SOLUTIONS FOR CHROMATOGRAPHY, SYNTHESIS & PURIFICATION





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Founded in 1995, SiliCycle is specialized in the development, manufacturing and commercialization of high value silica gels and specialty products for chromatography, purification and synthesis.



Scavenging



Scavengers are functionalized silica gels designed to react and bind excess reagents, metal complexes and / or by-products. Available either in bulk or prepacked, SiliCycle's wide range of scavenging products remove metal and / or organic compounds, to overcome any purification challenge.

Catalysis & Synthesis



Simplify purification steps by using silica-supported catalysts and reagents: Silia*Cat*[®] heterogeneous catalysts and Silia*Bond*[®] reagents & oxidants.

Chromatography



Silica is the most widely used media in chromatography. SiliCycle offers a wide range of chromatographic products: Silia*Flash*[®] irregular silica gels, Silia*Sep*[™] flash cartridges, Silia*Bond*[®] chromatographic phases, Silia*Prep*[™] sample preparation cartridges and Silia*Plate*[™] TLC plates.

R&D Services



SiliCycle's scientists offer a wide range of R&D services: scavenging screenings, synthetic chemistry services, separation center, custom column packing, material science and analytical services.

Purification



From lab to commercial scale, SiliCycle's complete portfolio ensures efficient purification. Take advantage of our Silia*Flash®* irregular silica gels, Silia*Sphere*[™] spherical silica gels, Silia*Chrom®* HPLC columns and E-PAK[®] fixed bed flow-through

Extraction - Purification Division NEW



SiliCycle offers extraction & purification services (*method development, fractionation, analytical services, etc.*) as well as purified natural ingredients (cannabis, *essential oils, omega-3, extracts, etc.*). Benefit from the perfect combination of SiliCycle's purification expertise and raw natural material of the highest quality!

What's New at SiliCycle

cartridges.



E-PAK[®] Purification Cartridges

E-PAK are radial flow adsorption cartridges developed specifically for pharmaceutical processing. Available in various sizes from lab to pilot and industrial scale, E-PAK cartridges can be made with Silia*MetS*[®] metal scavenger or activated carbon. Learn more page 3



SiliaSep[™] PREMIUM Flash Cartridges

Packed with high performance 25 µm spherical silica gel, SiliaSep[™] PREMIUM flash cartridges offer superior separation for difficult purifications. Learn more page 18

SiliaFast[™] FaPEx®

The FaPEx acronym stands for **Fa**st **P**esticide **Ex**traction, an extremely fast yet easy Extraction / Clean up technique for pesticide residues in agricultural products. Cut up to 60 % of your analysis costs with this 1-step cartridge! Learn more page 20





SiliCycle Scavenging Solutions

Metallic & Organic Impurities Removal

- Increased R&D and manufacturing productivity
- Versatile (solvents, pH, compatible in batch flow, microwave, etc.)
- · Green and environmentally friendly technology
- Broadest scope of metals & organics to be scavenged

Chemists have been searching for techniques and tools to separate, isolate and purify chemical substances from one another to improve the quality of life. SiliCycle grafted technology enables more powerful purification processes to help reach new purity standards. Our solutions are versatile and customizable, hence suitable for a use in a vast array of industries, facing different contamination issues.



Our Scavengers offer Easier, Cleaner, Faster, Efficient Purification Processes

- · More than two decades of know-how in silica-grafting and scavenging technology
- · Broadest portfolio of scavengers with many associated applications
- · Great variety of formats for all purifications scales: from R&D to manufacture scale
- Successful technology in a variety of fields, such as pharmaceuticals, organic chemistry labs, agrochemicals, mining, fine chemicals, water and waste treatment
- · Great compatibility with a myriad of experimental conditions, solvents, pH and temperatures
- · Strong chemical, physical, thermal and mechanical stability

Available in Different Formats to Suit your Needs

Metal & Organic Scavengers have the major benefit of being compatible with almost all experimental formats. They may be used as:



Bulk – directly added to a reaction flask or reactor



Flash cartridges





Guard cartridges

SPE cartridges, micro-SPE tips & well plates



Analysis

R&D Services



E-PAK[®]

Fixed Bed Flow-Through Purification Cartridges

E-PAK is a family of radial flow adsorption cartridges developed specifically for pharmaceutical processings.

Applications include the removal of precious metal catalysts, reaction by-products and color from synthetic reaction mixtures and natural products.

Created with proprietary technology, E-PAK cartridges provide rapid adsorption kinetics at flow rates and processing capacities suitable for laboratory, pilot and commercial operations. They are designed for use with both organic and aqueous solvents, and incorporate design features useful for the production of active pharmaceutical ingredients (API).

E-PAK cartridges are available in a range of various sizes and embedded sorbents (*SiliaMetS[®] metal scavengers, SiliaFlash[®] irregular silica gels and activated carbons*) to accommodate the broad range of processing requirements encountered over an API development cycle.

Features & Benefits



- Proven cartridge design ensures rapid, simple & reliable technology
- High adsorption capacity and flow rate
- Fixed-bed design ensuring safer handling, clean-up and disposal
- Various sizes available for easy scale-up from laboratory to industrial scale
- · Large adsorbent capacity in small area footprint increases product recovery & reduces solvent requirements
- Extended flow path provides increased contact time and better adsorption performance
- Robust, mechanically stable monolith block

A Cartridge for Any Step of Your Project

Various Sizes Available			
Cartridge Size	Cartridge Leng	th & Media Weight	Housing
Lab Scale - 5 cm diameter cartridges Designed to facilitate the evaluations of small samples. Testing with loose media can be done with samples as small as a few milliliters and are normally done in advance of cartridge testing to identify the formula with the highest capacity to remove contaminants with the highest recovery.	Silia/MetS 1 cm: 8 g 10 cm: 75 g 25 cm: 200 g	Activated Carbon 1 cm: 5 g 10 cm: 50 g 25 cm: 125 g	
Pilot Scale - 16.5 cm diameter cartridges E-PAK pilot scale cartridges provide rapid processing for volumes from 10 to hundreds of liters, and can establish the parameters upon moving to larger scales, since E-PAK achieve true linear scalability.	Silia <i>MetS</i> 12.5 cm: 875 g 25 cm: 1.75 kg	Activated Carbon 12.5 cm: 850 g 25 cm: 1.7 kg	,
Commercial Scale - 16.5 cm diameter cartridges E-PAK cartridges provide rapid processing for manufacturing operations needing to process batch sizes of > 10,000 liters or can be adapted for continuous operation using a duplex design.	Silia <i>MetS</i> 50 cm: 3.5 kg 100 cm: 7 kg	Activated Carbon 50 cm: 3.4 kg 100 cm: 6.8 kg	



We also offer conversion kits that allow E-PAK cartridges to be operated in existing lenticular cartridge housings. Contact us.

Learn more about E-PAK cartridges: <u>www.silicycle.com/epak</u>





Silia*MetS*®

Scavengers for Metallic Impurities

- Clean
- Hassle-Free
- FastEasy
- Multi Format
- Multi-Scale Applications

Metal contamination is one of the most frequent encountered purification issue when it comes to synthetic chemistry.

With virtually all industrial chemical processes based on catalysis and mostly organometallic catalysis, classical purification processes have long been non-satisfactory anymore in the industry. It was with this objective in mind that SiliCycle developed a new class of functionalized silicas with organic groups specially chosen for extra effective metal bounding and removal.

New Pharmaceutical Challenges in Purification

In recent years, the time pressure associated with quickly bringing drug candidates to market has increased the number of transition metal-catalysed reactions progressing from lead optimization to early scale-up. Hence, the removal of post-reaction metal residues has become a major issue in the pharmaceutical industry.

Purification of APIs (*Active Pharmaceutical Ingredients*), or product of interest from residual metal catalyst by traditional methods (*chromatography, activated carbon, distillation, etc.*) often leads to problems such as high costs, time loss, low efficiency and reduced API yields.

Yet, not only have Silia*MetS* metal scavengers received quite widespread importance in the chemical industry, but they are also becoming a broader purification strategy in fields such as electronics, mining, semi-conductors, optical fibers, metal recycling, natural extracts and so on.

SiliCycle offers a large spectrum of various Silia*MetS* metal scavengers that will selectively and exclusively remove metallic contaminants from your experimental solution in a snap: almost all metals were targeted, free or as coordination complexes, and many can be addressed at the same time.



