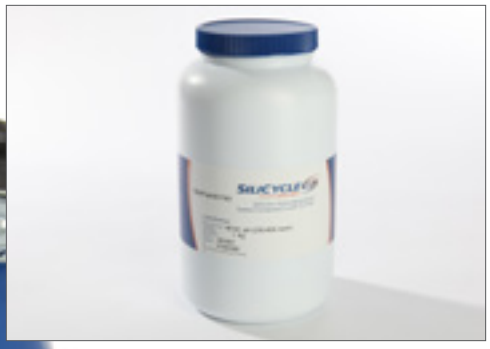


Bulk Silica Gels

SiliaFlash® Irregular Silica Gels
SiliaSphere™ PC Spherical Silica Gels

Chromatography at SiliCycle

SiliCycle is your partner of choice for your purification and chromatography needs.

Recognized as a leader with an outstanding quality silica gel, SiliCycle offers one of the largest selection on the market.

They are available in two different shapes:

- **Silia*Flash*®** Irregular silicas
- **Silia*Sphere*™** PC Spherical silicas

Get unbeatable performance with our products.

SiliCycle: Silica Expert

With pore diameters ranging from 30 to 1,000 Ångström (*Å*) and particle sizes up to 1,000 microns (*µm*), SiliCycle offers products to meet all your requirements. We offer one of the most reliable portfolios for flash and gravity grades for low to medium-high pressure. Our silica gels are ideal for preparative chromatography, from laboratory to pilot-plant processes and production scale.

Features and Benefits of Silia*Flash* & Silia*Sphere* PC

Features	Benefits
High purity silica gels	No contamination, consistency, reliability, reproducibility
Lowest level of fines on the market	No contamination, lower back-pressure, superior separation
Exceptional narrow particle and pore size distributions	Optimal separation and resolution
Batch-to-batch, year-to-year consistency	Reliable chromatography
Neutral pH	Wide range of products can be purified, even acid sensitive ones
Low metal content & controlled water content	Symmetrical peaks without tailing
High mechanical stability	Can be used under high pressures without surface abrasion
High surface area and density	Greater loading capacity, enabling more silica for the same volume Solvent economy (*smaller dead volume*)
Availability in bulk quantities	Always in stock with on-time delivery

Together, all these benefits mean optimal and reproducible separation power, saving you time and money.

SiliCycle, the Silica Supplier for Every Need

Each year, SiliCycle manufactures hundreds of tons of silica for a broad range of chromatography applications. All our products are manufactured under tightly controlled manufacturing processes and a stringent quality control ensures the highest quality.

Be confident in scaling-up your processes with our silica gels.

With SiliCycle, No Scale-up Limitations

Scaling-up from laboratory to production scale

Two Shapes Available From SiliCycle: Irregular & Spherical

The quality of a silica gel is extremely important when you are using it for chromatography purposes, particularly when dealing with difficult separations of valuable compounds. You need to be confident about your recoveries.

In chromatography, there are at least three physical properties that will influence your separation and that you need to consider when choosing your silica gel:

- Particle shape (*irregular or spherical*)
- Particle size distribution (*tight or large*)
- Pore diameter (*surface area*)

These caracteristics will directly influence crucial parameters involved in a successful chromatography:

- Resolution (*efficiency of separation & final purity*)
- Retention (*which allows separation*)
- Capacity (*maximal sample quantity and final recovery / yield*)
- Back-pressure (*speed and pumps related issues*)

At SiliCycle, we ensure **consistency**, **reliability** & **reproducibility**.

Our expertise and strong knowledge has been developed over many years of helping our customers find the best solutions to their particular needs.

How to Choose Between Silia*Flash* Irregular or Silia*Sphere* PC Spherical Gels?

Irregular silica gels are traditional in flash or gravity chromatography and have always been a spontaneous choice for preparative chromatography. Nowadays, spherical particles are now used increasingly.

