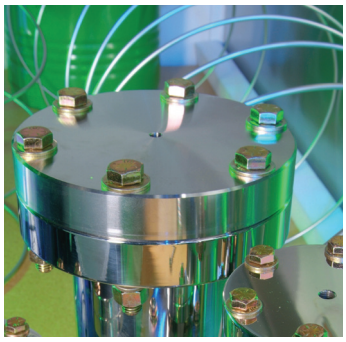
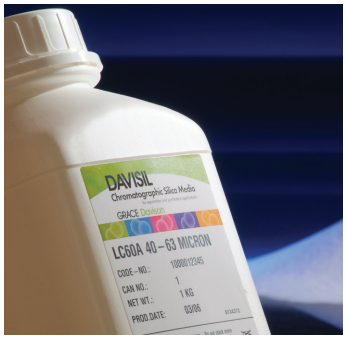
Davisil® Chromatographic Silica





- Improved Performance
- Predictable Scale-Up
- Exceptional Product Reliability
- Greater Selection
- Unmatched Technical Support

GRACE
Materials Technologies

Improved Performance

Davisil® silica's chemical and structural properties are optimized for chromatographic performance. Tight control of these properties from raw material to finished product in addition to real time monitoring of production processes distinguishes Davisil® silica and ensures consistent performance.

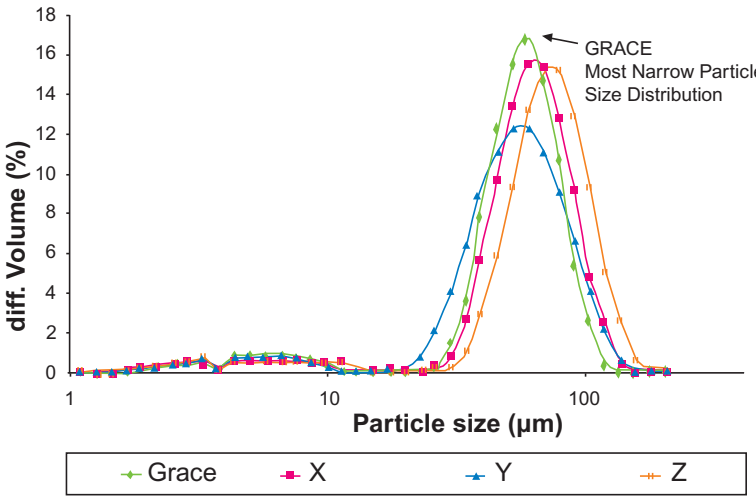
High surface area increases loading capacity.

Company	Surface Area	Bulk Density	Surface Area of 1L Column
Grace	550m²/g	420g/L	231,000m²/L
X	515m²/g	430g/L	221,450m²/L
Y	460m²/g	430g/L	197,800m²/L
Z	450m²/g	450g/L	189,000m²/L

High purity silica reduces unwanted and unpredictable interactions that cause contamination and poor reproducibility.

Company	Mg	Ca
Grace	25ppm	19ppm
X	27ppm	207ppm
Y	119ppm	793ppm
Z	212ppm	1775ppm

Particle Size Distribution*



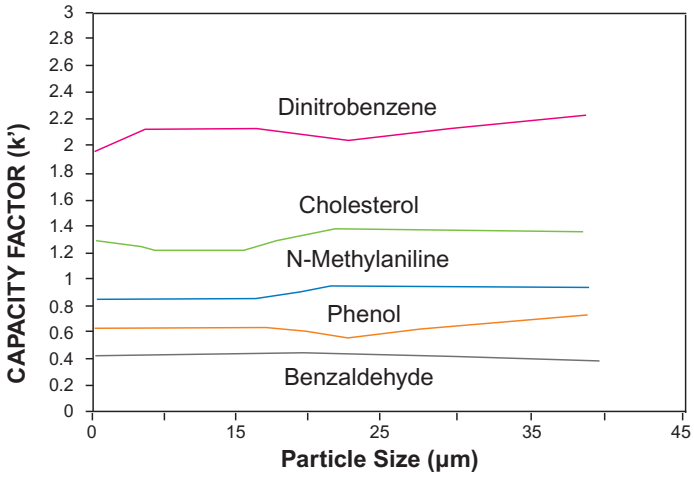
Tight particle size distribution optimizes efficiency and pressure drop in packed columns.

