SiliaFlash®

Irregular Silica Gels

SILICYCLE Inc.
UltraPure SILICA GELS

Chromatography at SiliCycle

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

Recognized worldwide as a leader with in outstanding quality silica gel, SiliCycle offers one of the largest selections of silica, available in different shapes, on the market.

- Silia*Flash*® Irregular silica
- IMPAQ® Angular silica
- Silia*Sphere*™ Spherical silica

Ensure Unbeatable Performance with SiliCycle.

UltraPure Silica Gel from SiliCycle

SiliCycle: Silica expert.

With pore diameters ranging from 40 to 1,000 Å and particle sizes from 5 to 1,000 microns, SiliCycle offers products to meet all your application requirements. This is one of the most reliable portfolios for flash and gravity grades from medium to high pressure. Our silica is ideal for both analytical and preparative chromatography, from laboratory to pilot-plant processes and production scales.

Features & Benefits of Silia*Flash*, IMPAQ & Silia*Sphere*

Features	Benefits
High purity silica gels	Consistency, reliability, reproducibility
Exempt of fine particles or very low level of fines	No contamination, lower backpressure, superior separation
Exceptional narrow particle and pore-size distribution	Optimal separation and resolution
Batch-to-batch, year-to-year consistency	Reliable chromatography
Neutral pH	Wide range of products, even acid sensitive ones (*no degradation*)
Low metal content & controlled water content	Symmetrical peaks with no 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 at affordable pricing	Always in stock with on-time delivery

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

SiliaFlash Irregular Silica Gel

- Consistency, Reliability, & Reproducibility*
- Tight Particle and Pore Size Distributions

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 extremely confident about your recoveries.

SiliCycle is recognized worldwide as a leader in chromatography and purification with our outstanding quality products. SiliCycle's expertise has been and strong knowledge acquired over the years and this distinguishes us from the competition.

Note: characteristics listed on following pages can also be applied to IMPAQ & SiliaSphere brands.

High Purity Silica Gel

You can be sure of the outstanding quality of SiliCycle's silica gels because of the closely controlled manufacturing conditions at our ISO 9001:2008 certified state-of-the-art facilities. Our tight control of every manufacturing process step, affords identical and reproducible properties (*chemical, physical and structural*) as well as ensuring the same chromatographic selectivities. Hence, SiliaFlash is suitable for validated chromatographic processes.

Furthermore, 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 SiliCycle website.

Every day, SiliCycle's SiliaFlash products are being used by thousands of satisfied scientists for their purifications. They know that SiliaFlash is synonymous with quality, confidence, and trust, and that they know they will have reproducible results day after day.

SiliaFlash - Now Exempt of Fines*

Over the years, in our quest to improve and provide the best quality products, SiliCycle has continuously reviewed how it can make a difference for you. At SiliCycle, a major improvement on our most popular silica gel (*SiliaFlash 40-63 microns, 60 Å*) has been the absence of fines (*small particles under 10 microns*).

In chromatography, fine particles increase backpressure 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.

- This improvement comes with NO EXTRA COST to you.

*Other SiliaFlash products have the lowest level of fines on the market.

SiliaFlash's Exceptional Characteristics

NARROW DISTRIBUTIONS ARE THE MOST SUITABLE .

Tight Particle and Pore Size Distributions

The importance of the particle and pore size distribution 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 be very narrow.

Importance of tight distributions in chromatography	
Tight particle size distribution	Tight pore size distribution
Greater column performance and separation	Optimal peak shape - Presence of smaller pore size leads to peak tailing
Tighter peaks and better peak shape	surface area - Presence of bigger pore size leads to lower surface availability
Better column packing, easier to pack	No molecules 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 Silica Gels 40 - 63 µm, 60 Å

SiliCycle Competitor

Particle Size Analysis Methods

Laser Diffraction (*Malvern Analysis*)

Usually used for particle sizes below 40 microns. Particle size distributions are reported in term of D10, D50 (*average*, *mean*) and D90. Some manufacturers also mentioned the ration of D90/D10.