ICH-Q3D Heavy Metal Regulation Ready for Implementation in the Pharmaceutical Industry



Since June 2013, the International Conference on Harmonisation (*ICH*) has been working on its Q3D guidelines on metal elemental impurities in new drugs and new formulations containing known ingredients. After many revisions and improvements, the final version of the Q3D guidelines was finally accepted and signed off by the ICH Steering Committee in December 2014, hence requiring the entire manufacturing industry and supply chain to meet more stringent regulations.

Since December 2015, twenty-four (24) metals - well-known to act as catalysts or present in solvents - have been indicted and associated with great health risks, and have been assigned distinctive PDE (*Permitted Daily Exposure*) limits. For example, now that ICH Q3D contains Lithium and Barium, we no longer talk of heavy metals impurities but elemental impurities.

There is no doubt that these guidelines will be one of the next major challenges to address for production plants and QC labs of the pharmaceutical industry. Take advantage of SiliCycle's expertise and knowledge in the field of grafting technologies to efficiently address this regulation.



	\mathcal{A}		Metal Scavengers Portfolio			
	Scavengers	Structure	Brief Description	Metals Removed*		
pgl-s	SiliaMetS Thiol PN: R51030B Loading: ≥ 1.20 mmol/g	бл ого вн	Silia <i>MetS</i> Thiol is our most versatile and robust metal scavenger for a variety of metals under a wide range of conditions.	Ag, Hg, Os, Pd & Ru Cu, Ir, Pb, Rh, Se & Sn		
PGI-S	SiliaMetS DMT PN: R79030B Loading: ≥ 0.50 mmol/g	SH N N H H SH	Silia <i>MetS</i> DMT is the silica-bound equivalent of 2,4,6-trimercaptotriazine (<i>trithiocyanuric acid, TMT</i>). It is a versatile metal scavenger for a variety of metals and the preferred metal scavenger for ruthenium catalysts and hindered Pd complexes (<i>i.e.</i> $Pd(dppf)Cl_2$).	As, Ir, Ni, Os, Pd, Pt, Rh, Sc, Ru & Se Cd, Co, Cu, Fe, Sc & Zn		
	SiliaBond Amine PN: R52030B Loading: ≥ 1.20 mmol/g	SI NH2		Cd, Cr, Pd, Pt, Rh & Ru Co, Cu, Fe, Hg, Pb, W & Zn		
	SiliaMetS Diamine PN: R49030B Loading: ≥ 1.28 mmol/g	SI CONNCENSION NH2	Also known for their electrophile scavenging efficiencies and their base reagent qualities, Silia <i>MetS</i> Amine, Diamine and Triamine have proven to be very useful for the scavenging of the following metals: Pd, Pt, Cr, W and Zn.	Cr, Pd, Pt, W & Zn Cd, Co, Cu, Fe, Hg, Ni, Pb, Ru, Se, V & Sc		
PGI-S	Silia <i>MetS</i> Triamine PN: R48030B Loading: ≥ 1.11 mmol/g	G N N NH2		Cr, Pd, Pt, W & Zn Ag, Cd, Co, Cu, Fe, Hg, Ni, Os, Pb, Rh, Ru & Sc		
·	SiliaMetS AMPA PN: R85130B Loading: ≥ 0.80 mmol/g	OH OH OH OH P O OH	Silia <i>MetS</i> AMPA is an aminomethyl-alkylphosphonic acid ligand known for its excellent metal-bonding properties. It is particularly efficient to remove Al, Sb, Ni, La, and also very effective for Co, Cu, Fe, Mg and Zn scavenging from reaction intermediates or final APIs.	Al, Ce, Dy, Er, Eu, Gd, Ho, La, Lu, Mg, Nd, Ni, Pm, Pr, Sb, Sm, Tb, Tm, V & Yb Co, Cu, Fe, Mg & Zn		
·	SiliaMetS Cysteine PN: R80530B Loading: ≥ 0.30 mmol/g	SI ~~~ N ~ ONA	Silia <i>MetS</i> Cysteine is the silica-bound equivalent of the amino acid cysteine. It is a versatile scavenger for a variety of metals and the preferred metal scavenger for tin residues. By attaching the molecule to the backbone via the amino group, the thiol group remains free and accessible for higher metal scavenging efficiency.	Cd, Fe, Ir, Os, Ru, Sc & Sn Ca, Cr, Cs, Cu, La, Mg, Pd, Pt, Rh, Se & Zn		
pgi-s	SiliaMetS DEAM PN: R54430B Loading: ≥ 0.85 mmol/g	СЭ NОН ОН	Silia <i>MetS</i> DEAM is a versatile scavenger designed to remove trace metal of Ti, Zn, Fe and Ag as well as boronic acids from reaction intermediates or final APIs.	Ag, Fe, Sn, Ti & Zn Se		
pgl-S	SiliaMetS DOTA PN: R91030B Loading: ≥ 0.38 mmol/g		Silia <i>MetS</i> DOTA is a silica-supported tetracarboxylic acid and its various conjugate bases. DOTA molecule is a well-adopted complexing agent. Linked to various metals, so formed-complexes are used as contrast agents in cancer treatments or other medical applications.	As, Ca, Cu, Gd, La, Ni, Se & Zn Co, Fe, Mg, Pd, Pt & Rh		
	SiliaMetS Imidazole PN: R79230B Loading: ≥ 0.96 mmol/g	Si NAN	Silia <i>MetS</i> Imidazole is a versatile metal scavenger for a variety of metals including Cd, Co, Cu, Fe, Ni, Os, Pd and Rh.	Cd, Co, Cu, Fe, Ir, Li, Mg, Ni, Os, W & Zn Cr, Pd & Rh		
PGI-S	SiliaMetS TAAcOH PN: R69030B Loading: ≥ 0.41 mmol/g	Contraction of the second seco	Silia <i>MetS</i> TAAcOH & TAAcONa are supported versions of EDTA in their acid and sodium salt forms. These two products are effective metal scavengers for	Ca, Co, Ir, Li, Mg, Ni, Os, Ru & Sc Cr, Cs, Fe, Pd, Rh & Sn		
	SiliaMetS TAAcONa PN: R69230B Loading: ≥ 0.41 mmol/g		metals in low or zero oxidation states, compared to Silia <i>MetS</i> TAAcONa which is useful for metals in higher oxidation states (≥ 2).	Ca, Cd, Cs, Cu, Fe, Ir, La, Li, Mg, Ni, Os, Rh, Sc & Sn Cr, Pd, Ru, Se & Zn		
	SiliaMetS Thiourea PN: R69530B Loading: ≥ 1.07 mmol/g	S N N H H H	Silia <i>MetS</i> Thiourea is a versatile metal scavenger for all forms of palladium and is widely used in the pharmaceutical industry. Once complexed with a transition metal, it has been reported to be an effective catalyst.	Pd & Ru Ag, Cu, Fe, Os, Rh, Sc & Sn		
PGI-S	SiliaBond Tosic Acid PN: R60530B Capacity: ≥ 0.54 meq/g	С С С С С С С С С С С С С С С С С С С	Silia <i>Bond</i> Tosic Acid is in a class of strong acids used in different fields of synthetic organic chemistry. The aromatic ring makes it slightly more acidic than other supported sulfonic acids.	Fe, Rh & Sn Ag, Cu, Ni, Pd, Pt, Ru & Zn		

* Metals removed: Navy blue: best scavenger / Light blue: good scavenger

🥸 : Potentially Genotoxic Impurities (PGI) Scavenger - Contact us for more information

R&D Services Extraction - Purification

Scavenging

Catalysis Synthesis

Chromatography

Sample Preparation

Analysis





SiliaBond®

Scavengers for Organic Impurities

The Importance of Organic Contaminant Removal From APIs.

Using excess reagents in organic synthesis is a very common strategy to maximize conversion and product yield. But the benefits of this approach can rapidly be outshined when comes the need to purify the final reaction mixture from excess reagents.

In addition, even reagents used in stoechiometric amounts can lead to an uncomplete reaction, and this is far more common than the other way around.

These reagents can either contaminate the API with potentially genotoxic impurities or environmental hazards, or jeopardize subsequent reactions by their reactivity. Indeed, such reagents usually bear nucleophilic, electrophilic, acidic or basic functional groups.

