ALUMINA

Dynamic Adsorbents' Aluminas
Analytical, Prep LC, Sample Processing

DAI's Alumina is at the forefront of Separation Technology. A major reason for the exponential growth in the use of alumina for chromatography has been our contribution to standardizing the manufacturing process. Our efforts have resulted in standardized grades of alumina having well controlled and defined:

1. Activity:
2. Constant Deactivation behavior
3. Controlled Chromatographic Parameters
4. Controlled Surface Area
5. Controlled Porosity
6. Ability to customize for specific applications

Alumina, by being **amphoteric** (acting either as a base or an acid as well as being configured as neutral) provides the chromatographer the ability to separate a multitude of compounds over and above silica gels. Alumina can act as a weak ion exchanger demonstrating anionic or cationic properties, while additionally acting as an adsorbent. Alumina, due to its unique biological characteristics, is a special adsorbent for use in separation sciences.

Super Activity I

Super Activity I Aluminas are unique as DAI's products; they provide twice the capacity compared to Standard Activity I; Surface modifications available are, "A" (Acid), "B" (Basic), and "N" (Neutral). Super Activity I Aluminas constitute the starting material for the Dynamic Adsorbents line of Aluminas. A special feature of Super Activity I is absolutely constant deactivation behavior which is valid for the deactivation process as well as when in contact with the chromatographic solvent.

Standard Activity I

Alumina Standard Activity I (Act I) is available with multiple surface modifications, A, B, and N, that facilitate the separation of a wide range of compounds. In addition to pH, the activity of the surface of Alumina can mediate the separation. Adjusting the activity can be altered by simply changing the water content of the alumina. (*Alternatively; other polar media can replace the water.*)

- Use high activity Alumina (Std Act I, Super Act I) for the separation of polar samples in nonpolar solvent systems ....and for the purification of solvents. (*see chart to the right*)
- Use lower activity Alumina for less polar samples.

(*See Deactivation Protocols in catalog*)

DCC Alumina

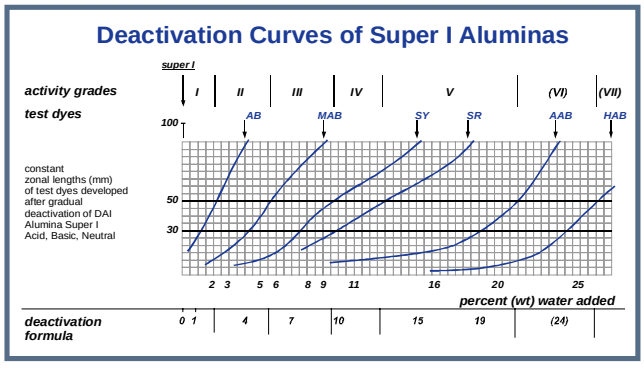
DCC - Dry column chromatography is a versatile Prep LC method that bridges the gap between analytical TLC and preparative column chromatography. (Request DCC Application Guide)

"Flash" Alumina

Flash Chromatography is a rapid Prep LC technique that facilitates the separation of 0.1-10g of material via simple economical laboratory protocols. (Request "Flash" Application Guide) 40 micron Flash grade is available in both bottles and drums.

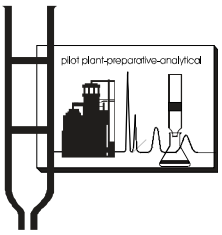
Activity II, III

Alumina II - III sorbents are economical adsorbents of medium activity. Use this material for general purpose scouting and in cases where the use of carbon black is precluded due to its organic nature. Also, use Alumina II - III as a replacement for organic/polymeric ion exchangers, especially when it is necessary to overcome temperature and radiation cleavage problems.



Symbols of test dyes on the deactivation curves:

AB	Azobenzene
MAB	Methoxy azobenzene
SY	Sudan yellow
SR	Sudan red
AAB	p-amino azobenzene
HAB	p-hydroxy azobenzene



Speciality Aluminas

Alumina C (for PCB Removal)

Alumina C is a chemically and physically modified Alumina for the analysis and removal of PCB's. This material has wide use and application in/for:

- Analysis
- Environmental Clean-Up
- Solvent Purification
- Electric Utilities: Transformer Oil
- Soil run off, Water Studies

(Request the Alumina Environmental Product Bulletin for other environmental applications)

Alumina for Dioxin Analysis

AL 5788 has been developed for doing dioxin analysis. It is a 50-200 micron particle.

