, air brick, material for iron runner, the castable with high-strength and coating resistant and anti-erosion for cement kiln.

CA65P product has a series advantages: high content of CA mineral, high area, high strength and early strength

CA70 is mainly composed of CA minerals and supplemented with CA2 minerals. It has good construction performance, good adaptability to stabilization, and good compatibility to additives. It is suitable for preparing various unshaped refractories such as castables and sprayed materials.

CA80 is manufactured from CA65 or CA70 and  $\alpha$ -Al<sub>2</sub>O<sub>3</sub> micropowder. It is suitable for the preparation of low-cement and ultra-low cement castables. According to customer requirements, in order to adapt to various construction environment changes, some products (CA70A, CA75A and CA80A) with additives have been developed.



## Physicochemical Properties:

Item			CA-65P	NA-70	CA-70E	CA-70G	CA-70A	CA-75E	CA-75G	CA-75A	CA-80E	CA-80G	CA-80A
Refractoriness	Pyrometric cone equivalent of cement paste (°C)		1610-1650	1650-1690	1650-1690	1650-1690	1650-1690	1710-1750	1710-1750	1710-1750	1780-1820	1780-1820	1780-1820
Chemical composition	Al <sub>2</sub> O <sub>3</sub>		≈65	68-70.5	68-72			≈75		≥77			
	CaO <sub>2</sub>		≤35	28.5-30.5	≤30			≤25		≤20			
	SiO <sub>2</sub>		≤1.0	0.2-0.6	≤1.0			≤1.0		≤0.5			
	Fe <sub>2</sub> O <sub>3</sub>		≤0.5	0.4	≤0.7			≤0.7		≤0.5			
	Na <sub>2</sub> O+K <sub>2</sub> O		≤0.4	0.4	≤0.4			≤0.4		≤0.4			
	S (total sulfur)				(≤0.1)			(≤0.1)		(≤0.1)			
Mineral composition	Main crystalline phase		CA	CA, CA <sub>2</sub>	CA	CA, CA <sub>2</sub>	CA, CA <sub>2</sub>	CA	CA, CA <sub>2</sub>	CA, CA <sub>2</sub>	CA	CA, CA <sub>2</sub>	CA, CA <sub>2</sub>
	Subcrystalline phase		CA <sub>2</sub>		CA <sub>2</sub> , $\alpha$ -Al <sub>2</sub> O <sub>3</sub>	$\alpha$ -Al <sub>2</sub> O <sub>3</sub>	$\alpha$ -Al <sub>2</sub> O <sub>3</sub>	CA <sub>2</sub> , $\alpha$ -Al <sub>2</sub> O <sub>3</sub>	$\alpha$ -Al <sub>2</sub> O <sub>3</sub>	$\alpha$ -Al <sub>2</sub> O <sub>3</sub>	CA <sub>2</sub> , $\alpha$ -Al <sub>2</sub> O <sub>3</sub>	$\alpha$ -Al <sub>2</sub> O <sub>3</sub>	$\alpha$ -Al <sub>2</sub> O <sub>3</sub>
Bulk Density (g/cm <sup>3</sup> )			3.05-3.15	2.95-3.05	2.95-3.05			3.1-3.2		3.2-3.3			
Fineness (GB/T 1345-2005)	BET (m <sup>2</sup> /kg) (GB/T 8074-2008)		≥550	≥400	≥600			≥600		≥650			
	Laser determination of particle size distribution-d50 (um)		8.0	9.0	7.0			7.0		5.0			

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	Laser determination of particle size distribution-d90 (um)		40	40	35			35			25		
Property of cement mortar	Formulation of cement mortar		Cement:sand=1:3 cement 450g, sand 1350g, water-cement ratio =0.39	Cement:sand=1:3 cement 450g, sand 1350g, water-cement ratio =0.42	Cement:sand=1:3 cement 450g, sand 1350g, water-cement ratio =0.39			Cement:sand=1:3 cement 450g, sand 1350g, water-cement ratio =0.39			Cement:sand=1:3 cement 450g, sand 1350g, water-cement ratio =0.40		
	Flow value after 30 minutes (%)		>30										
	Setting time(min) (GB201-2000附录A)	Initial setting time	≥30	≥90	≥30			≥30			≥30		
		Final setting time	≤360	≤300	≤360			≤360			≤360		
	Flexural strength (MPa)	6小时	-	3.0	3.0	-	-	3.0	-	-	3.0	-	-
		24小时	5.5	7.0	5.5	5.0	5.5	5.0	5.0	5.0	4.5	4.0	4.5
		72小时	6.0	9.0	6.0	6.0	6.5	6.0	6.0	6.0	5.5	5.0	5.5
	Compressive strength (MPa)	6小时		15	15	-	-	-	15	-	-10	-	-
		24小时	40	50	40	30	40	35	30	35	30	25	30
		72小时	50	60	50	40	50	45	40	45	40	30	40
Refractory castable properties	Type		Low cement castables	Corundum castable、Low cement castables									
	Formulation		6% cement	5% cement    6% cement									
	Water addition (%)		6.8	5.2    6.8									
	Flow value (mm)	Initial flow value	161	194 179	190 176	196 152	158 164	196 178	192 168	220 164	200 180	207 180	217 159
		30分钟	168	190 175	186 170	188 169	149 152	186 175	190 164	203 152	185 176	190 171	195 150
		60分钟	167	173 173	185 165	184 163	150 156	174 168	177 165	193 156	177 166	180 164	190 151
	Working hours (min) - time of vibration within 20secs		190	83 212	99 121	111 146	189 197	82 130	107 152	170 330	71 140	128 180	195 310
	Compressive strength (MPa)	normal temperature strength(24h)	24.5	21.2 32.2	22 25.4	19.7 25.7	24.3 26.1	18.7 21.6	21.1 22.1	20.5 20	15.2 15.1	14.2 15.9	14.0 15.4
		Dry for 110℃(24h)	119.7	92.5 131	93.2 118.6	76 121.6	91.9 120.4	82.4 115.0	91.9 109.5	83.2 98.2	71.0 86.1	76.6 102.2	67.4 70.0
		Calcination for 110℃ (6h)	112.2	47.7 113.2	57.5 112.6	55 120.5	55.0 109.7	52.8 123.1	49.6 120.7	50.0 116.0	51.9 119.4	55.0 118.3	47.7 118.1

