

# Activated Alumina “The Miracle Substance”

## Surpassing Silica Gel for Separation and Purification

by Amanda Pelley

For decades silica gel has been the primary adsorbent agent for separating and purifying compounds using the technique column chromatography; however, silica is far from ideal. The adsorbent has always been subject to many limitations, inhibiting its use in unfavorable conditions. An independent lab test has recently discovered activated alumina to be the superior adsorbent for the purification and separation for a spectrum of both novel and well characterized applications and processes. Activated alumina's advantages begin with the material's ability to be used with a mixture of neutral, acidic and basic compounds; additionally it demonstrates superior performance characteristics surpassing silica gel in critical categories such as consistency and purity.

Activated alumina outperforms silica in versatility and consistency because it possesses superior amphoteric properties, much higher pH pzc values and remains stable throughout different pH phases. Activated alumina does not degrade at either high pressure or high temperature in demanding HPLC settings, possesses Lewis acid sites for superior bonding to acidic materials and additionally has a strong affinity for halides. By offering these superior chemical properties, activated alumina surpasses silica in performance and will ultimately set the new standard for how chromatographers are separating and purifying their compounds.

- **Alumina Displays Superior Amphoteric Properties**

Amphoteric is a term used to describe the capacity to act as an acid or a base. This superior characteristic permits activated alumina to act as a weak ion exchanger; in doing so it allows the adsorbent to have a relationship with both cation and anion exchange over a broad pH range. Conversely, silica gel only permits singular cation exchange due to its low pH pzc (a term used to describe when the electrical charge density on a surface is zero). Activated alumina is the most desirable amphoteric ion exchanger due to its many enviable ion exchange properties. The material has a particularly rigid structure permitting little swelling or shrinkage when used in water or solutions containing electrolyte and organic modifiers; it also shows superior resistance towards radioactivity and oxidizing and reducing agents.

- **Alumina Remains Stable Throughout Different pH Phases**

The material remains stable throughout the pH range of 2-13, while silica often experiences complications with column collapse at extreme pH levels due to its dissolution.

- **Alumina Sustains High Temperature HPLC and More ...**

Alumina has the ability to sustain high temperature HPLC, whereas silica experiences limitations at the same HPLC because of its low stability at alkaline pH values. Support systems such as polymer-based packing material with alkyl backbones, perfluoralkyl acrylate, polystyrene divinylbenzene and modified polystyrene polymers have therefore been evaluated; however, activated alumina outperforms them all because it contains a higher isoelectric point, allowing it to overcome difficulties silica often experiences. Furthermore, though activated alumina is the superior material for use in the HPLC stationary phase for adsorption, it maintains its superiority when used after modification in reverse phase HPLC. This remarkable feature of activated alumina remains unknown to most professionals in the

separation sciences.

- **Alumina Possesses Lewis Acid Sites**

Alumina possesses Lewis Acid Sites allowing ligand exchange in biochemical reactions.

- **Alumina Has a Strong Affinity for Halides**

Activated alumina has a strong affinity for halides which allow it to elute excess concentrations such as fluoride from drinking water as well as the removal of other environmental toxins from surface and groundwater supplies such as arsenic and selenium.

These chemical properties have not gone unnoticed by environmental and separation scientists. Activated alumina provides superior adsorbent capabilities when used to bind and detoxify some of the worlds most dangerous chemicals. Currently, specialized forms of activated alumina are finding their way into the isolation and removal of such environmental hazards as polychlorinated biphenyls (PCBs), insecticides, radioactive contamination, lead, toxic waste, heavy metals, colors or dyes and chemical pyrogens.

Several companies sell activated alumina for separation and purification, however, only Dynamic Adsorbents Inc. offers activated alumina products in specialized and customized formats that are designed to meet the distinct and unique needs of specific applications. The company precisely controls the physical characteristics of pore size, surface area, particle size and surface chemistry resulting in specific alumina solutions for specific applications. Such customized products complimented by the best quality alumina in the marketplace, allow DAI to achieve its claim of guaranteed customer satisfaction.

Most customized orders of alumina at DAI are ready to be shipped within 24-hours of order placement. Products are shipped globally from the central warehouse and storage facility in Atlanta, GA.