There is a very strong need in organic chemistry and high-throughput screening for simpler work-up and purification processes. Our range of organic scavengers have been widely acknowledged and adopted by early R&D teams up to manufacturing.

How Silia*Bond* Organic Scavengers Can Help You Purify Your API From Organic Contaminants

Direct scavenging of the undesired compound to isolate the API:

- Silica is bound with a functional group, that will specifically react with a product: either excess reagents (*unreacted*) or impurities.
- The API is recovered by simple filtration as demonstrated on the following scheme:



Alternative Method: catch and release of the API

SiliaBond scavenger is packed in a SPE cartridge:

- · Conditioning step: with six to ten cartridge volumes of solvent
- Loading step: API is loaded and trapped onto the cartridge bed
- Washing steps: cartridge is washed to filter excess reagents and / or other impurities
- Elution step: API is eluted, recovered and purified





	Y.		Organic Scavengers Portfolio		
	Scavengers	Structure	Nature	Molecules Removed	
	SiliaBond Amine		Scavenger for Electrophiles (Covalent Bonding)	Acyl Chlorides, Aldehydes, Anhydrides, Chloroformates, Isocyanates, Ketones & Sulfonyl Chlorides	
	PN: R52030B Loading: \geq 1.20 mmol/g		Scavenger for Acids (<i>Ionic Bonding</i>) Catch & Release	Acids & Acidic Phenols	
	SiliaBond Carbonate PN: R66030B Loading: ≥ 0.46 mmol/g	(CO ₃ ²) _{0.5}	Scavenger for Acids (<i>Ionic Bonding</i>) Catch & Release	Acids, Acidic Phenols & Boronic Acids	
pgl-s	SiliaBond Carboxylic Acid PN: R70030B Loading: ≥ 0.92 mmol/g	С	Scavenger for Bases (<i>lonic Bonding</i>) Catch & Release	Primary / Secondary Amines & Anilines	
	SiliaMetS DEAM PN: R54430B Loading: ≥ 0.85 mmol/g	С М ОН ОН	Scavenger for Electrophiles & Lewis Acids (<i>Covalent & Ionic Bonding</i>) Catch & Release	Boronic Acids	
	SiliaMetS Diamine		Scavenger for Electrophiles (Covalent Bonding)	Acyl Chlorides, Aldehydes, Anhydrides, Chloroformates, Isocyanates, Ketones & Sulfonyl Chlorides	
	PN: R49030B Loading: \geq 1.28 mmol/g		Scavenger for Acids (<i>Ionic Bonding</i>) Catch & Release	Acids & Acidic phenols	
-	SiliaBond Diol PN: R35030B Loading: ≥ 0.97 mmol/g	бото стон	Scavenger for Electrophiles & Lewis Acids (Covalent & Ionic Bonding) Catch & Release	Boronic Acids	
	SiliaBond DMAP PN: R75630B Loading: ≥ 0.53 mmol/g	Si N	Scavenger for Electrophiles (Covalent Bonding)	Acyl Chlorides & Sulfonyl Chlorides	
	SiliaBond Guanidine PN: R68230B Loading: ≥ 0.80 mmol/g		Scavenger for Acids (<i>Ionic Bonding</i>) Catch & Release	Acids, Acidic Phenols & Boronic Acids	
	SiliaBond Carbamate PN: R50130B Loading: ≥ 1.16 mmol/g	هر الله الله الله الله الله الله الله ال	Scavenger for Nucleophiles (Covalent Bonding)	Alcohols, Alkoxides, Amines, Anilines, Hydrazines, Thiols & Thiolates	
	SiliaBond Maleimide PN: R71030B Loading: ≥ 0.64 mmol/g	S N N	Scavenger for Nucleophiles (Covalent Bonding)	Thiols & Thiolates	
agy.S	SiliaBond Piperazine		Scavenger for Electrophiles (Covalent Bonding)	Acyl Chlorides, Aldehydes, Anhydrides, Chloroformates, Isocyanates, Ketones & Sulfonyl Chlorides	
	PN: R60030B Loading: ≥ 0.83 mmol/g		Scavenger for Acids (<i>Ionic Bonding</i>) Catch & Release	Acids & Acidic Phenols	
PGI-S	SiliaBond PropyIsulfonic Acid PN: R51230B Loading: ≥ 0.63 mmol/g	о °″́∽он	Scavenger for Bases (Ionic Bonding)	Amines & Anilines	
PGI-S	SiliaBond Tosic Acid PN: R60530B Loading: ≥ 0.54 meq/g	С С С С С С С С С С С С С С С С С С С	Catch & Release		
	SiliaBond TMA Acetate PN: R66430B Loading: ≥ 0.71 mmol/g	Si Nr.~ I CH3COO.	Scavenger for Acids (<i>Ionic Bonding</i>) Catch & Release	Carboxylic Acids	
	SiliaBond Tosyl Chloride PN: R44030B Loading: ≥ 0.63 mmol/g		Scavenger for Nucleophiles (Covalent Bonding)	Alcohols, Alkoxides, Amines, Anilines, Hydrazines, Thiols & Thiolates	
PGI-S	SiliaMetS Triamine		Scavenger for Electrophiles (Covalent Bonding)	Acyl Chlorides, Aldehydes, Anhydrides, Chloroformates, Isocyanates, Ketones & Sulfonyl Chlorides	
Por	Loading: \geq 1.11 mmol/g	H H	Scavenger for Acids (<i>Ionic Bonding</i>) Catch & Release	Acids & Acidic Phenols	

Potentially Genotoxic Impurities (PGI) Scavenger - Contact us for more information





SiliaCat[®]

Heterogeneous Catalysts

- High stability and accurate loading
- Rigid & porous structure
- Compatibility with a wide range of solvents
- Ease of use: no swelling or static charge
- Minimal leaching
- Fast kinetics

The SiliaCat Matrix

Inspired by the ORganically MOdified SILica (*ORMOSIL*) technology, the Silia*Cat* family is composed of new and innovative catalysts.

Resulting from the co-condensation of two organosilane monomers by the sol-gel process, the hybrid organic-inorganic materials present the highest stability and reactivity available with heterogeneous catalysts.

Furthermore, the highly cross-linked framework presents a better resistance compared to post-functionalization process.

What is SiliaCat Heterogeneous Catalyst?

Usually, heterogeneous catalysts supported on a silica matrix are immobilized by postmodification of the inorganic support.

These supports, however, present a high degree of leaching due to the poor stability of the immobilized phase. With Silia*Cat*, the ligand is directly cross-linked in an organic-inorganic framework. This results in a high degree of stability of the catalysts.

Compared to homogeneous catalysts, Silia*Cat* exhibits a good reactivity and selectivity with one of the major advantages being that the catalyst is eliminated from the reaction mixture by a simple filtration.

Forget your purification problems with our SiliaCat catalysts family!

Features and Benefits of SiliaCat Catalysts

- Reagent concentrated at the surface of the material Reproducible synthesis with high conversion and yield
- Robustness High thermal and mechanical stability
- **Rigid and porous structure** No swelling, solvent independent and air stable (*no inert conditions required*)
- Minimal leaching of organoceramic matrix Easier purification
- High and accurate catalyst loading Less catalyst required over competitive products

- High turnover number (TON) Low catalytic amount required (< 1 mol %)
- Reusability
 Multi-uses possible
- Ease of handling and purification Free flowing, no static charge Easily removed by simple filtration
- Ease of scalability Scalable from mg up to multi-ton scale
- Available in bulk quantities Can be delivered in large quantities and always in stock