Cost is very important in preparative and process chromatography, and the use of monodisperse spherical particles with narrow particle size distribution is more expensive. It is possible in this case to use irregular silica but the separation may not provide the desired results. For these situations, SiliCycle has developed a more affordable class of spherical particles for preparative chromatography: Silia*Sphere* PC.

The advantage of using Silia*Sphere* PC materials over standard silica gels includes the following:

- Increased efficiency of the eluent's flow characteristics
- Higher resolution
- Ease of packing / better packing reproducibility
- Higher mechanical stability

Silia*Sphere* PC: Truly Spherical

Silica gel quality varies greatly between manufacturers. Even when advertised as being "spherical" this may not be the case. Please discover on next page a quick comparison of Scanning Electron Microscopy (*SEM*) pictures between SiliCycle Silia*Sphere* PC and the competition.

Silia*Flash* & Silia*Sphere* PC Exceptional Characteristics

Tight Particle and Pore Size Distributions

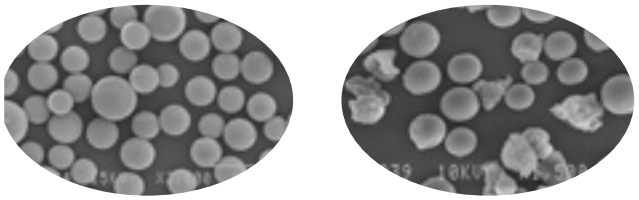
The importance of the particle and pore size distributions varies depending on the type of chromatography being done. For instance, it is very important when using HPLC that the particle size distribution of the spherical particles being used remain very narrow.

Importance of Tight Distributions in Chromatography	
Tight Particle Size Distribution	**Tight Pore Size Distribution**
Greater column performance and separation	Surface area (*Presence of bigger pore size leads to lower surface availability*)
Tighter peaks and better peak shape	Optimal peak shape (*Presence of smaller pore size leads to peak tailing*)
Better column packing, easier to pack	No molecule sequestration due to fluid diffusion inside pores
No preferential pathways (*channeling*)	
Faster flow rate with lower back-pressure	
Time and solvent savings	

Scanning Electron Microscopy (*SEM*) comparison of two IRREGULAR silica gels 40 - 63 µm, 60 Å

SiliCycle | Competitor

Scanning Electron Microscopy (*SEM*) comparison of two SPHERICAL silica gels 50 µm, 60 Å

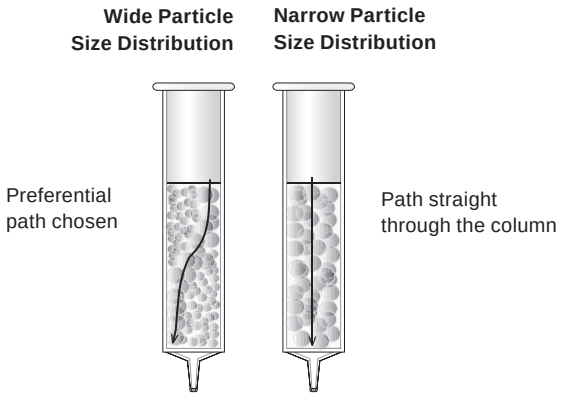


SiliCycle | Competitor

Effects of Homogeneous vs Uneven Packing

The connection between particle size distribution and column performance is very simple. When the distribution is broad, the packing is uneven. Some parts are composed of only large particles where the solvent will flow fast and meet little resistance, and there are sections composed of small particles where the solvent flows slowly and meets great resistance. As a result, the solvent will take the path of least resistance through the column and flow around the pockets of small particles instead of straight through the column. This uneven flow greatly affects the separation because the compounds will have different retention times depending on their flow path. As they exit the column, the compounds will give broad and poorly separated peaks.

The figure on the right illustrates the effect of a wide particle size distribution versus a narrow one. Narrower distribution gives a more homogenous packing and thus more concentrated fractions. And, by reducing solvent consumption, the process will be more cost-efficient.