Alumlna for Solvent Purification

Alumina is an ideal media for many solvent clean-up applications

(Please see "Solvent Purification" paper by M.L. Moskovitz)

Alumina for Pilot and Process

Based on DAI's expertise, Aluminas can be produced according to customer's specifications. They are used for batch processes as well as for production size chromatography. *(Please request information and technical assistance.)*

DRYSPHERE™

Desiccant For Gas And Liquid Dehydration

Drysphere™ is new high technology, ***dust-free***, spherical activated Alumina manufactured and designed to optimize Desiccant performance.
(Request the Drysphere™ Product Bulletin.)

AL 2000 - For Removal of Lead from Water

AL 2000 is a large particle (+200 micron) specially modified, chemically treated Alumina that has been designed for the removal of metal ions, especially dissolved lead and other cations from water. *(Request the AL 2000 Product Bulletin.)*

AL 2100 - Scavenger Alumina for Process Clean-up

Scavenger Activated Alumina is used for process scale removal of impurities. Its high macroporosity improves diffusion rates and the high surface area provides enhanced capacity.

AL 2300 - For Bio-Mass Clean-up

AL 2300 is designed for removing bio-mass in nutraceutical or natural product purification.

AL 5000 for Removal of LEAD and other Heavy Metals from Water

AL 5000 is a +50 micron spheriodal Alumina that can readily remove Lead and other heavy metals from Water. Metal Cation selectivity is Fe III> Cr III> Al III> Pb> Ag II> Zn II> Co II> Cd II.

AL 5005 for Decolorization

AL 5005 is a 50 micron spheroidal, macroporous high surface area, high performance Alumina, for the removal of color, dyes, and clean-up of water.

Alumina P for Pyrogen Removal

This material was developed specifically for the removal of Pyrogens in solution. Pyrogens are typically complex carbohydrates which preferentially sorb to Alumina P. Ideal for anti-biotic production and other types of bio-technology products.

Alumina R

Alumina R is an Alumina which is used for purifying, separatiing, and product formulations in the radio-active field; used for the production of various generators where one isotope is retained while the other is eluted. Mainly its improved exchange properties and the constant elution behavior will contribute to its reliability.

DRYSPHERE™

Uses:

- **Dehydration of solvents**
- **Dry Gases and Liquids, Gases: CO2, Acetylene, Air, Argon, Ethylene, Helium, Hydrogen, N2, O2, etc.**
- **Liquids: Benzene, CCl4, Ethylacetate, Hexane, Oil, Pentane, Transformer oils, Xylene, etc.**
- **Dehydrate acidic gases and liquids without softening or breakage.**

AL 5500 for Arsenic Removal from Water

AL 5500 is a specific macropore designed for the removal of arsenic from water or air vapor. Ideal for run-off water contaminated with arsenic.

AL 5900 Activated Wide-Pore Aluminas

Wide-Pore aluminas are available in various pore sizes up to a macropore of 1000Å. Ideal for Biotechnology, environmental, and petroleum uses.

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Aluminas

Deactivation Protocols

Introduction

Dynamic Adsorbents, Inc. Aluminas are unique products; e.g., Super I, Std Act I, etc: High activity Alumina is useful for eluting polar samples in nonpolar solvents, and for the purification of solvents. Lower activities of Alumina can readily be obtained by the addition of polar media, especially water. Thus, each problem can be resolved via the adjustment of the sorption system, as required for each problem.

Special Features

Super I Aluminas are twice as effective as compared to Standard Activity I. Super I does not have to be deactivated in steps. By following the appropriate deactivation curves, deactivation can be achieved in minute increments.

Deactivation Behavior

By the following procedures below, it is relatively easy to obtain the desired Activity.

Alumina Type	Super I	I	II	III	IV	V
Super I - A,B,N	0	1	4	7	10	19% Water Added
Std Act I - A,B,N	N/A	0	3	6	10	15% Water Added
A = Acid, B = Basic, N = Neutral						