*All comparative data generated on chromatographic silica labeled 60Å, 40-63µm.

Predictable Scale-Up

Hundreds of tons of Davisil® chromatographic silica are manufactured per year in multi-ton lots. Our manufacturing is at scale, so you can be confident that Davisil® silica will yield consistent chromatographic performance as particle size and volume are increased.

Capacity and Selectivity

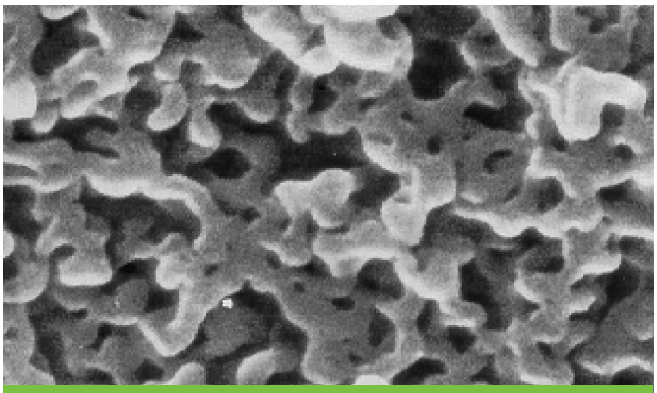


Uniform capacity (k') and selectivity (k') factors across all particle sizes for predictable and reliable scale-up

Exceptional Product Reliability

Manufactured for over 25 years, Davisil® chromatographic silica is one of the world's most widely used chromatography sorbents.

Davisil® silica is produced at two ISO-9001 certified facilities under strict QC controls from raw material to finished product. Each step in the production process is closely monitored to proactively eliminate discrepancies and better ensure high lot-to-lot finished product reproducibility and tightly controlled specifications.



XWP Silica 1:50 000

Surface Area & Pore Volume: +/- 10% lot to lot

A Wide Range of Media Options

Greater Selection

A wide range of Davisil® silica grades are available from 1kg to multi-ton quantities to meet your application, performance, and economic requirements.

Compared to 60Å silicas traditionally used for small molecule purification, the newly developed 35Å Davisil® silica has higher surface area. This can lead to up to 50% greater loading capacity and 50% reduction in solvent consumption making purification more productive with less impact on the environment.

The 4500Å Davisil® silica grade is especially designed for large molecules commonly purified in bioprocessing.

Product Range

- *Available in both normal phase bare silica and various bonding chemistries (C18, Amino, Diol, Cyano) for alternative selectivity.*
- *Wide selection of distinct pore diameters (30Å – 4500Å) for separation of a wide range of MW sizes.*
- *Available from 1kg to multi-ton quantities.*
- *Grace not only offers media for process purification but also column hardware, packing equipment, and process HPLC systems for optimized chromatographic performance.*

Davisil® normal phase silica functions through hydrophilic interactions, with **more polar compounds** generally retained longer. This makes it ideally suited for purification of:

- **Chemical Synthesis Intermediates**
- **Oils and Fats**
- **Natural Products**

Characteristic	Nominal Pore Size 35Å	60Å	150Å	250Å	500Å	1000Å	1500Å	2500Å	4500Å
Surface Area (m^2/g)	700	550	330	285	80	40	25	17	10
Pore Volume (mL/g)	0.6	0.9	1.2	1.8	1.1	1.1	1.1	1.1	1.1
pH (5% suspension)	5.7	7.3	7.3	7.5	8.0	9.0	9.0	9.0	9.5
H_2O (weight %)†	<6%	<6%	<6%	<6%	<6%	<6%	<6%	<6%	<6%
Bulk Density (kg/m^3)	720	530	350	210	370	370	370	370	370

