4. Activated Alumina / Hydraulic Alumina

Activated Alumina : Powder Shape

Typical Properties		Product	Powders				Chlomatography Grade	
			KC-501	A-11	AC-11	AC-12R	KCG-30	KCG-1525W
Chemical Composition	L.O.I	[%]	4.5	4.0	4.5	4.5	3.5	3.5
	Fe2O3	[%]	0.01	0.02	0.02	0.02	0.02	0.02
	SiO2	[%]	0.02	0.02	0.02	0.02	0.02	0.02
	Na2O	[%]	0.45	0.26	0.26	0.26	0.26	0.26
	Al2O3	[%]	99.5	99.7	99.7	99.7	99.7	99.7
Physical Properties	True specific gravity		-	3.1	3.1	3.1	3.1	3.1
	Apparent specific gravity (Packed bulk density)	[g/cm3]	0.3	1.1	1.1	1.1	1.1	1.1
	Mean particle size	[μm]	1.5	40-50	80-100	100-200	40-50	80-100
	Specific surface area	[m2/g]	200	150	140	130	150	140
	Pore volume	[mL/g]	-	0.30	0.30	0.30	0.30	0.30
Packing	Paper Bag / PE Bag		-	25kg	25kg	-	-	-
	Pail Can		5kg	-	-	15kg	15kg	15kg
	Drum		50kg	-	-	180kg	-	-

Easy to be adsorped ↑	organic acid	PO_4^{-3}	F^-
	water		
	alcohol	F^-	
	amine		
	mercaptan	$[Fe(CN)_6]^{-4}$	
	aldehyde		Cl^-
	ketone	SO_4^{-2}	
	ester		
	ether	$[FE(CN)_6]^{-3}$	
	aromatic hydrocarbon	$Cr_2O_7^{-2}$	
Difficult to be adsorped ↓	sulfide		Br^-
	organic halogen	Cl^-	
	unsaturated hydrocarbon	MnO_4^-	
	saturated hydrocarbon	ClO_4^-	I^-

Activated Alumina can be used as an adsorption refining agent, especially to refine non-polar solvents.

In general, the more polarity and heavier molecular weight, the better adsorption effect would be obtained.

Adsorption order example as follows.
-SO3H > -COOH > -OH, -NH2, -SH > -CHO
> -CO > -COOR > -S-, -O- > -X
> Unsaturated hydrocarbons
> Saturated hydrocarbons

Adsorption performance can be measured in terms adsorption rate and transmitting rate of the picric acid by sending a benzene solution of picric acid through a column filled with activated alumina.

Activated Alumina : Spherical (KH)

Typical Properties				Product	KHS	KHA		KHO			KHD	
					-46	-46	-24	-46	-24	-12	-46	-24
Appearance	Form				Spherical							
	Color				White							
	Particle Size		[mm]		4-6	4-6	2-4	4-6	2-4	1-2	4-6	2-4
Chemical Composition	L.O.I		[%]		3.5	1.9		1.5		2.4	5.4	
	Fe2O3		[%]		0.02	0.02		0.02			0.02	
	SiO2		[%]		0.02	0.02		0.02			0.02	
	Na2O		[%]		0.04	0.26		0.26			0.26	
	Al2O3		[%]		99.9	99.7		99.7			99.7	
Physical Properties	Bulk density		[kg/L]		0.60	0.73	0.74	0.80	0.83	0.85	0.82	0.86
	Pore volume		[mL/g]		0.64	0.51		0.43			0.38	
	Specific surface area		[m2/g]		155	150		140		190	270	
Mechanical strength	Attrition loss		[%]		0.3	0.4		0.4		0.2	0.2	
	Crushing strength		[daN]		17	26	13	33	18	5	30	16
H2O Adsorption	Effluent gas moisture		[gH2O/m3]								0.003	
	Adsorption Capacity	10% RH	[%]								5.3	5.5
		50% RH	[%]								13.6	14.8
		90% RH	[%]								34	34.1