Sieving

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

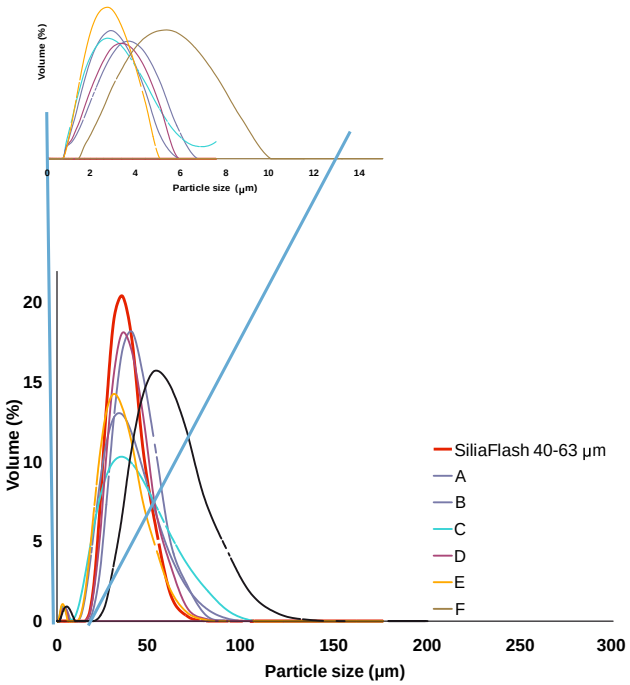
Tighter Particle Size Distribution

The importance of the particle size distribution varies depending on the type of chromatography being done. For instance, it is very important for HPLC that the particle size distribution of the spherical particles being used be very narrow.

When selecting a silica gel, chemists need to take into account that not all 40-63 µm gels are the same. The figure on the right shows the distribution curves of SiliCycle's Silia*Flash* gel compared to other manufacturers of flash silica gels. All products were sold as 40-63 µm gels.

The two key points of the graph are the height of the volume differential (*diff*) and percentage of particles below 40 µm. The SiliCycle curve has a much higher percentage of particles between 40-63 microns and a very low level of particles below 40 microns (*or "fines"*). Fines can cause several problems such as higher backpressure, clogging, contamination (*see previous section for more details*). SiliCycle has the lowest level of fines on the market.

The absence of fines gives a more regular, stable, and reproducible chromatography bed, which results in a faster and more even flow rate for better separation.

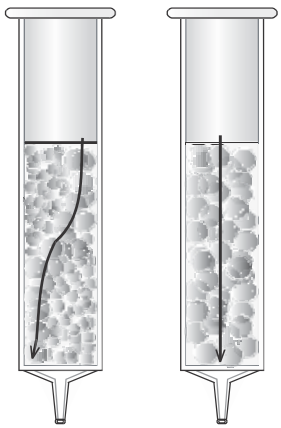


Effects of Homogeneous vs Uneven Packing

Almost all silica gel manufacturers sell a form of 40-63 µm gel, but not all gels are equal. SiliCycle's Silia*Flash* gels have a mean of 90% of the particles in the nominal range compared with 80% for most of the competitors.

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



Low Trace Metal Content

Irregular silica, depending on its method of manufacturing, normally contains trace quantities of a variety of 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 today.

As shown in the table below, trace metal concentration in SiliCycle's silica gel is significantly lower than flash silica gels from other manufacturers. Our low trace metal content ensures you will get optimal performance from your chromatography. Tight control of trace metals in every batch also improves your reproducibility and reduces risks of interaction between metals and desired compounds.