Silia*Flash*
Silia*Sphere* PC

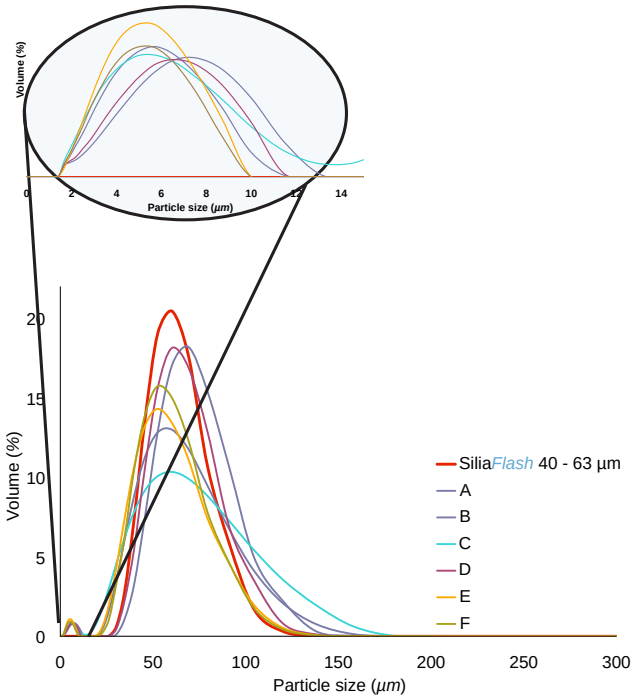
Silia*Flash*, one of the Tightest Particle Size Distribution on the Market

Of particle size distributions' disparity

When selecting a silica gel, chemists need to take into account that not all 40 - 63 µm gels are the same.

In this example, the figure on the right shows the distribution curves of SiliCycle's Silia*Flash* gel (*PN: R10030B*) compared to other manufacturers of flash silica gels of same particle sizes. ***All products were sold as 40 - 63 µm 60 Å gels.***

As you can observe, SiliCycle's gel has a mean of 90 % of the particles in the nominal range compared to maximum 80 % for the competitor gels. The higher the curve, the tighter the particle size distribution.



Of the importance of the absence of fines

In chromatography, fine particles (*small particles under 10 microns*) increase back-pressure and can result in clogging, which is particularly dangerous when using glass columns. Fines can also pass through filters and contaminate final products. The lack of fines gives a more regular, stable and reproducible chromatography bed and a faster and more even flow rate for better separation.

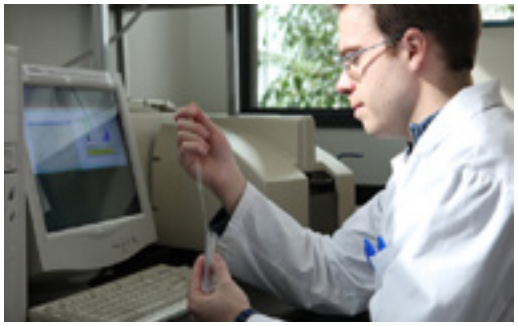
The zoomed part of the figure shows that our most popular silica gel, Silia*Flash* 40 - 63 microns 60 Å, has total absence of fines unlike the six competitor gels analyzed.

***SiliCycle has the lowest level of fines on the market for both* Silia*Flash* & Silia*Sphere* PC**.

Particle Size Analysis Methods

Laser Diffraction (*Malvern Analysis*)

Typically used for particle sizes below 40 microns. Particle size distribution is reported in term of D10, D50 (*average, mean*) and D90. Some manufacturers also mention the ratio of D90/D10.



Sieving

Usually for particle sizes over 40 microns. Particle size distribution is reported in percentage of undersized and oversized.

High Purity Silica Gels

You can be sure of the outstanding quality of SiliCycle's silica gels because of the closely controlled manufacturing conditions. Our tight control of every manufacturing process step allows reproducible results (*chemical, physical and structural*) as well as ensuring the same chromatographic selectivity. Hence, Silia*Flash* and Silia*Sphere* PC are suitable for validated chromatographic processes.