	Heterogeneous Catalysts Portfolio				
SiliaCat Name Structure B		Brief Description	Typical Applications		
SiliaCat DPP-Pd PN: R390-100	$ \begin{bmatrix} I \\ O \\ I \\ O \\ I \\ O \\ I \\ O \\ I \end{bmatrix}_{n}^{n} DPP-Pd $	Silia <u>Cat</u> DPP-Pd is a unique diphenylphosphine palladium (II) heterogeneous catalyst made from a leach-resistant organoceramic matrix.	Suzuki, Heck, Negishi, Borylation, Sonogashira, Kumada, Stille		
SiliaCat Pd⁰ PN: R815-100	-O−Si−CH₃ Pd ⁰	Silia <i>Cat</i> Pd ^o is a new series of patent-protected sol-gel-entrapped Pd nanocatalysts. It is made from highly dispersed Pd nanoparticles (<i>uniformly in the range 2.0 - 6.0 nm</i>) encapsulated within an organosilica matrix. It is a safer alternative for hydrogenation over Pd/C.	Selective debenzylation, Selective hydrogenation, Suzuki, Heck Sonogashira, Kumada, Stille		
SiliaCat Pt⁰ PN: R820-100	−O−Si−CH₃ U I I I I I I I I I	Silia <i>Cat</i> Pt ^o is made of organosilica physically doped with nanostructured platinum (0), and is both stable and efficient. Pt nanoparticles (<i>uniformly in the range 1.5 - 6 nm</i>) are encapsulated via an alcohol-free sol-gel process typical of enzyme sol-gel encapsulation.	Selective reduction of nitroarenes, Hydrosilylation		
SiliaCat TEMPO PN: R723-100	$ \begin{array}{c} & & \\ & & $	Silia <i>Cat</i> TEMPO is an oxidizing catalyst made from a proprietary class of organosilica-entrapped radicals. This encapsulation process confers enhanced reactivity and properties. The leach-resistant organoceramic matrix makes Silia <i>Cat</i> TEMPO highly efficient and selective compared to homogeneous TEMPO. It also has a superior performance compared to polymer-supported TEMPO in terms of both selectivity and stability. With Silia <i>Cat</i> TEMPO, no activation is required prior to use and selective aldehyde vs acid oxidation is possible.	Oxidation of alcohols or aldehydes		

Available Kits

Because all reactions are unique, and that small differences can influence the catalysis efficiency, doing a screening is often recommended, especially if you are new to this technology. This is why we created a special kit containing our four catalysts.

This kit is available in 5 g, 10 g, 25 g, 50 g and 100 g formats.

Heterogen			
Kit Name	Kit PN	Composition	
Silia <mark>Cat</mark> Heterogeneous Catalysts Kit	K305-100	DPP-Pd, Pd ^o , Pt ^o & TEMPO	- Ale Carl

A safer alternative to pyrophoric Pd/C or Raney Nickel



Unlike its homogeneous counterparts – which are air unstable and pyrophoric – SiliaCat ORMOSIL-entrapped palladium catalyst Pd⁰ shows a much better stability.

When testing its flammability limits¹, it was only under special conditions which took us several hours to identify via trial and error that the Pd nanobeads finally did turn incandescent, and this was over the limit of 350 °C of the laser thermometer. This was due to the exothermic reaction between MeOH vapors and atmospheric O_2 . Yet, no flames from the catalyst structure were ever spotted under any applied conditions and it was only the color of the white filter paper in the Büchner funnel that turned brown, but never incandescent.

¹ Béland, F; Pagliaro, M. *et al. Org. Process Res. Dev.*, **2018**, XX, XXXX (DOI: 10.1021/acs.oprd.8b00242)





SiliaBond®

Heterogeneous Reagents & Oxidants

Discover how our heterogeneous reagents & oxidants can optimize your synthesis.

Our heterogeneous supports for chemical synthesis are offered in two different forms:

- SiliaBond Reagents (for both catalytic & stoechiometric reactions)
- SiliaBond Oxidants

What are SiliaBond Heterogeneous Reagents & Oxidants?

Increasingly, the use of heterogeneous reagents in organic synthesis and chemical production is growing in importance. This technology is completely in line with the industries seeking improved sustainability and reduced ecological footprint.

This strong trend is directly derived from the inherent benefits offered by silica-based heterogeneous reagents & oxidants:

- Extremely easy product / API isolation and purification (simple & quick filtration of the heterogeneous support)
- Eliminates or strongly reduces the need for laborious purifications
- No leaching of silica or catalyst and no cross contamination
- · Highly suitable for either batch or continuous flow applications
- · Convenient for high throughput medicinal & discovery chemistry
- · Improved reactivity & selectivity over homogeneous reagents / catalyst
- Compares very favourably to polymer-based reagents: no swelling, thermally stable, more easily scalable, faster kinetics, compatible with all solvents and mechanically stable

Here is the reaction mechanism:



Reactions addressed by SiliaBond reagents & oxidants

- Acylation / Esterification
- Alkylation / Etherification
- Amide Coupling
- Various Cross-Couplings
- Cyanation
- Deprotection of Ethers
- Ether Formation

- Fmoc, Bsmoc Deprotections
- Friedel-Crafts Alkylation
- Fries Rearrangement
- Michael Addition
- Tosylate Formation
- Urea Synthesis
- and so many more...



Available formats: from 5 g to 25 kg, even up to multi-ton scale!

Catalysts & Reagents Portfolio							
Name & Product Number	Structure	Loading / Density					
SiliaBond AICI _x PN: R74530B		≥ 1.60 mmol/g 0.781 g/mL					
SiliaBond Amine PN: R52030B	Si NH ₂	≥ 1.20 mmol/g 0.700 g/mL					
SiliaBond Carbodiimide PN: R70530B	Si N=C=N-	≥ 0.91 mmol/g 0.751 g/mL					
SiliaBond Carbonate PN: R66030B	Si N ⁺ (CO ₃ ²) ₀₅	≥ 0.46 mmol/g 0.608 g/mL					
SiliaBond Cyanoborohydride PN: R66730B	Si H ₃ CN	≥ 0.87 mmol/g 0.705 g/mL					
SiliaBond Dichlorotriazine PN: R52230B		≥ 0.60 mmol/g 0.781 g/mL					
SiliaBond Dimethylamine PN: R45030B		≥ 1.14 mmol/g 0.705 g/mL					
SiliaBond Diphenylphosphine PN: R39030B	9~~~C	≥ 0.75 mmol/g 0.588 g/mL					
SiliaBond DMAP PN: R75630B		≥ 0.53 mmol/g 0.674 g/mL					
SiliaBond EDC PN: R70630B	S C N-c-N	≥ 0.32 mmol/g 0.770 g/mL					
Silia<u>Bond</u> Guanidine PN: R68230B		≥ 0.80 mmol/g 0.732 g/mL					
Silia<u>Bond</u> HOBt PN: R70730B	S N N N N N N N N N N N N N N N N N N N	≥ 0.56 mmol/g 0.766 g/mL					
Silia<u>Bond</u> Maleimide PN: R71030B	SI N	≥ 0.64 mmol/g 0.644 g/mL					
SiliaBond Morpholine PN: R68030B	Si N	≥ 0.99 mmol/g 0.666 g/mL					
SiliaBond Piperazine PN: R60030B	S NH	≥ 0.83 mmol/g 0.671 g/mL					
SiliaBond Piperidine PN: R71530B		≥ 1.03 mmol/g 0.660 g/mL					
SiliaBond Tosic Acid PN: R60530B	С	≥ 0.54 meq/g 0.698 g/mL					
SiliaBond Tosyl Chloride PN: R44030B		≥ 0.63 mmol/g 0.761 g/mL					

Oxidants Portfolio						
Name & Product Number	Structure	Loading / Density				
SiliaBond KMnO₄ PN: R23030B	Si + KMnO ₄	10 % w/w 0.593 g/mL				
SiliaBond PCC PN: R24030B) + NH+ CICro;	20 % w/w 0.693 g/mL				
SiliaBond PDC PN: R24530B	S + C NH' Cr, Cro, *	20 % w/w 0.651 g/mL				
SiliaCat TEMPO PN: R723-100		≥ 0.70 mmol/g 0.550 - 0.650 g/mL				

Acids & Bases Portfolio						
Name & Product Number	Structure	Loading / Density				
Silia <mark>Bond Carboxylic Acid</mark> PN: R70030B	С С С С С С С С С С С С С С С С С С С	≥ 0.92 mmol/g 0.687 g/mL				
Silia <mark>Bond Propylsulfonic Acid</mark> PN: R51230B	G S S S S OH	≥ 0.63 mmol/g 0.728 g/mL				
SiliaBond Tosic Acid PN: R60530B	С С С С С С С С С С С С С С С С С С С	≥ 0.54 mmol/g 0.698 g/mL				
Silia<mark>Bond</mark> Amine PN: R52030B	Si NH ₂	≥ 1.20 mmol/g 0.700 g/mL				
Silia <mark>Bond</mark> Carbonate PN: R66030B	(CO ₃ ²) _{0.5}	≥ 0.46 mmol/g 0.608 g/mL				
Silia<mark>Bond</mark> Dimethylamine PN: R45030B	Si N	≥ 1.14 mmol/g 0.705 g/mL				
Silia<mark>Bond</mark> Guanidine PN: R68230B		≥ 0.80 mmol/g 0.732 g/mL				
Silia <mark>Bond Morpholine</mark> PN: R68030B		≥ 0.99 mmol/g 0.666 g/mL				
Silia <mark>Bond</mark> Piperazine PN: R60030B		≥ 0.83 mmol/g 0.671 g/mL				
Silia<mark>Bond</mark> Piperidine PN: R71530B		≥ 1.03 mmol/g 0.660 g/mL				