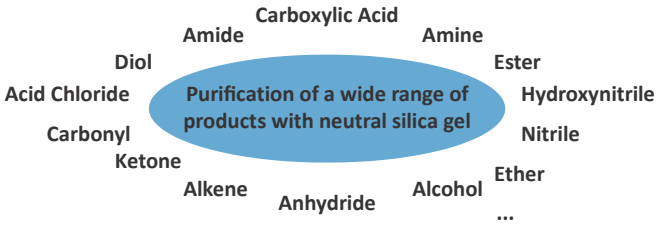
Typical Trace Metal Concentration

Metals	SiliCycle	Manuf. A	Manuf. B	Metals	SiliCycle	Manuf. A	Manuf. B
Aluminum (Al)	33	262	280	Magnesium (Mg)	61	149	104
Barium (Ba)	9.4	59.7	32.5	Nickel (Ni)	0.4	0.5	0.5
Clacium (Ca)	336	1150	502	Silver (Ag)	0.09	0.29	0.19
Chromium (Cr)	0.5	0.6	0.4	Sodium (Na)	466	945	585
Copper (Cu)	0.2	0.2	0.2	Tin (Sn)	0.2	0.2	0.1
Iron (Fe)	32	75	41	Titanium (Ti)	147	250	179
Lead (Pb)	0.41	5.24	0.95	Zirconium (Zr)	32	75	56

Stable Water Level Content

Water level of silica gel is affecting the selectivity of the silica. Silia*Flash* has a water content between 4 to 6%. This is advantageous for you since the other products available have a water variation from 2 to 9% depending on the manufacturer. SiliCycle can adjust the water level upon request.

Neutral pH & High Surface Area



Neutral pH

Our Silia*Flash* are pH-adjusted between 6.5 and 7.5 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 the pH of 6 to 7 often seen in the market.

SiliCycle can adjust the pH upon request to help protect pH sensitive products that require a lower pH.

High Surface Area

Higher surface area provides greater separation power.

SiliCycle, the Silica Supplier for Every Need

With SiliCycle, No Scale-up Limitations

Each year, SiliCycle manufactures hundreds of tons of Silia*Flash*, a broad range of silica gels for chromatography applications. The same production plant, tightly controlled manufacturing processes, and stringent quality control is guaranteed for all products.

Be confident in scaling-up your processes with our Silia*Flash*. Performance will remain the same even if the particle size is changed.

Scaling-up from laboratory to production scale

SiliCycle Has One of the Largest Selections

SiliCycle offers one of the largest selections of silica-based products, from bare to various functionalized silicas, required for chromatography.

These products are available in different pore diameters (*from 40 to 1,000 Å*), particle sizes (*from 5 to 1,000 µm*) and particle shape (*irregular, angular or spherical*) to target a wide range of applications, performance and economic requirements.

All of these products are available from laboratory scale to multi-ton quantities.

Silia*Flash* is also available in fixed bed format:
Silia*Sep* Flash Cartridges
Silia*Prep* SPE cartridges

Silia*Flash* Ordering Information

Silia*Flash* Ordering Information			
Product Number	Name	Particle Size (µm)	Pore Diameter (Å)
R10030A	F40	40 - 63	40
R10040A	G40	60 - 200	40
R10070A	B40	200 - 500	40
R10010B	C60	0 - 20	60
R10013B	I60	15 - 25	60
R10014B	A60	5 - 20	60
R10015B	S60	15 - 35	60
R10017B	E60	15 - 40	60
R10019B	D60	10 - 30	60
R10023B	R60	20 - 45	60
R10030B	F60	40 - 63	60
R12030B	P60	40 - 63	60
R10040B	G60	60 - 200	60
R10050B	M60	60 - 120	60
R10060B	L60	120 - 200	60
R10070B	B60	200 - 500	60
R10015D	S90	15 - 35	90
R10030D	F90	40 - 63	90
R10040D	G90	60 - 200	90
R10070D	B90	200 - 500	90
R10040H	G150	60 - 200	150
R10050H	M150	60 - 120	150
R10060H	L150	120 - 200	150
R10072H	B150	250 - 500	150
R10030M	F300	40-63	300