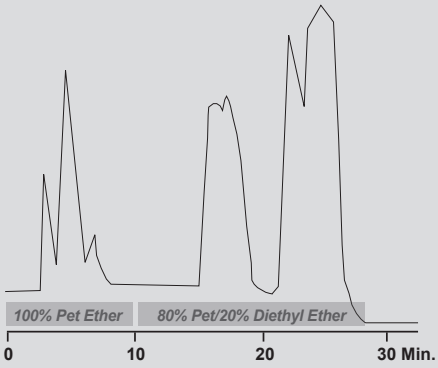
†Moisture content (% H_20) can be tailored (increased or decreased) to meet customer requirements.

Unmatched Technical Support

To better serve our customers, Grace can provide advice, technical assistance, laboratory trials, and column packing services for prep and process-scale chromatography. Our field representatives can perform installations and support your technical requirements on site, as well as recommend purification solutions and discuss the ability to customize grades tailored to your specific needs.

Ideally Suited for Challenging Applications

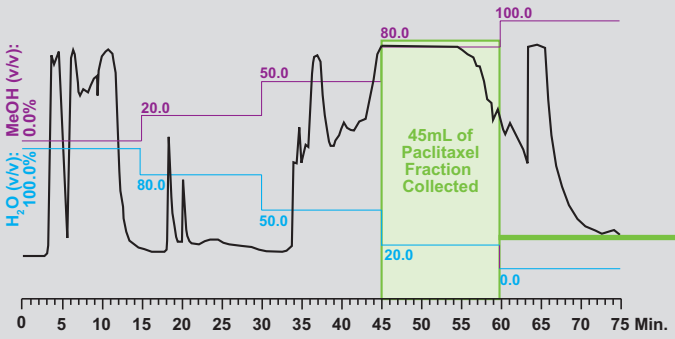
Organic Synthesis Clean-up

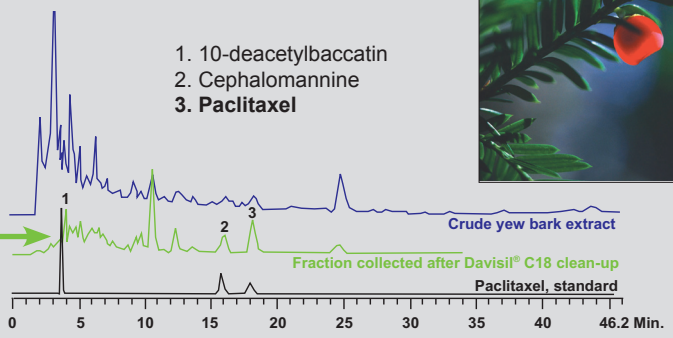


Sample: 1g reaction products
Column: 50 x 500mm
Column Packing: Davisil® LC60Å 20-45µm silica
Mobile Phase: See chromatogram
Flow Rate: 175mL/min (535cm/hr)
Detection: UV 254nm

Davisil® silica purification of a schiff base from a crude reaction mixture containing aldehyde, amine and other by-products. The superior separation and loading capacity shown at the pilot scale allowed scale-up to a 300mm diameter column producing over 90g of purified product per run.