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### Calcium-Aluminate Ael Materials

In recent years, with the rapid development of chemical building materials, aluminate cement is to be attached importance gradually by the material workers as a kind of regulation additive in control of the portland cement setting and hardening's time, and it will be a kind of important raw materials in chemical building. Based on this, the factory has developed some new kinds of aluminate cement, whose composition, fineness and area per unit volume are in control, are more stable than general aluminate cements. The new kinds of aluminate cement, such as CA50-J6, CA50-J7, CA50-J9, CA50-JN, fused CA50-J, fused CA40-J, CA70 and CSA, are available for all the customers now, and their reliable performance and stable quality favored by domestic and overseas customers



### Performance and Application:

Aluminate cement can speed up the setting of portland cement and advance accelerating. When various kinds of additives are applied in reasonably, the process of setting and hardening of portland cement can be quickly, and the performance of liquidity, water- retaining property, cohesiveness and compensatory striction can be achieved.

The main aim of aluminate cement applied in chemical building materials is to speed up setting and hardening, thus improving work efficiency. It is achieved through the reaction among calcium aluminate, calcium sulfate and calcium hydroxide or calcium hydroxide from portland cement. Because the creating of a sort of reaction products, ettringite, absorbs a great quantity of water, and it makes the concretion have low water content, so as to lesson contraction caused by moisture evaporation in concretion.

The mixture of aluminate cement and portland cement performs well in the applications, and is wildly used in compounding mortar commodities. For example, tile stickup, tile plaster, SL flooring, sealing materials, water stop and plugging materialsd, fast hardening mortar, mending mortar, bonding mortar, pouring mortar and son on.

### Physicochemical Properties:

项目		CA50-J6	CA50-J7	CA50-J9	CA50-JN	CA50-J电熔	CSA	CA70
化学成分 (%) (GB/T205-2008)	Al <sub>2</sub> O <sub>3</sub>	50-52	50.5-52.5	52-54	51-53	51-53	46-48	68.5-71
	GaO	33-34.5	33-34.5	33.5-35	34-35.5	35-37	37-39	28.5-30.5
	SiO <sub>2</sub>	7-8	7-8	5-6.5	6-7	5-6	3-6	0.3-0.8
	Fe <sub>2</sub> O <sub>3</sub>	<2.5	<2.5	<2.5	<2.5	<2.5	<2.0	0.1-0.3
矿物组成	Main crystalline phase	CA、CA2	CA、CA2	CA、CA2	CA、CA2	CA	C4AS2	CA、CA2
	Subcrystalline phase	CT, C <sub>2</sub> AS	CT, C <sub>2</sub> AS	CT, C <sub>2</sub> AS	CT, C <sub>2</sub> AS	CA <sub>2</sub> , C <sub>2</sub> AS	CA <sub>2</sub> , C <sub>2</sub> AS	α-Al2O3
BET (m <sup>2</sup> /kg) (GB/T 8074-2008)		300-350	300-350	400-450	380-430	400-450	440-480	450-500
Setting time(min) (GB201-2000)	Initial setting time	1:00-2:00	1:30-3:00	2:00-4:00	0:30-1:00	2:00-4:00		1:30-2:30



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附录A)	Final setting time	1 : 00-3 : 00	1 : 30-4 : 00	3 : 00-6 : 00	1 : 00-3 : 00	3 : 00-5 : 00		1 : 30-4 : 00
Compressive strength (MPa) (GB/T17671-1999)	6-8h	10-20	10-20	15-25	20-30	25-35		10-20
	24h	45-55	50-60	70-80	50-60	70-80		50-65
	72h	50-60	55-65	75-85	55-65	75-85		55-70