pH (5% w/w): 6.5 - 7.5, Volatile content: ≤ 7

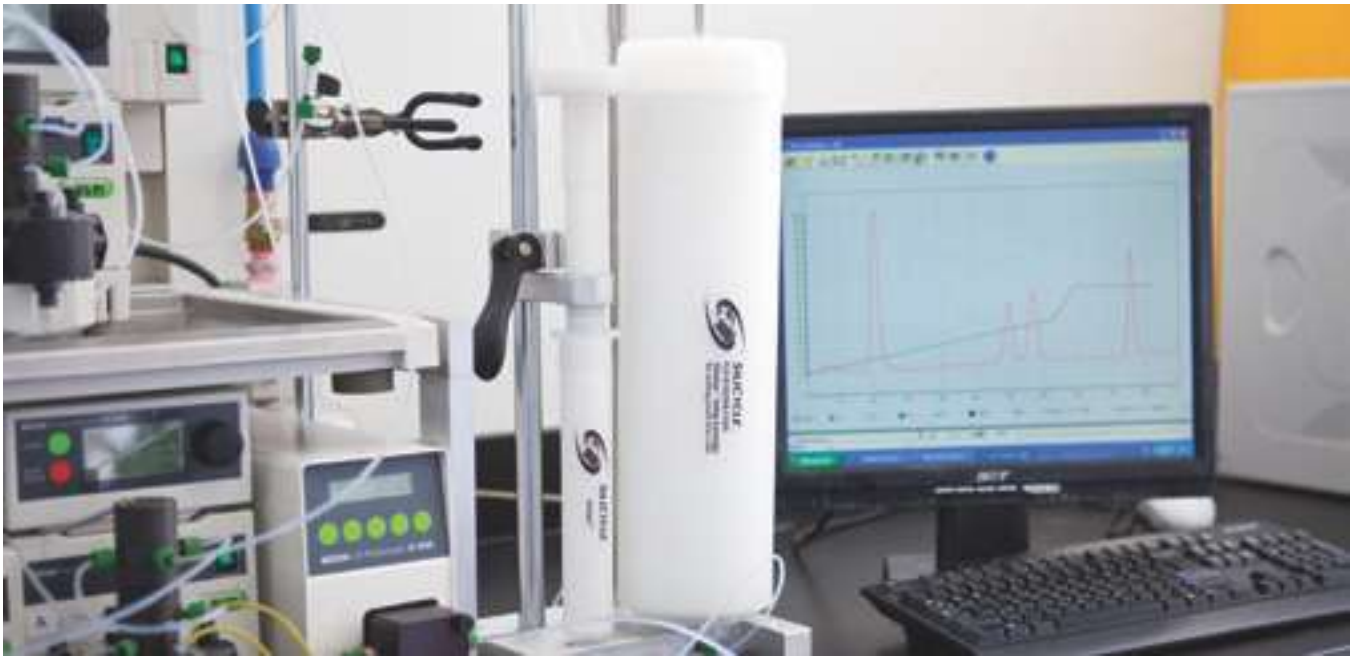
Tip: Silica gel standardization is possible by eliminating the residual moisture. Place the silica inside a vacuum oven and heat at 130 °C during 30 minutes. Cool to room temperature and pack column.

Particle Size Conversion Table

Conversion Table Microns vs Mesh			
Microns	Mesh	Microns	Mesh
5 - 20	625 - 2500	60 - 120	120 - 230
15 - 25	~ 325 - 625	60 - 200	70 - 230
15 - 40	~ 400 - 1,250	120 - 200	70 - 120
20 - 45	325 - 625	200 - 500	35 - 70
40 - 63	230 - 400	500 - 1,000	18 - 35