Natural Products Purification





Column: 10mm i.d. x 200mm
Packing: 10g Davisil® C18 silica (cat# 633NC18E)
Mobile Phase: Methanol:Water step gradient as shown above
Loading Volume: 2mL
Detection: UV@230nm

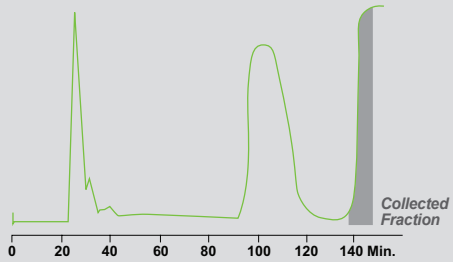
Analytical Column: Denali® C18, 5µm
Mobile Phase: A:38% Acetonitrile, **B:**42% Water, **C:**20% Methanol
Flow: 1.0 mL/min
Detection: UV@230
Injection Volume: 10µL

Analytical analysis of the collected fraction purified using Davisil® C18 silica compared to the crude Yew bark extract and Paclitaxel standard. The moderately polar target Paclitaxel was effectively retained and enriched while the majority of crude impurities were removed from the extraction sample.

ⓘ ***For More Information, Request Application Note M191***

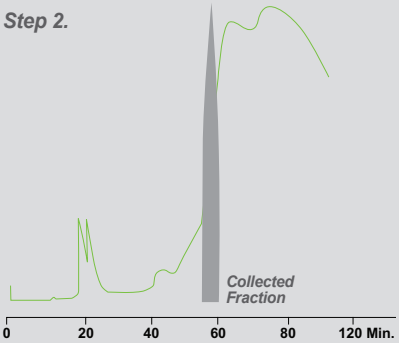
Vitamin E Purification

Step 1.



Sample: 250g tocopherol isomer mixture in 1000mL hexane
Column: 200 x 500mm Davisil® LC60Å 20-45mm
Mobile Phase: hexane/2.5% THF
Flow Rate: 600mL/min (115cm/hr)

Step 2.



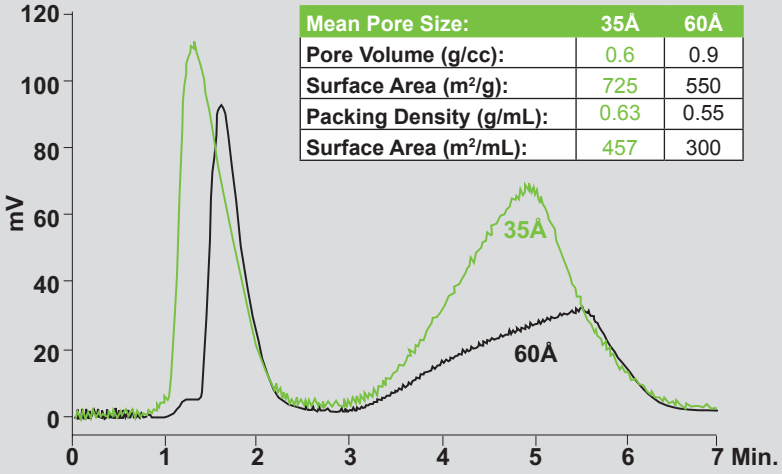
Sample: Pooled fraction from run shown in Step 1
Column: 50 x 500mm Davisil® LC60Å 20-45mm
Flow Rate: 50mL/min (155cm/hr)

Loading studies showed that in overload conditions, the large amount of the γ-isomer adversely affected the chromatography of the desired β-isomer. Therefore, a two step strategy was developed. In the first step, the tocopherol β-isomer was separated. The second step was rechromatography of the β-isomer enriched tocopherol. The resulting product was >93% pure.

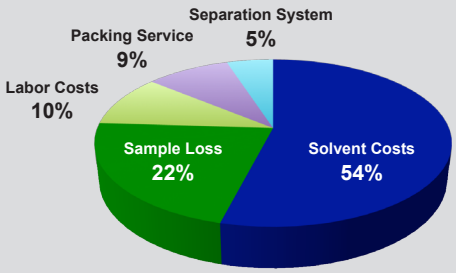
Use Less Media and Solvent with New 35Å Davisil® Media

35Å Media has Higher Surface Area and Packing Density Resulting in Up to 50% Higher Capacity