Our stringent Quality Control and Quality Assurance ensures high performance with no scale-up limitations. Every product meets our quality specifications and is shipped with a Certificate of Analysis (*CofA*). Individual data sheets are also available directly from our website.

Every day, SiliCycle's silica gels are being used by thousands of satisfied scientists for their purifications. They know that Silia*Flash* and Silia*Sphere* PC are synonymous of quality and that they can expect reproducible results every time.

Stable Water Level Content

Water level of silica gel affects the selectivity of the silica. Silia*Flash* and Silia*Sphere* PC have generally a water content between 2 to 6 %. This is advantageous for you since other products have a water variation from 2 to 15 % depending on the manufacturer. SiliCycle can also adjust the water level upon request.

Neutral pH

Our silicas are pH-adjusted between 6 and 8 to be safely used in the separation of a wide range of products (*a neutral pH is needed to separate pH-sensitive compounds*). Once again, this is advantageous when compared to many gels on the market that are much more acidic.

Low Trace Metal Content

Silica, depending on its method of manufacturing, contains a certain amount of various metals. This can, in turn, affect the quality of the separation. Aluminum, iron and lead are particularly problematic because they cause peak tailing. SiliCycle's proprietary technology generates a silica gel with the lowest trace metal content on the market. This ensures you will get optimal performance from your chromatography. Tight control of metals in every batch also improves your reproducibility and reduces risks of interaction between metals and desired compounds.

Typical Metal Content Comparison for 40 - 63 µm, 60 Å Silica Gels

Metals		SiliCycle F60 R10030B	Manufacturer A	Manufacturer B
Metal (*mg/kg*)				
Aluminum	**Al**	33	262	280
Barium	**Ba**	9	60	33
Calcium	**Ca**	336	1,150	502
Iron	**Fe**	32	75	41
Magnesium	**Mg**	61	149	104
Sodium	**Na**	466	945	585
Titanium	**Ti**	147	250	179
Zirconium	**Zr**	32	75	56

Silia*Flash* Irregular Silica Gels

Two Different Grades for Different Needs

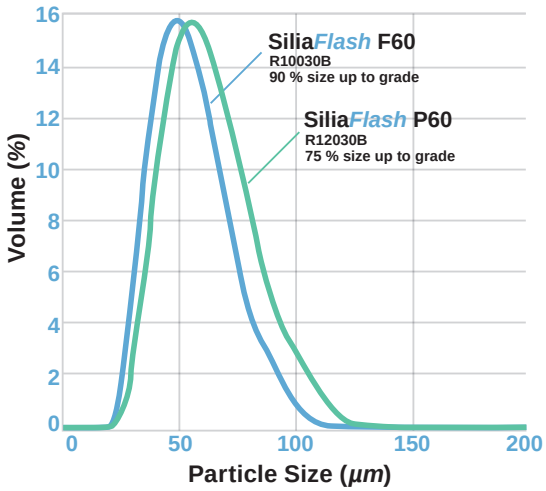
Over the years, SiliCycle has developed two different grades for the two most popular irregular gels used in the industry:
1) *40 - 63 µm, 60 Å*
2) 60 - 200 µm, 60 Å

Those two grades of each gel are available to address all our customers requirements, depending on their applications, areas of research, budgets and so on.

40 - 63 µm, 60 Å Gels: Silia*Flash* F60 (*R10030B*) VS Silia*Flash* P60 (*R12030B*)

Both compare favorably with the overall industry average of a 40 - 63 µm distribution, and each grade offers its own particle size distribution profile.

Two Different Grades of 40 - 63 µm, 60 Å Gels		
Characteristics	**F60 (*R10030B*)**	**P60 (*R12030B*)**
Particle Size (*µm*)	40 - 63	40 - 63
Pore Diameter (*Å*)	60	60
Particularities	• Extra step to reduce metal content to minimum level • Tighter particle size distribution • Fines have been removed	• Fines have been removed • Lower price



The figure on the right shows F60 tighter particle size distribution and the absence of fines for both gels.

