

THE RESTEK ADVANTAGE

Turning Visions into Reality™

2005 vol. 1



new! Viva™ HPLC Silica: Ideal for Separating Large Molecules

New Wide Pore Silica, Designed and Manufactured by Restek

by Vernon Bartlett, HPLC Manager, Bruce Albright, HPLC Chemist, and Rebecca Wittrig, Ph.D., HPLC Product Marketing Manager

- 67% of available surface area can interact with proteins, peptides, other large molecules.
- Larger surface area than other commercially available 300Å materials.
- Manufactured by Restek, quality controlled by Restek.



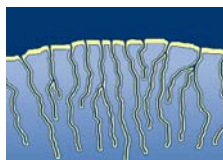
Numerous HPLC grade silica materials currently are available in the marketplace, but these silicas differ greatly from one manufacturer to

another. Some of the most important factors affecting the selectivity of a substrate are surface area, pore volume, and pore diameter distribution. We have determined these physical properties of our new Viva™ 300 Ångstrom silica, and have compared this silica to other commercially available 300Å silicas.

Of the silicas tested, Viva™ 300Å silica shows the largest available surface area and the greatest percentage of pores narrowly distributed around a mean diameter of 300Å (Table I). These characteristics ensure greater accessibility to larger molecules, relative to other materials. They also are important because silicas with excessive numbers of pores smaller than 200Å can become more easily fouled with larger molecular weight debris, and silicas with excessive numbers of pores larger than 500Å can be impractically fragile for conventional HPLC applications.

Figure 1 depicts a typical porous silica particle. In general, as the number of pores in a silica increase, surface area and pore volume

Figure 1 A typical porous silica substrate: as the number of pores increase, surface area and pore volume increase.



increase. Also, as pore width increases, pore volume increases. For a fixed pore volume, materials having the smallest pore diameters have the largest available surface area (Table II). While smaller pores (e.g., 60Å) maximize retention of small molecules,

larger pores are necessary when analyzing higher molecular weight analytes, such as proteins and peptides, because retention will be maximized if an analyte can enter into the pores of the material. Theoretically, the more pores to which an analyte has access, the longer the retention. For analytes with molecular weights greater than 3000, silica materials with pore diameters in the 250-350Å range, or larger, should yield the highest retention. In addition, a narrow pore diameter distribution is desirable,

Table I Viva™ silica has the highest percentage of available surface area from 200-300Å pores, allowing the greatest interaction with large molecules.

| Silica | Total Surface Area (m ² /g) | % of Total Surface Area | | |
|------------|--|-------------------------|----------|-------|
| | | <200Å | 200-300Å | >300Å |
| Viva™ 300Å | 128.0 | 2.5 | 67.3 | 30.2 |
| (7) 300Å | 51.8 | 65.6 | 18.5 | 15.9 |
| (6) 300Å | 87.2 | 53.6 | 22.2 | 24.2 |
| (5) 300Å | 105.8 | 56.3 | 22.3 | 21.4 |
| (3) 300Å | 83.5 | 40.5 | 24.5 | 35.0 |
| ("B") 200Å | 231.5 | 66.1 | 33.1 | 0.8 |
| ("B") 300Å | 118.1 | 8.3 | 34.3 | 57.4 |

in this issue

| | |
|--|-------|
| New Viva™ 300Å Silica for Large Molecules | 1-2 |
| Parts for Dionex ASE® Systems | 3 |
| New Solid Phase Extraction Tubes for Nitrosamines | 3 |
| Combine Primary and Confirmation GC Analysis of Organochlorine Pesticides | 4-5 |
| Restek Seminars for 2005 | 5 |
| Superior Storage and Transfer of Sulfur Compounds | 6-7 |
| Nine-Minute GC/MS Analysis of Semivolatile Organics | 8-9 |
| High-Resolution GC/MS of Dioxin or Furan Congeners | 10 |
| Stable, Low-Bleed Rtx®-XLB Columns | 11 |
| Enhanced Rtx®-IPONA Column for Detailed Hydrocarbon Analysis | 12 |
| New GC Column for PCB Congeners or Aroclor® Mixes | 13 |
| Fast GC/MS Analysis of Semivolatiles | 14 |
| Unique GC Column for Rapid Analysis of Semivolatiles | 15 |
| New Mixes: Chlorination Disinfection Byproducts & Solvents, Halogenated Pesticides | 16-17 |
| GC/ECD Analysis of Chlorophenoxyacid Herbicides | 18-19 |
| Injection Liners, O-Rings, Liner Seals; Injector and Detector Parts | 20-21 |
| Reliable Restek Connectors for Capillary GC | 22 |
| EZ No-Vent™ GC Column-MS Connector for Varian Systems | 23 |
| 2005 Restek Catalog Available Now | 24 |

because this can aid in separating closely related analytes that differ only slightly in hydrodynamic size (size in solution). In developing Viva™ silica, we found some "wide pore" materials do not possess sufficiently large pore volume in the pore diameter range needed for effectively separating large molecules.

Table II For a fixed pore volume, the smaller the pores in a silica particle, the larger the surface area.

| Pore Diameter (Å) | Surface Area (m ² /g) |
|-------------------|----------------------------------|
| 60 | 300-600 |
| 100 | 150-300 |
| 200 | 75-150 |
| 300 | 50-75 |
| 500 | 30-40 |
| 1000 | 20-30 |

In addition to our Viva™ 300Å silica, we evaluated 300Å materials from five other vendors, and one 200Å material, determining pore characteristics and surface area for each. We used nitrogen gas porosimetry, BET measurements¹, and BJH calculation² to determine the surface area,

pore volume, and pore diameter distribution of each material. Figures 2 and 3 show the pore volume and pore area for each material; Table I indicates the available surface area for a given pore diameter range. Viva™ 300Å silica shows, by far, the greatest available surface area rep-

resented by 200-300Å pores. None of the other materials evaluated comes close to the 67.3% value obtained for Viva™ 300Å silica.