Mean Pore Size:	35Å	60Å
Pore Volume (g/cc):	0.6	0.9
Surface Area (m^2/g):	725	550
Packing Density (g/mL):	0.63	0.55
Surface Area (m^2/mL):	457	300



Solvent is a Significant Contributing Factor in the Overall Cost of Purification



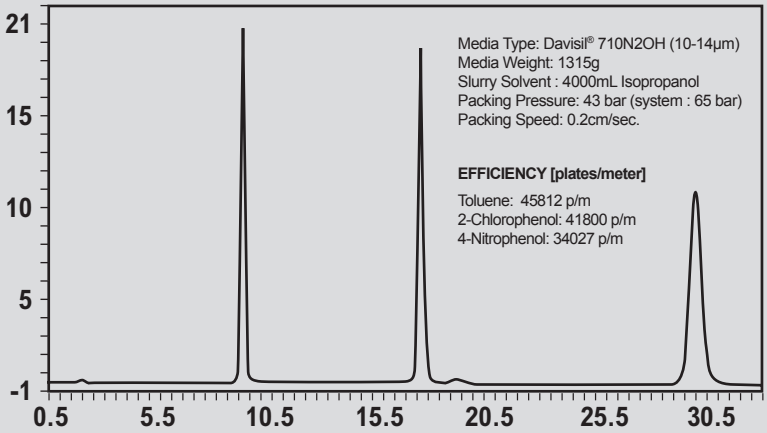
With 35Å Davisil® media, solvent consumption can be substantially reduced compared to 60Å media (~50%). Switching to a small-pore 35Å high-surface area media can be a simple way to help comply with environmental, increased productivity, and cost-reduction initiatives.

This overlay shows that twice the mass of Dimethyl Phthalates (13.6mg vs. 6.8mg) can be chromatographed with the same peak width using a 35Å Davisil® media. To achieve the same purification capacity as a 60Å media, half the column size, significantly less solvent, and much less time is required on a 35Å media for the same amount of target molecule. In addition to the increased capacity, the concentration of the collected fraction is twice as high leading to a 50% reduction in impurities coming from the solvent after evaporation. This can also allow process chromatography to be performed on a smaller system.

ⓘ ***For More Information, Technical Poster PP227***

Multipacker® System and Spring® Columns Enhance Performance

Davisil® Efficiency Test with 4" i.d. Spring® Column Shows Similar Performace to Columns Packed with Spherical Media



Signal	No.	Substance	Ret. Time	Height	Peak Area	Plate Count	Asymmetry
UV	1	Toluene	9.33min	20.71	210.75	15576	1.250
	2	2-Chlorophenol	17.38min	19.43	398.86	14212	1.152
	3	4-Nitrophenol	29.81min	11.48	469.65	11569	1.119

MODcol® Multipacker® Column Packing System

With the MultiPacker® packing station, the Dynamic Axial Compression (DAC) mechanism remains contained within the column. It is the only truly mobile DAC column, and the packing system gives the ability to pack multiple columns with a single unit for extended versatility and productivity.

MODcol® Spring® Columns

Spring® columns incorporate our patented internal DAC technology. DAC eliminates voids and increases peak symmetry, column lifetime, reproducibility, and overall efficiency.

With irregular silica and even other fragile media, the Spring® column compression mechanism gently eliminates voids without damaging media to maintain superior performance. The combination of a high purity silica with the unique Spring® column technology achieves results close to those only possible with spherical silicas. Unlike competitive systems, the DAC mechanism is contained within the Spring® column itself for truly mobile operation free from the packing device. To further extend versatility (especially for screening multiple media in process development) you can pack multiple columns with a single Multipacker® system.