Applications: Typical Chromatography Uses of Alumina

Application	Description of Application	Recommended Alumina
ALKALOIDS	Isolation from ergot-, opium-, rauwolfia-, and other alkaloids	Basic, medium activity, Specialty
ANTIBIOTICS	Isolation, purification	Neutral
ESSENTIAL OILS	Removal of terpenes	Basic, Neutral
PLANT EXTRACTION	Isolation of active substances	Basic, Neutral, Acid
DEHYDRATION OF ORGANIC SOLVENTS	Use in HPLC solvents, removal of H2O	Basic. highly active Drysphere™
ENZYMES	Purification	Neutral
GLYCOSIDES	Isolation of digitalis-, strophantus-, glycosides, etc.	Neutral
REMOVAL OF LEAD	Cations from water	See Specialty Types
HORMONES	Isolation and purification of synthetic products, of ketosteroids from neutral materials. etc.	Neutral
PURIFICATION OF ORGANIC SOLVENTS	for analytical and technical purposes	Basic, highly active
OILS	Clarification of fatty oils, separation of fatty acids	Basic
PCB'S	Remove from solvents, Transformer oils	Alumina "C "
REMOVAL OF PEROXIDES	from organic solvents	Basic, highly active
REMOVAL OF PYROGENS	from injectable solutions and infusions	Alumina P
TAXOLS AND NEUTRACEUTICALS	Various medicinal extracts from plants, etc.	Alumina Biomass & Decolorization

Adsorbents of Interest

Superior Adsorption

Alumina	
30 Parameters for Selectivity	
A.	**3 pH ranges: acid, basic, and neutral**
B.	**2 surfaces areas for standard Chromatography…Alumina: 150 m^2/gm and 200 m^2/gm**
C.	**5 Brockman activity ranges: I, II, III, IV, V**

VERSUS

Standard Adsorption

Silica Gel	
Parameters for Selectivity	
A.	**pH ranges 6.5 to 7.5** Limited range
B.	**2 Brockman activity ranges: I and II**

Not in the equation are the different pore diameters that can be produced for both Alumina and Silica Gel
40 Å, 60 Å, 100 Å, and up to 1000 Å

Alumina

Dynamic Adsorbents, Inc. Aluminas are manufactured and Quality Assured providing world class Laboratory and Pilot Process chromatographic materials. We control the manufacturing process from raw material to finished product, unique in our industry.

We carefully control the physical characteristics of pore size, surface area, particle size and surface chemistry to ensure reproducible optimized chromatographic behavior for:

- k' - uniform capacity
- - reproducible selectivity
- R_S- improved resolution
- N - excellent performance

Careful attention is paid to quality control procedures reproducible performance regardless of the technique used, especially when transferring from one technique to another.

Technique

- "Flash" Chromatography
- Column Chromatography
- DCC - Dry Column Chromatography
- Large Column Chromatography
- TLC, HPTLC, HPLC

Application

- Prep LC. Request "Flash",
- DCC, Application Guide(s)
- Pilot - Prep - Process
- Analytical QC Methods Development

Prep LC

Flash Chromatography

"Flash Chromatography" is a rapid form of preparative column chromatography- Prep LC based upon "an air pressure driven hybrid of medium and short column chromatography optimized for rapid separation." This approach was pioneered by W.C. Still at Columbia University, and described in J. Org Chem 43, 2923 (1978). Separation was based upon the relatively inexpensive apparatus used.

Flash chromatography is typically used to prepare 0.1-10.0 g of material in less than 15 minutes and is especially useful when the differences on TLC are greater than 0.15 Rf units. Clearly, Flash Chromatography is a simple and economical approach to Prep LC.

Sorbent Selection

Use an analytical TLC plate to scout for the best solvents and to optimize separations. The desired Rf of the component should be 0.35 with a sRf of 0.15. Use Dynamic Adsorbents' TLC plate, Alumina, 20x20, Cat. #82101, or Alumina F-254, 20x20 Cat. #82111.

The following Dynamic Adsorbents' "Flash" Alumina Sorbent Catalog #'s are recommended: 02061-25, 02061-05, 02061-1, 02826-5 series Flash grade Alumina.

Column Selection

Select a column that is 10, 20, 40 mm id based upon preparative requirements. Indeed, Prof. Still et al offered this selection table.

Sorbent

Results were less than acceptable when large 63-200 microns (70-230 mesh) material was used, but remarkably improved when a mean of 40 micron (32-63 micron) material was in the column. Equally important: particle sizes less than 40 microns offered no significant improvement in resolution in this system. Ideally, use Dynamic's "Flash" Alumina 40 micron Cat. #02061-25.

Apparatus

The column is a flat bottom 18 inch glass tube fined with a Teflon stopcock and topped with 24/40 standard taper glass joint, "Columns without frined glass bed are generally preferred because they have less dead volume than the standard fritted type." Stills' group described the flow controller as a "simple variable bleed device."

Wide-Pore Alumina

Wide pore Alumina 300 ang., 500 ang. and 1000 ang are available, (*Please inquire for particle distribution and price)*.