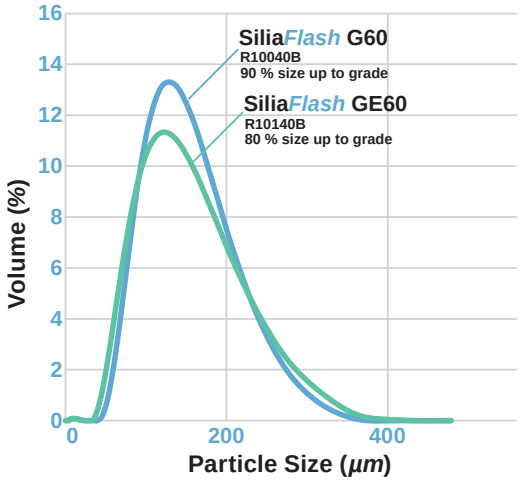
Acid washed silica gel for extra purity (*R10530B*)

SiliCycle also manufactures an acid washed Silia*Flash* 40 - 63 µm, 60 Å Silica Gel.
SiliCycle's acid washed gel has been developed to ensure a pH-controlled media with even lower levels of trace metal contaminants for maximal purity. Please refer to the table next page for metal content details.

60 - 200 µm, 60 Å Gels: Silia*Flash* G60 (*R10040B*) VS Silia*Flash* GE60 (*R10140B*)

Each grade offers its own particle size distribution profile.

Two Different Grades of 60 - 200 µm, 60 Å Gels		
Characteristics	**G60 (*R10040B*)**	**GE60 (*R10140B*)**
Particle Size (*µm*)	60 - 200	60 - 200
Pore Diameter (*Å*)	60	60
Particularities	• Extra step to reduce metal content to minimum level • Tighter particle size distribution • Fines have been reduced to minimal level	• Fines have been reduced to minimal level • Lower price



The figure on the right shows G60 tighter particle size distribution.

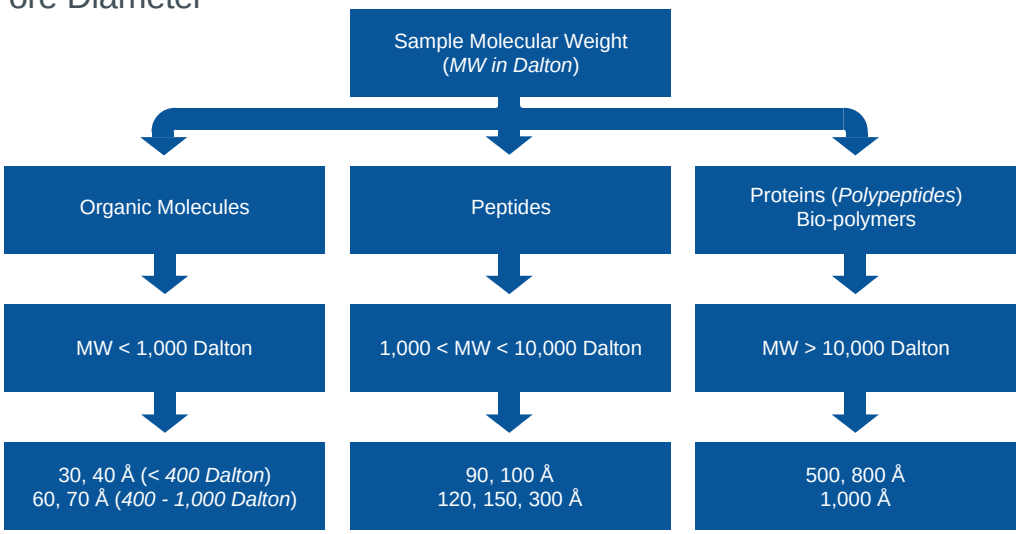
Typical metal content comparison between SiliCycle's five most popular gels