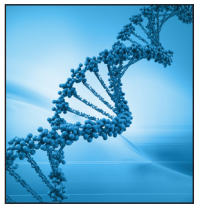
ⓘ ***For More Information, Request Technical Note M301A***

Davisil® Silica Selection Information

Application Areas:







Pore Diameter	30Å	35Å - 150Å			250Å - 4500Å
Industry:	**Petrochem**	**Pharma**	**Food & Cosmetics**	**Chemicals**	**Biotech**
Applications:	• ASTM Methods • Hydrocarbon Analysis	• Vitamins • Antibiotics • Vaccines • Oil-based APIs • Organic Synthesis • Nutraceuticals	• Oils and Fats (Polar Impurity) • Natural Products • De-colorization	• Pesticides • Lipids • Chemical Synthesis	• Vaccines • DNA • Enzymes • Carriers • Biomolecules

Davisil® Media Selection Guide

Many packings are suitable for a given application. Use the information below as general guidelines for media selection. By following each of the three steps in sequence, the proper packing medium can be selected. Grace also offers Vydac® media specifically designed for peptides and proteins to complement the Davisil® media line

STEP 1 - Select **pore size** of media based on the molecular weight of molecule to be purified

Molecular Weight of Molecule	Pore Size of Media*
<350 MW ➲	**35Å**
<800 MW ➲	**60Å**
<15000 MW ➲	**150Å**
<100000 MW ➲	**250Å**
<250000 MW ➲	**500Å**
>250000 MW ➲	**1000Å-4500Å**

STEP 2 - Select **particle size** based on scale and system pressure.

System Pressure**	Particle Size of Media
65bar** ➲	**10µm**
20bar** ➲	**16-24µm**
15bar** ➲	**20-45µm**
5bar** ➲	**40-63µm**
2bar** ➲	**70-200µm**
<1bar** ➲	**>200µm**

STEP 3 - Determine **surface functionality** based on sample solubility and separation goals.

Solubility	Functionality
Non-Aqueous *(NP)*	**Silica**
Aqueous or Non-Aqueous *(NP, RP, HILIC)*	**Cyano**
	Diol
	Amino
Aqueous *(RP)*	**C18**

* Consideration of compounds being separated and bonded phase should be made when selecting the right pore size.

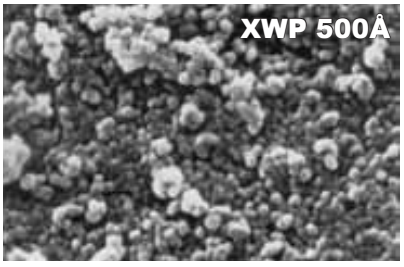
** 1 bar = 14.5037738 pounds per square inch.

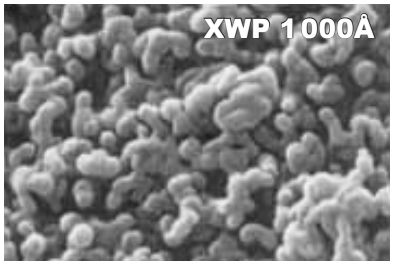
Unique Grades - Extra Wide Pore (XWP) Davisil® Silica

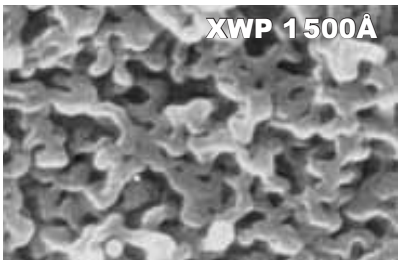
A cost effective solution for purification of large molecues such as nucleic acids, recombinant proteins, and vaccines.