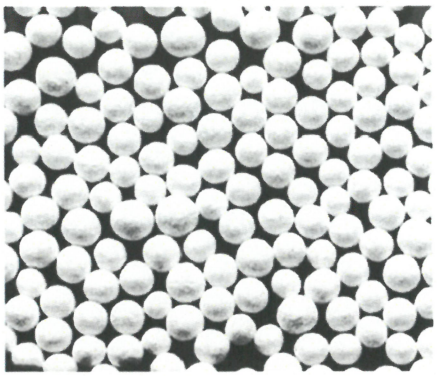
Packing					
	Drum	120kg	130kg	150kg	160kg
	Square Can	10kg	10kg	15kg -	15kg
	Paper bag	-	-	- 20kg	-

Activated Alumina : Spherical (NK)

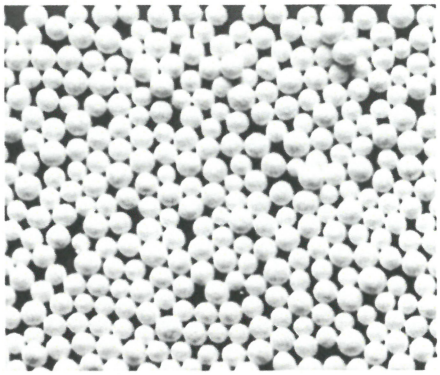
Typical Properties				Product	NKHD				NKHO	HD	FD
					-46	-24	-46HD	-24HD	-24	-13	-24
Appearance	Form				Spherical						
	Color				White						
	Particle Size		[mm]		4-6	2-4	4-6	2-4	2-4	1-2	2-4
Chemical Composition	L.O.I		[%]		6.4		5.9		1.8	6.1	6.3
	Fe2O3		[%]		0.02						
	SiO2		[%]		0.02						
	Na2O		[%]		0.26						
	Al2O3		[%]		99.7						
Physical Properties	Bulk density		[kg/L]		0.60	0.64	0.74	0.77	0.61	0.80	0.68
	Pore volume		[mL/g]		0.60		0.45		0.62	0.45	0.55
	Specific surface area		[m2/g]		300		290		170	290	280
Mechanical strength	Attrition loss		[%]		0.3		0.3		0.2	0.4	0.2
	Crushing strength		[daN]		10	5	30	16	5	5	7
H2O Adsorption	Effluent gas moisture		[gH2O/m3]		0.003		0.003				0.003
	Adsorption Capacity	10% RH	[%]		5.7	5.7	5.8	6.1			5.8
		50% RH	[%]		15.5	16.0	15.7	16.7			16.0
		90% RH	[%]		37.8	39.3	37.0	38.2			37.0

Packing							
	Drum	120kg		150kg		120kg	150kg	120kg
	Square Can	10kg		15kg		10kg	-	10kg

NK contains more macropores than KH and has larger pore volume and the weight is lighter.



KHD-46(Actual)



KHD-24(Actual)

Hydraulic Alumina

Typical Properties			Product BK-112
Chemical Composition	L.O.I	[%]	6.6
	Fe2O3	[%]	0.05
	SiO2	[%]	0.01
	Na2O	[%]	0.25
	Al2O3	[%]	99.7
Physical Properties	True specific gravity		3.0
	Apparent specific gravity (Packed bulk density)	[g/cm3]	1.0
	Mean particle size	[μm]	16

Packing		
	Drum	120kg
	Pail Can	10kg

An alumina powder with a large surface area and some crystal water.

Used as a binder for refractories instead of alumina cement due to large caking capacity and plasticity.

Condition/setting time of the hydraulic alumina and water mixture

Water Volume (g/100g-Al2O3)	Kneaded material condition	Setting Time* (min.)
60	Dry	-
70	Impossible to knead	-
75	Creamy	-
80	Creamy	15
90	Slurry with good fluidity	20

* Setting time is determined by JIS R 5210 needle penetration method (slurry thickness 38mm). Distance between the slurry bottom and the needle is 25mm.