Most Popular Particle Size Applications

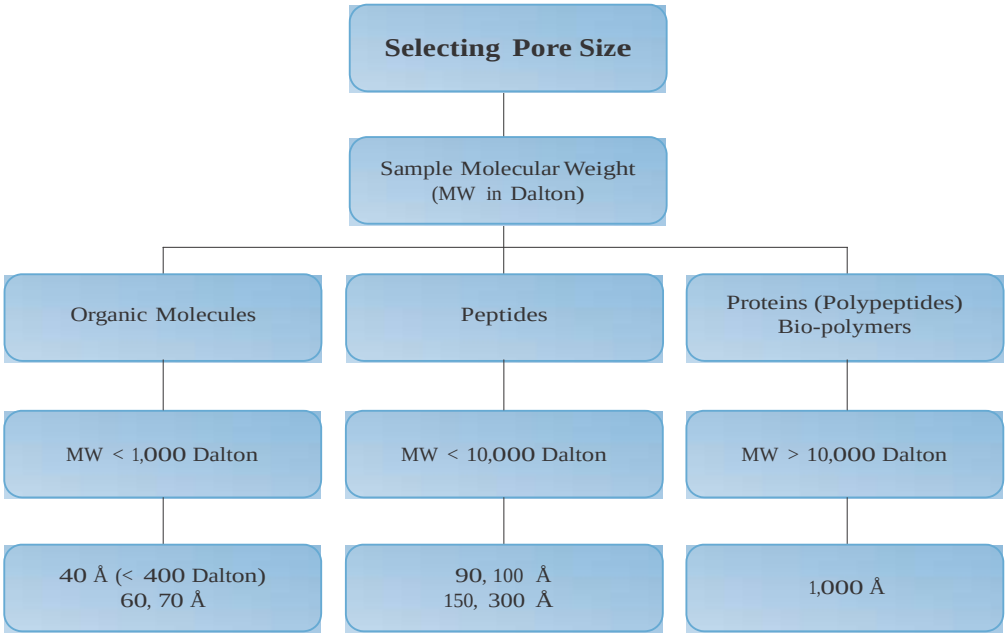
Most Popular Particle Size Applications	
Particle Size Distribution	Application
Particles for Preparative TLC Plates	
0 - 20 µm 5 - 15 µm 5 - 20 µm	• Contain neither binder (*organic or inorganic*) nor UV indicator (*F254*) • Can also be used in flash chromatography if higher resolution is required (*higher back-pressure*)
Specialized Particles for Difficult Separations	
15 - 35 µm 15 - 40 µm	• High-resolution silica for difficult separations (*similar polarities*)
Particles for Flash Chromatography	
40 - 63 µm	• Chromatography types: high-resolution flash chromatography & low to medium-pressure preparative chromatography • Narrow particle size over other flash chromatography silica • Easier to pack • More uniform packing • Superior resolution • Suitable for uses with complex matrices MOST POPULAR PARTICLE SIZE DISTRIBUTION!
60 - 120 µm	• Alternative to 40-63 µm silica for faster flow rate without pressure
Particles for Column (*or Gravity*) Chromatography	
60 - 200 µm	• Most economical silica for open column chromatography (*gravity*) • Suitable for rough purification and large-scale preparative chromatography • Easier to handle • Purification cost reduction
120 - 200 µm	• Silica for standard open column chromatography • Narrow particle size enables uniform packing • Suitable for mass overload purification