- *Produced in a proprietary process.*
- *Ideal combination of large pore sizes with narrow pore size distribution.*
- *Good mechanical strength.*
- *Optimized for separation of large biological molecules in low, medium, or high pressure*

Davisil® XWP media has more available surface area and accessible pores than competitive options

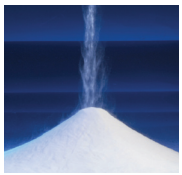






Ordering Information

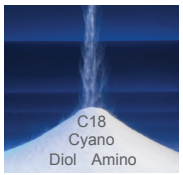
Davisil® Silica Unbonded Grades*



Davisil® Silica Unbonded Grades				
Pore size (Å)	Particle size (µm)	Description	Pkg Wt (kg)	Part No.
30 Angstrom				
30	50-100	Grade 921	50	5140213
30	75-150	Grade 923	25	5138973
30	1000-3000	LC30A 1000-3000	150	5016637
35 Angstrom				
35	10-14	LC35A 10-14	25	*Inquire*
35	10-14	LC35A 10-14	1	*Inquire*
35	40-63	LC35A 40-63	25	5156563
35	40-63	LC35A 40-63	1	5159092
60 Angstrom				
60	10-14	Grade 710NW	20	5136220
60	10-14	Grade 710NW	1	5153530
60	20-45	LC60A 20-45	25	5055349
60	20-45	LC60A 20-45	5	5094230
60	20-45	LC60A 20-45	1	5143588
60	40-63	LC60A 40-63	25	5054993
60	40-63	LC60A 40-63	5	5098468
60	40-63	LC60A 40-63	1	5134312
60	35-70	LC60A 35-70	25	5037849
60	35-70	LC60A 35-70	1	5152540
60	90-130	LC60A 90-130	80	5032927
60	30-200	LC60A 30-200	25	5152703
60	70-200	LC60A 70-200	25	5029213
60	70-200	LC60A 70-200	1	5149540
60	200-500	LC60A 200-500	25	5022298
60	1000-3000	LC60A 1000-3000	30	5058299
150 Angstrom				
150	10-14	LC150Å 10-14	15	5166880
150	16-24	LC150Å 16-24	20	5018962
150	35-70	LC150A 35-70	25	5057993
150	35-70	LC150Å 35-70	1	5134299
150	40-63	LC150A 40-63	25	5152611
150	30-200	LC150Å 30-200	25	5152702
150	70-200	LC150Å 70-200	25	5076059
150	70-200	LC150A 70-200	1	5152610
150	90-130	LC150Å 90-130	25	*Inquire*
150	90-130	LC150Å 90-130	1	5152503
150	100-300	LC150Å 100-300	70	5054067
150	315-500	LC150Å 315-500	25	5037727
250 Angstrom				
250	40-63	LC250A 40-63	15	5134301
250	40-63	LC250A 40-63	2.5	5134292
250	70-200	LC250A 70-200	15	5153368
250	70-200	LC250A 70-200	2.5	5153450
250	90-130	LC250A 90-130	15	5143160
500 Angstrom				
500	35-70	XWP500Å 35-70	20	5030057
500	35-70	XWP500Å 35-70	1	5143587
500	90-130	XWP500Å 90-130	20	5058842
500	90-130	XWP500Å 90-130	1	5152541
500	100-300	XWP500Å 100-300	20	5057050
1000 Angstrom				
1000	16-24	XWP1000Å 16-24	20	5134302
1000	16-24	XWP1000Å 16-24	1	5143585
1000	35-70	XWP1000Å 35-70	20	5034754
1000	35-70	XWP1000Å 35-70	1	5143586
1000	90-130	XWP1000Å 90-130	20	5093501
1000	90-130	XWP1000Å 90-130	1	5152504
1500 Angstrom				
1500	16-24	XWP1500Å 16-24	18	5070159
1500	90-130	XWP1500Å 90-130	18	5045931
1500	90-130	XWP1500Å 90-130	1	5143584
2500 Angstrom				
2500	90-130	XWP2500Å 90-130	20	*Inquire*
2500	90-130	XWP2500Å 90-130	1	5143590
4500 Angstrom				
4500	100-300	XWP4500Å 100-300	5	5154492