In selecting a wide pore material, it is important to know the available surface area, the pore volume, and the pore diameter distribution, because these are the critical factors in determining retention. The exceptionally large available surface area of Viva™ 300Å silica, and a highly desirable pore volume and pore diameter distribution, will help ensure effective retention of peptides, proteins, or other large molecules, making Viva™ 300Å products an excellent choice for your analyses.

References

1. Barton, T., et al., *Tailored Porous Materials* Chem. Mater. 11: 2633-2656 (1999).
2. Webb, P.A. and C. Orr, *Analytical Methods in Fine Particle Technology* Micrometrics, Georgia, 1997, pp. 53-152.

Figure 2 Pore volume vs pore diameter for commercial wide pore silicas (BJH desorption). Only Viva™ silica has a sharp distribution around 300Å. (Change in scale for plots at right.)

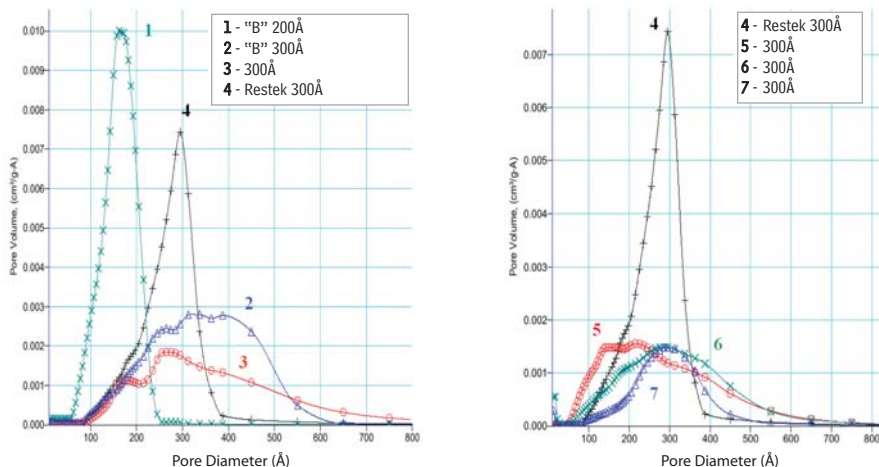
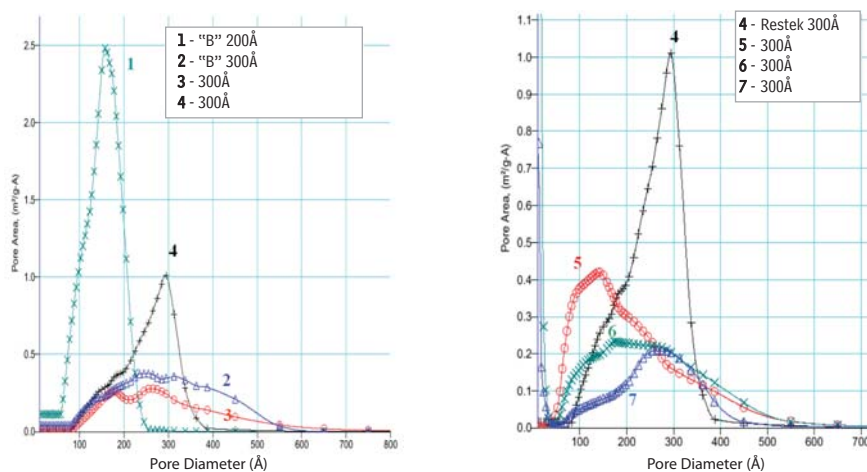


Figure 3 Pore area vs pore diameter for commercial wide pore silicas (BJH desorption). Viva™ silica shows a highly desirable distribution. (Change in scale for plots at right.)



free literature
HPLC Columns and Accessories

General-purpose and unique special-purpose columns, guard columns, column kits, and bulk materials, plus instrument parts, innovative tools, accessories, and many example chromatograms. Our five silicas have characteristics tailored to meet specific analytical requirements. Request lit. cat.# 59241B (100 pages).

Viva™ Wide Pore C18 Columns

| Length | 3.2mm ID cat.# | 4.6mm ID cat.# |
|--------------------|-------------------|-------------------|
| 5µm Columns | | |
| 100mm | 9514513 | 9514515 |
| 150mm | 9514563 | 9514565 |
| 250mm | 9514573 | 9514575 |

Viva™ Wide Pore Silica Columns

| Length | 3.2mm ID cat.# | 4.6mm ID cat.# |
|--------------------|-------------------|-------------------|
| 5µm Columns | | |
| 100mm | 9510513 | 9510515 |
| 150mm | 9510563 | 9510565 |
| 250mm | 9510573 | 9510575 |

Viva™ wide pore silica packings are available in bulk. Please inquire: 800-356-1688 or 814-353-1300, ext. 4, or contact your Restek representative.

ordering note

For guard columns for Viva™ wide pore columns, refer to our current catalog, or visit our website.

To order a 3.2mm or 4.6mm ID column with a Trident™ Integral Inlet Fitting, add "-700" to the catalog number for the column.
Nominal additional charge

Example:
100mm x 4.6mm ID Viva™ Wide Pore C18 column with Trident™ Integral Inlet Fitting: 9514515-700