Linkers Portfolio						
Name & Product Number	Structure	Loading / Density				
Silia<mark>Bond</mark> Allyl PN: R53530B	SI ~~	≥ 1.08 mmol/g 0.613 g/mL				
SiliaBond Bromophenyl PN: R55030B	Si	≥ 0.99 mmol/g 0.742 g/mL				
Silia <mark>Bond</mark> Glycidoxy PN: R36030B		≥ 0.82 mmol/g 0.662 g/mL				
SiliaBond Phenylmethylchloride PN: R56530B		≥ 1.14 mmol/g 0.637 g/mL				
Silia<u>Bond</u> Propyl Bromide PN: R55530B	Sil	≥ 1.39 mmol/g 0.748 g/mL				
SiliaBond Propyl Chloride PN: R59030B	Giran Ci	≥ 1.39 mmol/g 0.751 g/mL				

Not finding what you are looking for?

Contact us!

Scavenging

Synthesis & Catalysis





Silia*Flash*[®] & Silia*Sphere*[™] PC

Silica Gels for Chromatography

With pore diameters ranging from 30 to 1,000 Ångström (Å) and particle sizes up to 1,200 μ m, 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. In addition to performance, SiliCycle's silica gels also ensure consistency, reliability and reproducibility.

- High purity silica with the lowest level of fines on the market No contamination, lower back-pressure and 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

Choosing Between SiliaFlash Irregular and SiliaSphere 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 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: SiliaSphere PC.

Advantages of using Silia*Sphere* PC materials over standard irregular silica gels include the following:

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





SiliaFlash® Irregular silica

SiliaSphere[™] PC Spherical silica

SiliaFlash: Different Grades for Different Requirements

Over the years, SiliCycle has developed two different grades for the two most popular irregular gels used in the industry: $40 - 63 \mu m$, $60 \text{ Å} \& 60 - 200 \mu m$, 60 Å. Those two grades of each gel are available to address our customers' requirements, depending on their applications, areas of research and budgets.

Two Different Grades of 40 - 63 μm, 60 Å Gels							
Grade	Superior Grade	Standard Grade					
Name (PN)	F60 (<i>R10030B</i>)	P60 (<i>R12030B</i>)					
Particularities	 Extra step to reduce metal content to minimum level Tighter particle size distribution Fines have been removed 	Fines have been removedLower price					

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 60 - 200 μm, 60 Å Gels							
Grade	Superior Grade	Standard Grade					
Name (PN)	G60 (<i>R10040B</i>)	GE60 (<i>R10140B</i>)					
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 					

Each grade offers its own particle size distribution profile.



R10170M

Available formats: from 1 kg to 25 kg, even up to multi-ton scale!

SiliaFlash Irregular Silica Gels Portfolio



50

60

70

90

100

120

300

500

800

1,000

SiliaSphere PC Spherical Silica Gels Portfolio

	Scavenging
lio	
Diameter (Å)	

Product Number	Particle Size		Pore Diameter (Å)	Product Number	Particle Size		Pore
Product Number	μm	mesh	Pore Diameter (A)	Product Number	μm	mesh	PUIC
R10137L	75 - 150	100 - 200	30	S10095W-A	25	*	
R10130A	40 - 63	230 - 400		S10030B-A	50	300	
R10150A	60 - 120	325 - 625		S10027B-A	60	250]
R10140A	60 - 200	70 - 230	40	S10034B-A	75	200	
R10160A	120 - 200	70 - 125	40	S10040B-A	100	150	
R10170A	200 - 500	35 - 70		S10063B-A	150	100	
R10180A	500 - 1,000	18 - 35		S10066B-A	200	70	
R10117B	15 - 40	*		S10068B-A	300	50	
R10023B	20 - 45	*		S10020C	20 - 45	*	
R10030B (<i>F60</i>)				S10040C	75 - 200	70 - 200	
R12030B (P60)	40 - 63	230 - 400		S10030C	40 - 75	200 - 400	
R10530B (Acid-Washed)				S10070C	200 - 500	35 - 70	
R10150B	60 - 120	325 - 625		S10095D-A	25	*	
R10040B (G60)	60 - 200	70 - 230	60	S10020E	20 - 45	*	
R10140B (GE60)	00 200	10 200		S10030E	40 - 75	200 - 400	
R10137B	75 - 150	100 - 200		S10040E	75 - 200	70 - 200	
R10157B	105 - 175	86 - 140		S10065E	150 - 250	60 - 100	
R10160B	120 - 200	70 - 125		S10070E	200 - 500	35 - 70	
R10165B	150 - 250	60 - 100		S10030G-A	50	300	
R10170B	200 - 500	35 - 70		S10034G-A	75	200	
R10180B	500 - 1,000	18 - 35		S10040G-A	100	150	
R10130D	40 - 63	230 - 400		S10063G-A	150	100	
R10140D	60 - 200	70 - 230		S10020M	20 - 45	*	
R10157D	105 - 175	86 - 140	90	S10030M	40 - 75	200 - 400	
R10170D	200 - 500	35 - 70	30	S10040M	75 - 200	70 - 200	
R10180D	500 - 1,000	18 - 35		S10070M	200 - 500	35 - 70	
R10181D	800 - 1,200	16 - 22		S10020P	20 - 45	*	
R10130H	40 - 63	230 - 400		S10030P	40 - 75	200 - 400	
R10150H	60 - 120	325 - 625		S10040P	75 - 200	70 - 200	
R10140H	75 - 250	60 - 200		S10070P	200 - 500	35 - 70	
R10157H	105 - 175	86 - 140		S10020S	20 - 45	*	
R10160H	120 - 200	70 - 125	150	S10030S	40 - 75	200 - 400	
R10170H	200 - 500	35 - 70		S10040S	75 - 200	70 - 200	
R10072H	250 - 500	35 - 60		S10070S	200 - 500	35 - 70	
R10180H	500 - 1,000	18 - 35		S10020T	20 - 45	*	
R10181H	800 - 1,200	16 - 22		S10030T	40 - 75	200 - 400	
R10130M	40 - 63	230 - 400		S10040T	75 - 200	70 - 200	
R10140M	60 - 200	70 - 230	300	S10070T	200 - 500	35 - 70	

* Mesh equivalent too small to exist as real screen size.

Acid-washed SiliaFlash silica gel for extra purity (R10530B)

35 - 70

200 - 500

SiliCycle also manufactures an acid-washed SiliaFlash 40 - 63 µm, 60 Å irregular silica gel. This product gel has been developed to ensure a pH-controlled media with even lower levels of trace metal contaminants and maximal purity.





SiliaBond®

Chromatographic Phases

Thanks to its high mechanical resistance, silica is the most widely used media in chromatography. With Silia*Bond* irregular silica gels, SiliCycle offers a large range of solutions for low pressure chromatography, to help cover many kinds of purification.

We guarantee superior quality and stability of our phases: no fines will appear when packing the media. Glass gravity columns will give excellent performance and lifetime!

Solutions for Low Pressure Chromatography

For all our listed Silia*Bond* sorbents, particle size is 40 - 63 µm and pore diameter is 60 Å. But we can graft any irregular Silia*Flash* or spherical Silia*Sphere* PC silica gel, with the function of your choice. Contact us for more information.

All functionalized SiliaBond sorbents are available in bulk but also pre-packed in SiliaPrep SPE cartridges and SiliaSep flash cartridges.

Reversed-Phases

In reversed-phase chromatography, the packing material is always hydrophobic (*non polar*) while the mobile phase is polar. The more hydrophobic the packing material, the more retention of non polar analytes.

Usual reversed-phases are standard alkyl chains grafted on silica (C18, C8, C4, C1) and cyclic or aromatic functions (Phenyl, Pentafluorophenyl, Cyclohexyl).