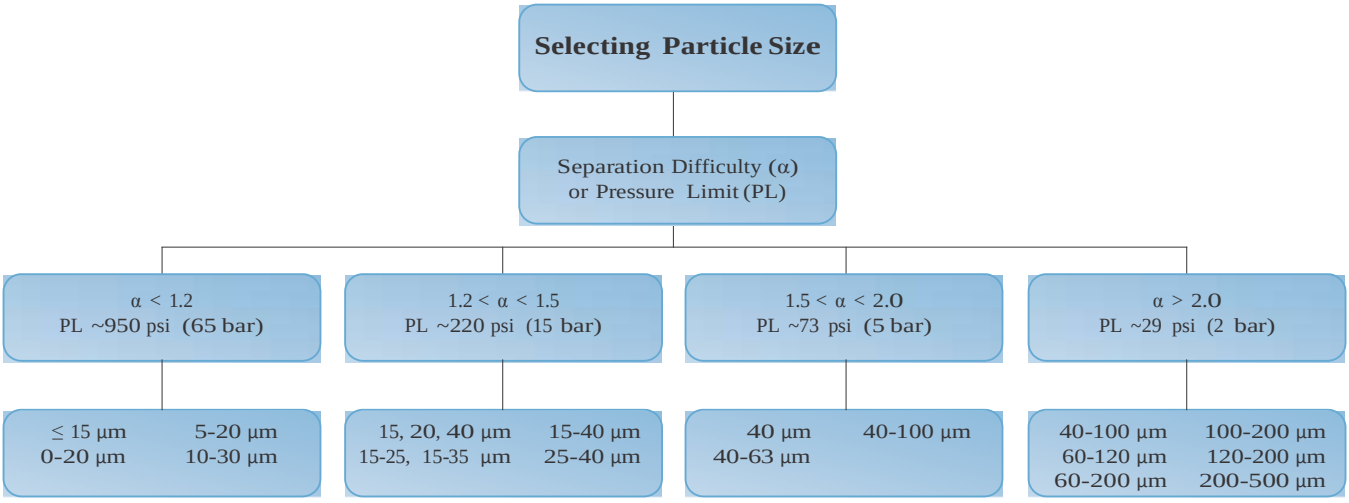
Silica Selection Guide

SiliCycle offers a wide range of Silia*Flash*, Silia*Sphere* and IMPAQ products to cover many types of applications. Selecting the most appropriate sorbent for any given applications can be difficult. To help you choose the right media (*bonded or not*), our experts recommend using the diagram below as a guide. Simply follow the three pathways to select the most suitable sorbent.

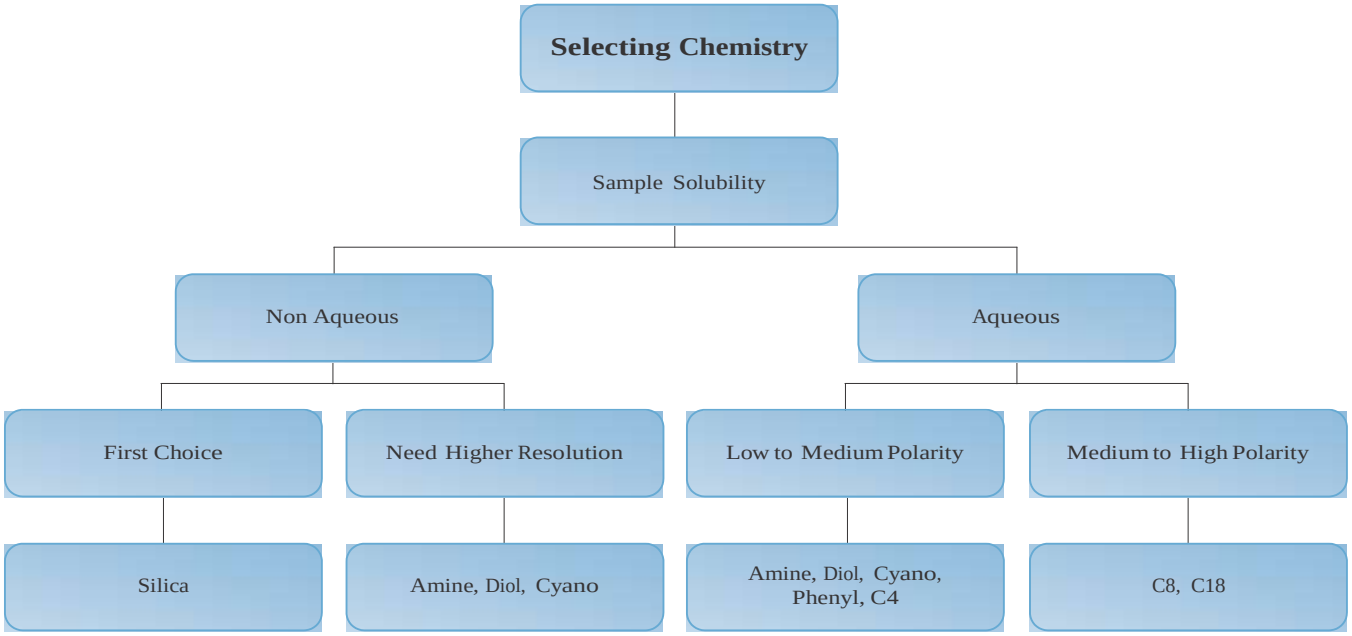
Selecting Pore Size



Selecting Particle Size



Selecting Chemistry



Note: Standard functionalized sorbents are 40-63 µm, 60 Å