Typical Metal Content of Most Popular Irregular Silicas						
Product Number		**F60 (*R10030B*)**	**P60 (*R12030B*)**	**Acid Washed (*R10530B*)**	**G60 (*R10040B*)**	**GE60 (*R10140B*)**
Particle Size	µm	40 - 63			60 - 200	
Pore Diameter	Å	60			60	
Metal (*mg/kg*)						
Aluminum	**Al**	**< 200**	**< 1,000**	**< 70**	**< 350**	**< 900**
Antimony	Sb	< 0.2			< 0.2	
Arsenic	Ar	< 1			< 1	
Barium	**Ba**	**< 40**	**< 40**	**< 5**	**< 40**	
Beryllium	Be	< 0.1			< 0.1	
Bismuth	Bi	< 1			< 1	
Cadmium	Cd	< 0.01			< 0.01	
Calcium	**Ca**	**< 200**	**< 500**	**< 10**	**< 250**	**< 500**
Chromium	Cr	< 1			< 1	
Cobalt	Co	< 0.1			< 0.1	
Copper	Cu	< 1			< 1	
Iron	**Fe**	**< 75**	**< 350**	**< 10**	**< 75**	**< 350**
Lead	Pb	< 1			< 1	
Lithium	Li	< 0.1			< 0.1	
Magnesium	**Mg**	**< 150**	**< 250**	**< 10**	**< 100**	**< 150**
Manganese	Mn	< 1	< 2	< 1	< 1	
Molybdenum	Mo	< 0.1			< 0.1	
Nickel	Ni	< 1			< 1	
Potassium	**K**	**< 500**	**< 30**	**< 2**	**< 750**	**< 30**
Rubidium	Rb	< 0.2			< 0.2	
Selenium	Se	< 1			< 1	
Silver	Ag	< 0.1			< 0.1	
Sodium	**Na**	**< 150**	**< 1,500**	**< 15**	**< 150**	**< 1,500**
Strontium	**Sr**	**< 4**	**< 15**	**< 1**	**< 4**	**< 15**
Tellurium	Te	< 0.1			< 0.1	
Thallium	Tl	< 0.1			< 0.1	
Tin	Sn	< 0.4	< 0.4	< 0.2	< 0.4	
Titanium	**Ti**	**< 200**	**< 250**	**< 90**	**< 250**	
Uranium	U	< 0.1			< 0.1	
Vanadium	V	< 1			< 1	
Zinc	Zn	< 1			< 1	

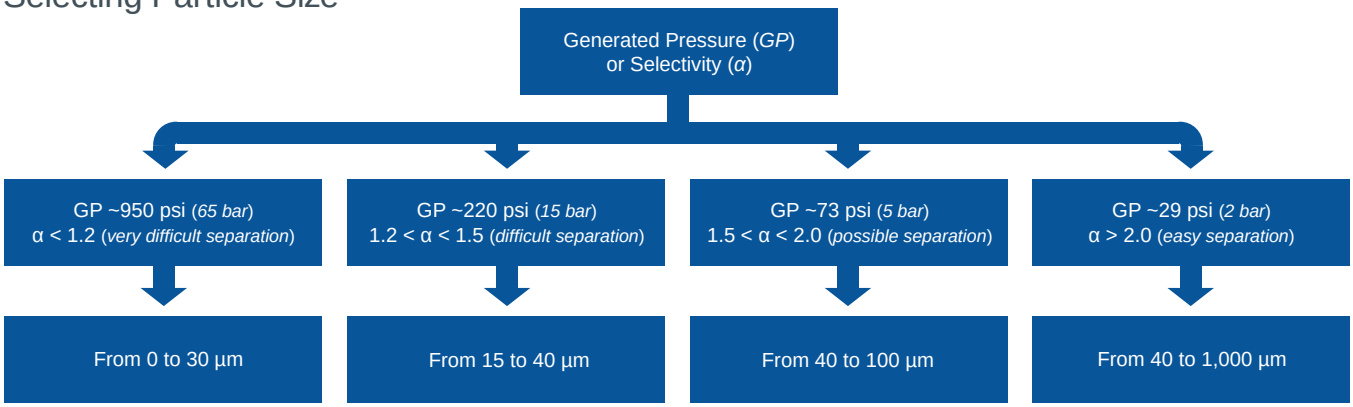
Silica Selection Guide

Selecting the most appropriate sorbent for any given application can be difficult. To help you choose the right pore diameter and particle size, simply follow the two pathways to select the most suitable sorbent.