Important parameters to keep in mind in reversed-phase chromatography:

- Carbon load (% *C*) will give the relative hydrophobicity of the packing media. Most of the time, it varies between 4 % and 19 %.
- Endcapping: it is impossible to react with all available silanol groups (*free -OH groups on the silica surface*) when functionalizing silica. But these free silanols are acidic and will react with basic compounds, so we endcap them with a capping agent to avoid non-specific bindings.

Normal Phases

In normal phase chromatography, the packing material is always polar while the mobile phase is non polar. The interactions between analytes and sorbent mainly take place on the highly polar silanols of the silica gel surface. Some hydrogen bonds can also happen on polar functionalized groups.

Usual normal phases are ungrafted silica, polar functions (*amino, cyano and diol*) or alternative adsorbents (*Alumina and Florisil for example*).

Ion Exchange Phases

In ion exchange chromatography, both silica support and analytes must be ionized. If the stationary phase (*packing material*) is positively charged, anionic analytes only will retain (*these phases are called WAX & SAX*). And in the contrary if the stationary phase is negatively charged, cationic analytes only will retain (*these phases are called WAX & SAX*). And in the contrary if the stationary phase is negatively charged, cationic analytes only will retain (*these phases are called WAX & SAX*). Hence, pH of the mobile phase is of crucial importance and needs to be chosen carefully, so that both functions are charged:

Analyte pK



Analyte pK_a



Available formats: from 5 g to 25 kg, even up to multi-ton scale!

	Ó.	Low Pi	ressure Chromatography Phases Portfolio			
	Sorbent	Characteristics	Typical Applications			
	C18 PN: R33230B	% C: ≥ 16 % Density: 0.639 g/mL	 Purification of low to high polarity compounds Reproducible purification without complexity and cost of preparative HPLC 			
ŝ	C8 PN: R30830B	% C: 11.0 % Density: 0.586 g/mL	 Less retention compared to C18 For highly hydrophobic pesticides, small peptides and large molecule drugs 			
phase	Cyclohexyl (C6) PN: R61530B	% C: 9.5 % Density: 0.662 g/mL	 Less retention compared to C18 and C8 Additional steric interaction 			
ersed-	C4 PN: R32030B	% C: ≥ 6.67 % Density: 0.656 g/mL	 Less retention compared to C18 and C8 For molecules with large hydrophobic regions 			
Rev	C1 PN: R33030B	% C: ≥ 4.17 % Density: 0.559 g/mL	 Lower retention compared to other reversed-phases For purification of polar and non-polar highly hydrophobic pharmaceutical products 			
	Phenyl (<i>PHE</i>) PN: R34030B	% C: 8.0 % Density: 0.637 g/mL	 Moderate non-polar sorbent Alternative selectivity for aromatic compounds, compared to other reversed-phases 			
	Pentafluorophenyl (PFP) PN: R67530B	% C: 9.0 % Density: 0.761 g/mL	 For alternative selectivity approach with aromatic ring interactions For purification of conjugated compounds (<i>isomers</i>) 			
	Cyano (<i>CN</i>) PN: R38030B	% C: 7.0 % % N: ≥ 1.93 % Loading: ≥ 1.38 mmol/g Density: 0.703 g/mL	 Versatile sorbent that can be used either as normal or reversed-phase Less polar than silica For organic compounds with intermediate to extreme polarity 			
	Silica (<i>Si</i>) PN: R10030B	Density: 0.550 g/mL	 Most popular sorbent for day-to-day use For purification of non-ionic polar organic compounds 			
ases	Silica HP (Si HP)	Particle size: 25 μm Density: 0.500 g/mL	 High Performance sorbent for difficult separations (<i>isomers</i>) Higher loading capacity, faster flow rate, less solvent used 			
rmal Ph	Diol nec PN: R35030B	Loading: ≥ 0.97 mmol/g Density: 0.687 g/mL	 For difficult separation of low to medium polarity samples Can be used in HILIC mode For mono and polysaccharides separation 			
S No	Neutral Alumina PN: AUT-0054	Particle size: 50 - 200 μm	• For aromatic compounds, aliphatic amines & compounds containing electronegative functions			
	Florisil PN: AUT-0014	Particle size: 40 - 75 μm Pore size: 100 Å	• For separation of chlorinated pesticides, polychlorinated biphenyls (PCBs) & polysaccharides			
	Silver Nitrate (<i>AgNO</i> ₃) PN: R23530B	Loading: 10 % w/w Density: 0.604 g/mL	• For separation of cis / trans isomers of unsaturated compounds (alkenes, lipids, steroids and terpenes)			
	Amine (<i>NH</i> ₂ , <i>WAX</i>) PN: R53030B	Loading: ≥ 1.2 mmol/g Density: 0.700 g/mL	 In normal phase: for purification of compounds with basic properties, or for monosaccharides separation In ion exchange: Weak anion exchanger (<i>pK_a</i> of 9.8), positively charged at pH below 7.8 For very strong anions (<i>such as sulfonic acids</i>), that may be too strongly retained on SAX 			
S	WAX-2 (<i>Triethylamine</i>) PN: R76530B	Loading: ≥ 1.04 mmol/g Density: 0.761 g/mL	 Weak anion exchanger (<i>pK_a</i> of 10.5), positively charged at pH below 8.5 For catch & release of compounds bearing a permanent negative charge (<i>ie salts of sulfonic acids</i>) 			
ige Phase	SAX (TMA Chloride) PN: R66530B	Loading: ≥ 0.90 meq/g Density: 0.700 g/mL	 Strong anion exchanger, permanently positively charged (<i>pH independant</i>) For weak anions (<i>such as carboxylic acids</i>) that may not bind strongly enough on WAX For analysis of acidic drugs / analgesics, biomolecules (<i>peptides and proteins</i>) & water-soluble vitamins (<i>vitamins B and C</i>) 			
char	SAX-2 (TMA Acetate) PN: R66430B	Loading: ≥ 0.71 mmol/g Density: 0.665 g/mL	 Easily exchangeable acetate counter-ion (more than chloride ion) For compounds with pK_a < 5 (such as carboxylic acids) 			
lon E	SCX (Tosic Acid) PN: R60530B	Loading: ≥ 0.54 meq/g Density: 0.698 g/mL	• Strong cation exchanger ($pK_a < 1$), permanently negatively charged (pH independant)			
	SCX-2 (<i>Propylsulfonic Acid</i>) PN: R51230B	Loading: ≥ 0.63 mmol/g Density: 0.728 g/mL	(peptides and proteins) & water-soluble vitamins (basic vitamins B and C)			
	WCX (Carboxylic Acid) PN: R70030B	Loading: ≥ 0.92 mmol/g Density: 0.687 g/mL	 Weak cation exchanger (<i>pK_a of 4.8</i>), neutralized at pH below 2.8 For strong cationic species, which would bind too strongly on SCX 			

For all sorbents, particle size is 40 - 63 μm and pore diameter is 60 Å. All bonded phases are available endcapped and non-endcapped.



Scavenging

Catalysis Synthesis

R&D Services





SiliaSep™

Flash Cartridges

With SiliaSep, benefit from the same quality that all our products are known for: selectivity, speed & reliability.

With a more tightly packed silica bed and a homogeneous packing, the use of pre-packed flash cartridges improves purification efficiency by offering superior reproducibility and productivity compared to conventional manual flash chromatography.

SiliaSep Cartridge Design



Secure screw cap with unique design to prevent leaks and ensure consistent sample loads

SiliaSep Features & Benefits

High silica gel quality, with low level of fines

- No product contamination
- Homogeneous packing, no channelling (no peak tailing)
- High loading capacity (high surface area)
- Direct transfer from TLC to flash chromatography

Reproducibility, reliability & safety

- · Leak-free guaranteed by unique one-piece cartridge design
- Reproducible performance from lot-to-lot (stringent quality control)
- · Excellent durability to withstand high pressures
- Universal luer fittings for compatibility with any flash system

Versatility

- · Wide choice of cartridge sizes from 4 g to 41 kg
- · Purification scale-up from milligram to kilograms
- · Variety of sorbents to meet any separation need

Effective packing technology

- Consistent packing for reproducible high plate count (N)
- Excellent performance & separation
- High resolution with tight band definition (no tailing)
- Great compound purity & recovery

Cost effectiveness

- Excellent performance vs price ratio
- Readily available from stock inventory for many volumes





All SiliaSep cartridges are available in:

- Bare silica: standard 40 63 µm irregular grade and PREMIUM 25 µm spherical grade NEW
- Bonded phases: Amine, Diol, Cyano, C18, C8, Phenyl, PFP, SCX, SAX, etc.

