SIGMA-ALDRICH

3050 Spruce Street
Saint Louis, Missouri 63103 USA
Telephone 800-325-5832 • (314) 771-5765
Fax (314) 286-7828
email: techserv@sial.com
sigma-aldrich.com

ProductInformation

ALUMINA
For column chromatography
Sigma Prod. Nos. A8753, A8878, A9003, A1772, A1647, A1522

CAS NUMBER: 1344-28-1
SYNONYMS: aluminum oxide, aluminum sesquioxide, activated aluminum oxide

PHYSICAL DESCRIPTION:

Appearance: white powder
Particle size: range 70-290 mesh (50-200 µm); most are "approximately 150 mesh".[3]
When slurried with water, each product has a characteristic pH range, as provided below. The designation "super" on Sigma indicates a higher surface area. For example, Type I has a surface area of about 155 m^2/g, whereas Super I has an activity of 200 m^2/g.

Prod. No.	A8753	A8878	A9003	A1772	A1647	A1522
Type	WA-1	WB-2	WN-3	WA-4	WB-5	WN-6
Surf. area	regular 155 m^2/g	regular 155 m^2/g	regular 155 m^2/g	super 200 m^2/g	super 200 m^2/g	super 200 m^2/g
pH range	4.2-4.6	9.1-9.8	7.0-7.5	4.2-4.6	9.4-10.4	7.3-8.0
% slurry	5%	5%	5%	10%	10%	10%

STORAGE / STABILITY AS SUPPLIED:

Alumina is extremely stable stored at room temperature. It does tend to adsorb moisture over time, so may require reactivation before use.

GENERAL REMARKS:

Alumina is essentially aluminum oxide, Al_2O_3, occurring in nature as minerals bauxite, bayerite, corundum, etc. The naturally occurring material has a melting point about 2000°C; the solid has a hardness of about 8.8 on the Mohs scale. Alumina is widely used as an adsorbent, desiccant, abrasive, electrical insulator and as a catalyst for various organic reactions.[1]

When aluminum hydroxide is screened for particle size and heated in a carbon dioxide stream at about 900°C, it is converted to individual particles of aluminum oxide that are coated with a thin layer of aluminum oxycarbonate (with the approximate formula: $[Al_2(OH)_5]_2CO_3 \cong H_2O$). The alumina particles are between 70-290 mesh (50-200 µm), and most are "approximately 150 mesh".[3] Water content and alkalinity are then adjusted by washing with dilute acids.

Aluminas used for column chromatography or thin-layer chromatography are treated with acid or base to adjust the pH of a 10% slurry (w/v in water) to acidic, basic or neutral pH. These are designated by A, B or N, respectively. Acidic alumina has approximate pH 4.5, basic alumina has approximate pH 10.[4]

Application notes:[5]

Alumina WB, or basic alumina, is the usual form, and is suitable for the chromatography of basic and neutral compounds that are stable to alkali, as well as for alcohols, hydrocarbons, steroids, alkaloids and natural pigments. It can cause polymerization, condensation and dehydration reactions. Neither acetone nor ethyl acetate should be used as eluants, the latter being subject to saponification.

Alumina WN, or neutral alumina, (less active than the basic form) is useful for separation of aldehydes, ketones, quinones, esters, lactones, and glucosides.

Alumina WA, or acidic alumina, is the weakest and least often used type. It is useful for separation of acid pigments and strong acids.

Activity adjustment:

For chromatography, alumina is usually used with organic solvents, and is treated with water to achieve different affinities, or activities, for specific uses. Sigma products are all activity #1, and water can be added to convert alumina to a lower activity grade:

For grade #	Add water to mass %
II	3%
III	6%
IV	10%
V	15%

Pipet the water into a clear, dry glass-stoppered flask and distribute it evenly on the walls by gentle rotation. Add the alumina and shake until moist spots and lumps are no longer evident. Since heat is evolved, wait until the mixture is cooled down before use or sealing the container. However, keep the container closed during storage so that the equilibrium conditions remain constant.[3]

REACTIVATION:

Alumina can be reactivated by dehydration at 360°C for five hours or overnight, then allowing the desired moisture content to be readsorbed.[6]

REFERENCES:

1. *Merck Index*, 11th ed., #359 (1989).
2. *Merck Index*, 11th ed., #360 (1989).
3. Supplier usage notes.
4. Sigma quality control and general information.
5. Gordon, A.J. and Ford, R.A., *The Chemist's Companion* (John Wiley & Sons, 1972), p. 371-375.
6. Shugar, G.J. and Ballinger, J.T., *Chemical Technicians' Ready Reference Handbook*, 3rd ed., (McGraw-Hill, Inc., 1990), p. 837.