**Media stocking policies vary by demand and grade. For most up to date availability, please contact us.*

Davisil® Silica Bonded Grades*



Davisil® Silica Bonded Grades					
Pore size (Å)	Selectivity	Particle size (µm)	Description	Pkg Wt (kg)	Part No.
60 Angstrom					
60	C18	35-70	633NC18E	250g	5135414
60	C18	35-70	633NC18E	1kg	5134095
60	Cyano	35-70	633NCNE	250g	5135415
60	Cyano	35-70	633NCNE	1kg	5134224
60	Diol	35-70	633N2OH	250g	5135413
60	Diol	35-70	633N2OH	1kg	5135302
60	Amino	35-70	633NNH2	250g	5135416
60	Amino	35-70	633NNH2	1kg	5134096
60	C18	10-14	710NC18E	250g	5135418
60	C18	10-14	710NC18E	1kg	5135305
60	Cyano	10-14	710NCNE	250g	5135419
60	Cyano	10-14	710NCNE	1kg	5134223
60	Diol	10-14	710N2OH	250g	5135417
60	Diol	10-14	710N2OH	1kg	5135303
60	Amino	10-14	710NNH2	250g	5135420
60	Amino	10-14	710NNH2	1kg	5134682

Davisil® Scout Columns

Davisil® Scout Columns					
Pore size (Å)	Selectivity	Particle size (µm)	Description	Column Dimensions	Part No.
60 Angstrom					
60	C18	10	710NC18E	250 x 4.6mm	5145650
60	Cyano	10	710NCNE	250 x 4.6mm	5145651
60	Diol	10	710N2OH	250 x 4.6mm	5145652
60	Amino	10	710NNH2	250 x 4.6mm	5145653
60	Unbonded Silica	10	710NSI	250 x 4.6mm	5145654

Spring® DAC Columns

Spring® Column Complete Kits			
Description	25mm Diameter	50mm Diameter	101mm Diameter
40cm Length			
Non-Water Jacket Spring® Column	5110881	5111769	5152351
Water Jacket Spring® Column	5135940	5141096	-
Water Jacket ASFC Spring® Column	5136390	5135423	-
70cm Length			
Non-Water Jacket Spring® Column	5110882	5111768	5152350
Water Jacket Spring® Column	5141098	5141097	5141847
Water Jacket ASFC Spring® Column	5120910	5120902	-

MODcol® Multipacker® Packing Stations

MODcol® Multipacker® Packing Stations*	
Description	Part No.
1" and 2" Multipacker®	
1" and 2" Multipacker® for 25 & 50mm Spring® Columns	5142605
2" and 4" Multipacker®	
2" and 4" Multipacker® for 50 & 101mm Spring® Columns	5145921

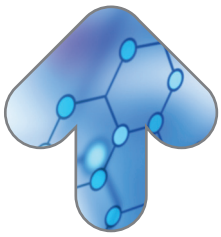
**Approved by TÜV Rheinland according to the EU machinery directive. Fully CE-certified, and come with an ATEX exclusion that states their suitability to be safely operated in explosion-hazard areas.*

Materials for Pharmaceutical Manufacturing

synthesis intermediates

- **Chiral Building Blocks**
- **Custom Synthesis**

Grace's **Synthetech™** products and contract manufacturing services support pharmaceutical companies' synthesis needs to bring new drugs to market faster.



purification technologies

- **Bulk Chromatographic Media**
- **DAC Systems and Column Packing**

Grace has nearly 100 years experience in silica engineering technology. Grace's **Davisil®** and **Vydac®** chromatography media are trusted names in process purification.

formulation and delivery

- **Multi-functional Silica Excipients**
- **Silica-Based Drug Delivery**

The advanced adsorptive properties of **Syloid®** FP silica excipients help pharmaceutical companies improve formulations and streamline manufacturing.

GRACE

Grace is the world's largest manufacturer of specialty silica gel and a leading supplier of chromatography media. We offer an extensive portfolio of products and services to support pharmaceutical manufacturing including: pharmaceutical intermediates and custom chemical synthesis; purification technologies and process optimization; and formulation excipients and silica-based drug delivery solutions.

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