Make your own SiliaSep Flash Cartridges!

You can customize your flash cartridges by choosing silica properties and selectivity. Any Silia*Flash (irregular silica gels)*, Silia*Sphere (spherical silica gels)*, Silia*Bond (chromatographic phases)* or Silia*MetS / SiliaBond (metal & organic scavengers)* is available to be packed in Silia*Sep* cartridges to accomodate your chemistry.

Y	Flash Cartridges Portfolio							
	Cartridge	Code	Silica weight	Dimensions	Column volume	Recommended flow rate	Loading capacity	Max operating pressure
D	Silia <i>Sep</i> 4 g	ISO04	Bare: 4 g Bonded: ≥ 5 g	12 x 98 mm	4.9 mL	15 - 25 mL/min	Bare: 0.04 - 0.4 g Bonded: 0.02 - 0.2 g	
	Silia <i>Sep</i> 12 g	ISO12	Bare: 12 g Bonded: ≥ 15 g	21 x 117 mm	17 mL	20 - 40 mL/min	Bare: 0.12 - 1.2 g Bonded: 0.06 - 0.6 g	
	Silia <i>Sep</i> 25 g	ISO25	Bare: 25 g Bonded: ≥ 30 g	21 x 165 mm	31 mL	20 - 45 mL/min	Bare: 0.25 - 2.5 g Bonded: 0.125 - 1.25 g	225 psi / 16 bar
y & R8	Silia <i>Sep</i> 40 g	ISO40	Bare: 40 g Bonded: ≥ 45 g	27 x 169 mm	47 mL	25 - 50 mL/min	Bare: 0.4 - 4 g Bonded: 0.2 - 2 g	
scover	Silia <i>Sep</i> 80 g	ISO80	Bare: 80 g Bonded: ≥ 90 g	31 x 237 mm	123 mL	40 - 80 mL/min	Bare: 0.8 - 8 g Bonded: 0.4 - 4 g	
D	Silia <i>Sep</i> 120 g	IS120	Bare: 120 g Bonded: ≥ 130 g	36 x 256 mm	190 mL	60 - 120 mL/min	Bare: 1.2 - 12 g Bonded: 0.6 - 6 g	205 psi / 13 bar
	Silia <i>Sep</i> 220 g	IS220	Bare: 220 g Bonded: ≥ 230 g	60 x 195 mm	306 mL	60 - 190 mL/min	Bare: 2.2 - 22 g Bonded: 1.1 - 11 g	
	Silia <i>Sep</i> 330 g	IS330	Bare: 330 g Bonded: ≥ 360 g	60 x 268 mm	441 mL	80 - 190 mL/min	Bare: 3.3 - 33 g Bonded: 1.65 - 16.5 g	160 psi / 11 bar
	SiliaSep BT 75S	75iS	200 g	75 x 90 mm	300 mL		Bare: 0.2 - 20 g Bonded: 0.1 - 10 g	00
ocess	SiliaSep BT 75M	75iM	400 g	75 x 170 mm	500 mL	100 - 250 mL/min	Bare: 0.4 - 40 g Bonded: 0.2 - 20 g	90 psi / 6.5 bar (inside the compression - module)
it & Pr	SiliaSep BT 75L	75iL	800 g	75 x 350 mm	1 L		Bare: 0.8 - 80 g Bonded: 0.4 - 40 g	
opmen	Silia <i>Sep</i> XL 800 g	IS750	Bare: 800 g Bonded: ≥ 870 g	78 x 382 mm	1.5 L	200 - 300 mL/min	Bare: 8 - 80 g Bonded: 4 - 40 g	125 psi / 8 bar
Develo	Silia <i>Sep</i> XL 1,600 g	11500	Bare: 1,600 g Bonded: ≥ 1,700 g	104 x 429 mm	2.9 L	300 - 450 mL/min	Bare: 16 - 160 g Bonded: 8 - 80 g	100 psi / 7 bar
	Silia <i>Sep</i> XL 3,000	13000			Contac	t us for more informa	tion	
	SiliaSep BT 150M	150iM	2.5 kg	150 x 300 mm	4 L	05.111	Bare: 3 - 160 g Bonded: 1.5 - 80 g	
trial	SiliaSep BT 150L	150iL	5 kg	150 x 600 mm	8.5 L	0.5 - 1 L/min	Bare: 6 - 320 g Bonded: 3 - 160 g	90 psi / 6.5 bar (inside the
Indus	Silia <i>Sep</i> BT XLS-400M	400iM	20 kg	400 x 300 mm	28 L		Bare: 24 g - 1.3 kg Bonded: 12 - 650 g	compression module)
	SiliaSep BT XLS-400L	400iL	41 kg	400 x 600 mm	56 L	3 - 6 L/min	Bare: 50 g - 2.7 kg Bonded: 25 g - 1.35 kg	

Silia Sep BT cartridges are designed to enhance your purifications when using Biotage[™] Flash 75 or 150 development-scale purification systems, or Biotage Flash 400 large-scale purification system. These cartridges offer a faster and safer solution compared to traditional glass columns and allow purification up to 2.7 kg of sample.

Scavenging



SiliaPlate[™]

Thin Layer Chromatography Plates

- Rapid and cost-efficient results
- Facility selecting and optimizing chromatographic conditions prior to flash chromatography purification or HPLC analysis
- · Only small quantities of compounds are required for analysis
- High sample throughput capability (up to 20 samples simultaneously)
- Affordable products

Thin-layer chromatography (*TLC*) is a quick, simple, inexpensive and extremely versatile technique for both analytical and preparative analysis. Widely used in numerous scientific fields, it is particularly popular for reaction monitoring and screening, compound contamination assessment and sample purification.

Why choose SiliaPlate?

Silia*Plate* represents an efficient and economical alternative to other TLC plate manufacturers while demonstrating high separation power, which is due to our narrow particle size distribution silica gel.

The extraordinary hardness of our silica layer, combined to a homogeneous coating and layer thickness, allows excellent separations. Each TLC batch is chemically and physically controlled by our Quality Control department to ensure lot-to-lot and layer-to-layer reproducibility.

SiliaPlate Selection Guide

	Available Backings						
Properties	Glass	Aluminum	Plastic				
Advantages	 Rigid High chemical resistance High heating stability and charring resistance Transparent 	 Thin Low weight & consequent shipping costs High heating stability Low fragility Possible to cut with scissors Can be stored in notebook 	 Thin Low fragility Possible to cut with scissors High chemical resistance Can be stored in notebook 				
Thickness (approx.) 2.0 - 2.5 mm		1.5 - 2.0 mm	1.5 - 2.0 mm				
Total Weight	High	Low	Medium				
Heating Stability	High	High	Below 175°C				
Fragility	High	Low	Low				
Cutting with Scissors Impossible		Easily	Possible				
Chemical Resistance	High	Low	High				

Available Matrices (or Adsorbents)						
Classical Silica Gel	Reversed-Phases	Normal Phases				
A universal matrix for daily, fast, reliable analysis of the largest spectra of molecules	The two most popular modes of separation emp	loyed in TLC are normal and reversed-phases.				
The particle size distribution used for the silica is related to the nature of the plate.	reversed mode, the mobile phase (<i>usually a mixture of water and organic solvent</i>) is m the stationary phase (<i>C18</i>).					
For standard TLC, silica gel with a mean particle size of 10 - 14 μm is used compared to HPTLC, where a	When satisfactory separations cannot be achieved by unmodified silica, other functionalized matrices have been designed for specific applications:					
smaller particle size is required. In both cases, pore diameter is always 60 Å.	C2, C8 and C18 phases are functionalization of silica performed using organosilanes of various	• Diol and Cyano (<i>CN</i>) are moderately polar. They can thus be suitable for both normal and				
In be unmodified or functionalized, and suitable for nyriad of molecules of functionalities & polarities, tolerate water in the moving phase are directly	reversed-phase chromatography, depending on your application.					
such as aflatoxins, alkaloids, barbiturates, fatty acids, flavonoids, glycosides, lipids, nucleosides, proteins, pesticides, sweeteners, vitamins and so on.	dependent on the chains length.	• Amino phases (<i>NH</i> ₂) show weak anion exchange characteristics, great for charged compounds.				