Selecting Pore Diameter



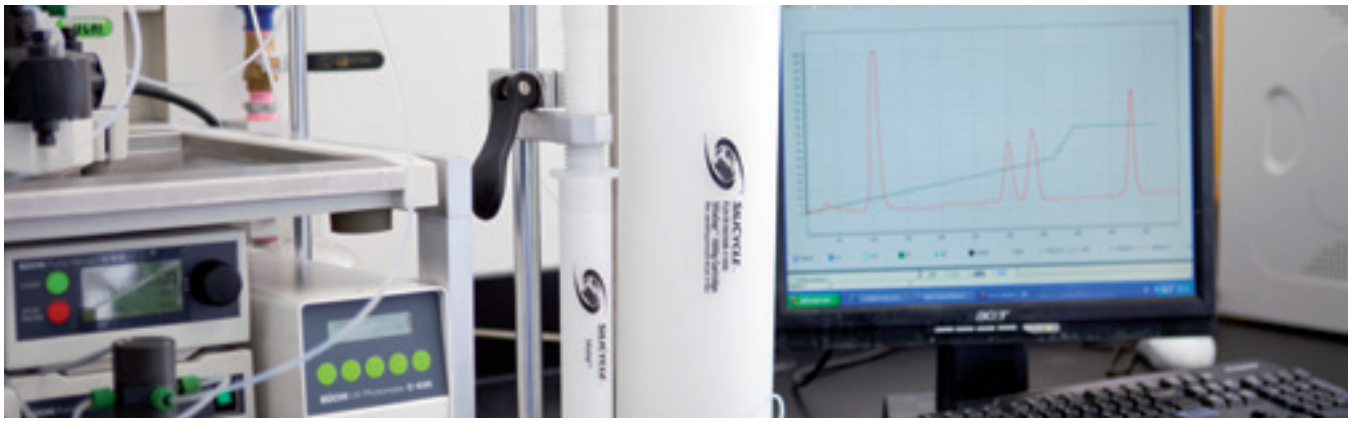
Selecting Particle Size



Selectivity (α) is measured by the retention factor ratio between two similar compounds: $\alpha = \frac{Tr_1 - T_0}{Tr_2 - T_0}$

A Particle Size for Each Application

Most Popular Particle Size Applications		
Particle Size Distribution		Applications
Irregular Particles	Spherical Particles	
Particles for Preparative TLC Plates		
From 0 to 20 µm	-	• Contains neither binder (*organic or inorganic*) nor UV indicator (F_{254}) • Can also be used in flash chromatography if higher resolution is required (*higher back-pressure*)
Particles for Difficult Separations		
From 10 to 45 µm	From 15 to 45 µm	• High-resolution silica for difficult separations (*similar polarities*)
Particles for Flash Chromatography		
40 - 63 µm	From 40 to 75 µm	• Chromatography types: high-resolution flash chromatography & low to medium-pressure preparative chromatography • Narrow particle size distribution • Easier to pack and more uniform packing • Superior resolution • Suitable for use with complex matrices MOST POPULAR PARTICLE SIZE DISTRIBUTION
60 - 120 µm	From 60 to 150 µm	• Alternative to 40 - 63 µm silica for faster flow rate with lower pressure
Particles for Column (*or Gravity*) Chromatography		
From 60 to 200 µm	From 75 to 250 µm	• Most economical silica for open column chromatography (*gravity*) • Suitable for very dirty purification • Easier to handle
From 120 to 200 µm	From 100 to 200 µm	• Silica for standard open column chromatography • Narrow particle size distribution enables uniform packing • Suitable for mass overload purification
Other Application		
From 200 to 1,000 µm	From 200 to 500 µm	• Silica for plugs



Silia*Flash* & Silia*Sphere* PC Ordering Information

This is only an overview of gels we can provide. Please contact us if you are looking for a different product.

Silia*Flash* Ordering Information

Product Number	Particle Size (*µm*)	Particle Size (*mesh*)	Pore Diameter (*Å*)
R10037L	75 - 150	100 - 200	30
R10130A	40 - 63	230 - 400	40
R10150A	60 - 120	325 - 625	
R10140A	60 - 200	70 - 250	
R10160A	120 - 200	70 - 125	
R10170A	200 - 500	35 - 70	
R10180A	500 - 1,000	18 - 35	
R10110B	0 - 20	*	60
R10019B	10 - 30	*	
R10017B	15 - 40	400 - 800	
R10023B	20 - 45	*	
R10030B (*F60*)	40 - 63	230 - 400	
R12030B (*P60*)			
R10530B (*acid washed*)			
R10150B	60 - 120	325 - 625	
R10040B (*G60*)	60 - 200	70 - 230	
R10140B (*GE60*)			
R10137B	75 - 150	100 - 200	
R10057B	105 - 175	86 - 140	
R10160B	120 - 200	70 - 125	
R10160B	150 - 175	80 - 100	
R10160B	150 - 250	60 - 100	
R10170B	200 - 500	35 - 70	
R10180B	500 - 1,000	18 - 35	
R10130D	40 - 63	230 - 400	90
R10140D	60 - 200	70 - 250	
R10157D	105 - 175	86 - 140	
R10170D	200 - 500	35 - 70	
R10180D	500 - 1,000	18 - 35	
R10181D	800 - 1,200	16 - 22	
R10130H	40 - 63	230 - 400	150
R10150H	60 - 120	325 - 625	
R10140H	60 - 200	70 - 250	
R10157H	105 - 175	86 - 140	
R10160H	120 - 200	70 - 125	
R10170H	200 - 500	35 - 70	
R10072H	250 - 500	35 - 60	
R10180H	500 - 1,000	18 - 35	
R10181H	800 - 1,200	16 - 22	
R10130M	40 - 63	230 - 400	300
R10140M	60 - 200	70 - 250	
R10170M	200 - 500	35 - 70	

Silia*Sphere* PC Ordering Information

Product Number	Particle Size (*µm*)	Particle Size (*mesh*)	Pore Diameter (*Å*)
S10030B-A	50	300	60
S10027B-A	60	250	
S10034B-A	75	200	
S10040B-A	100	150	
S10063B-A	150	100	
S10066B-A	200	70	
S10068B-A	300	50	
S10020C	20 - 45	-	70
S10040C	75 - 200	70 - 200	
S10030C	200 - 375	45 - 70	
S10070C	200 - 500	35 - 70	
S10095D-A	25	-	90
S10009E-A	20	-	100
S10020E	20 - 45	-	
S10030E	40 - 75	200 - 400	
S10040E	75 - 200	70 - 200	
S10065E	150 - 250	60 - 100	
S10070E	200 - 500	35 - 70	
S10009G-A	20	*	120
S10030G-A	50	300	
S10034G-A	75	200	
S10040G-A	100	150	
S10063G-A	150	100	
S10020M	20 - 45	*	300
S10030M	40 - 75	200 - 400	
S10040M	75 - 200	70 - 200	
S10064M	150 - 200	70 - 100	
S10070M	200 - 500	35 - 70	
S10020P	20 - 45	*	500
S10030P	40 - 75	200 - 400	
S10040P	75 - 200	70 - 200	
S10070P	200 - 500	35 - 70	
S10020S	20 - 45	*	800
S10030S	40 - 75	200 - 400	
S10040S	75 - 200	70 - 200	
S10070S	200 - 500	35 - 70	
S10020T	20 - 45	*	1,000
S10030T	40 - 75	200 - 400	
S10040T	75 - 200	70 - 200	
S10070T	200 - 500	35 - 70	

Formats: 1 kg, 5 kg, 10 kg, 25 kg, etc. Up to multi-ton scale.
* Mesh equivalent too small to exist as real screen size.