SiliCycle offers different types of plates for thin-layer chromatography applications: classical TLC, high performance TLC (*also called HPTLC*) and preparative TLC (*PLC*). The plate types are selected based on the type of analysis required and the available budget.

Types of TLC Plates Offered								
Properties	Classical TLC	HPTLC	Preparative TLC					
Applications	Quick, inexpensive, flexible and classical separations	Highly sophisticated separations, complex samples	Purification on a TLC plate					
Analysis	Qualitative	Qualitative & Quantitative	Quantitative					
Detection	UV - Stains	- Stains Instrumented analysis						
Distribution [Mean Particle Size]	5 - 20 μm [<i>10 - 14 μm</i>]	4 - 8 μm [5 - 6 μm]	5 - 40 μm [22 - 25 μm]					
Layer Thickness	200 - 250 μm	150 - 200 μm	500 - 2,000 μm					
Typical Sample Volume	1 - 5 μL	0.1 - 0.5 μL	5 - 20 μL					

CLASSICAL TLC Plates

<u>Glass</u>



- Analytical SiliaPlate TLG-R1001
- Scored Analytical SiliaPlate
- Channeled Analytical SiliaPlate (with or without Preadsorbent Zone)
- Specialty Sorbents SiliaPlate
 - SiliaPlate AgNO₃ TLC (Silver Nitrate 10 15 or 20 % impregnated): particularly for C=C double-bonded compounds
- · SiliaPlate Aluminum Oxide TLC: great for alkaloids, aliphatic compounds, aromatics, steroids
- SiliaPlate Cellulose TLC: perfect for challenging separations of sensitive biomolecules carrying ion exchange groups

<u>Aluminum</u>

• SiliaPlate Al TLA-R10011B-323

SiliaPlate Al C18

<u>Plastic</u>

SiliaPlate Pl

High Performance TLC (HPTLC) Plates

SiliaPlate Bare HPTLC

SiliaPlate Reversed-Phase Modified HPTLC

- SiliaPlate C18 HPTLC
- SiliaPlate C8 HPTLC
- SiliaPlate C2 HPTLC

SiliaPlate Normal Phase Modified HPTLC

- SiliaPlate NH₂ (Amine) HPTLC: a weak anion exchanger, ideal when dealing with charged compounds
- SiliaPlate CN (Cyano) HPTLC: moderately polar, hence suitable for both normal & reversed chromatography depending on your needs
 SiliaPlate Diol HPTLC

PREPARATIVE TLC Plates

- SiliaPlate Prep TLG-R10011B-341
- Scored SiliaPlate Prep
- SiliaPlate C18 Prep ; AgNO3 Prep ; Alumina Prep

TRIAL PACKAGES

Trial Package of Functionalized Silia*Plate* TLC Plates with Glass Backing (5 plates of each, scored to 2.5 x 10 cm, 25 / box)

Composition: C18, C8, C2, NH₂ & CN

ACCESSORIES

- SiliaPlate Rectangular TLC Developing Chamber
- TLC Cutter Guide for SiliaPlate (up to 20 x 20 cm)
- Pencil Glass Cutter for SiliaPlate
- Scrapper for TLC Plates
- SiliaPlate TLC Spotting Guide





SiliaQuick[™] & SiliaFast[™]

Sample Preparation & Pesticide Analysis

Two comprehensive solutions available from SiliCycle to simplify your sample prep and analysis: Silia*Quick*[™] QuEChERS and Silia*Fast*[™] FaPEx[®].

If you are frustrated with time and expenses of your sample prep & cleanup procedures, we have simple, economical, highly performant new alternatives to share with you!

SiliaQuick[™] QuEChERS

The QuEChERS technique was developed in 2003 by USDA (*United States Department of Agriculture*) scientists to simplify and accelerate the analysis of pesticides in various fruit and vegetable samples. The name QuEChERS is formed by an acronym of the properties that are observed with this technique: *Qu*ick, *E*asy, *Ch*eap, *E*ffective, *R*ugged and *S*afe.

Initially popularized for the detection and analysis of traces of pesticides in a high throughput environment, scientists have expanded the use of this method to the analysis of a vast array of herbicides, fungicides, antibiotics, drugs and any other compounds present in a myriad of food, beverage, animal and human matrices.



The QuEChERS technique can be summarized as a three-step methodology, starting with a Liquid Extraction, followed by a dispersive Solid-Phase Extraction clean-up and completed by a LC or GC Analysis.

In comparison to traditional sample preparation analysis – a combination of Liquid-Liquid Extraction & Solid-Phase Extraction – the QuEChERS methodology is about 6 times faster, uses 6 - 9 times less solvent, is a safer, greener, much less costly technique, and require no additional and cumbersome apparatus (*funnels, rotary evaporators, etc.*).

Silia*Fast*[™] FaPEx[®]

One of the fastest extraction / clean-up approaches for pesticide residue analysis

FaPEx stands for "Fast Pesticide Extraction" and may be considered as "QuEChERS made even easier".



This 1-step extraction method preceding LC/MS/MS or GC/MS/MS analysis will ensure you:

- Extraction of thousands of pesticides simultaneously
- Reduction by at least 60 % of labor cost
- Up to 120 X faster than existing methods
- Less operating equipment, less organic solvents and waste than QuEChERS
- · Impressive versatility
- High reliability

Want to learn more?

Contact us: sampleprep@silicycle.com





Catalysis Synthesis

SiliaQuick QuEChERS Portfolio

Step 1: Liquid Extraction

	SiliaQuick QuEChERS Liquid Extraction Step				
Original Mathed	Buffered Methods				
Original Method	AOAC 2007.01 Method	EN 15662 Method			
10 g Sample	15 g Sample	10 g Sample			
4 g MgSO ₄ ; 1.5 g NaCl	6 g MgSO₄ ; 1.5 g NaOAc	4 g MgSO ₄ ; 1 g NaCl ; 1 g SCTD ; 0.5 g SCDS			
PN: QE-0001-100P (packets only) PN: QE-0001-100K (packets & tubes)	PN: QE-0002-100P (packets only) PN: QE-0002-100K (packets & tubes)	PN: QE-0003-100P (packets only) PN: QE-0003-100K (packets & tubes)			

Step 2: dSPE (dispersive Solid-Phase Extraction)

SiliaQuick QuEChERS dSPE Step						
Cap Color	Motrix	2 mL tubes for sm	all extract volumes	15 mL tubes for large extract volumes		
for 2 mL tubes	Matrix	AOAC 2007.01	EN 15662	AOAC 2007.01	EN 15662	
Clear	General matrices • Apples • Bananas • Broccoli •	150 mg MgSO4 50 mg PSA PN: QD-1000-2T	150 mg MgSO4 25 mg PSA PN: QD-1001-2T	1200 mg MgSO4 400 mg PSA PN: QD-2000-15T	900 mg MgSO4 150 mg PSA PN: QD-2001-15T	
Pink	Pigmented matrices • Lettuces • • Peppers • • Strawberries •	150 mg MgSO4 50 mg PSA 50 mg GCB PN: QD-1002-2T	150 mg MgSO4 25 mg PSA 2.5 mg GCB PN: QD-1003-2T	1200 mg MgSO4 400 mg PSA 400 mg GCB PN: QD-2002-15T	900 mg MgSO4 150 mg PSA 15 mg GCB PN: QD-2003-15T	
Green	Highly pigmented matrices Urine Avocados Coffee	150 mg MgSO₄ 50 mg PSA 50 mg GCB 50 mg C18 PN: QD-1004-2T	150 mg MgSO₄ 25 mg PSA 7.5 mg GCB PN: QD-1005-2T	1200 mg MgSO₄ 400 mg PSA 400 mg GCB 400 mg C18 PN: QD-2004-15T	900 mg MgSO₄ 150 mg PSA 45 mg GCB PN: QD-2005-15T	
Blue	Fatty and waxed matrices Milk Shrimps Blood Liver 	150 mg MgSO₄ 50 mg PSA 50 mg C18 PN: QD-1006-2T	150 mg MgSO ₄ 25 mg PSA 25 mg C18 PN: QD-1007-2T	1200 mg MgSO₄ 400 mg PSA 400 mg C18 PN: QD-2006-15T	900 mg MgSO₄ 150 mg PSA 150 mg C18 PN: QD-2007-15T	

Bulk Sorbents Available for Your Own Recipe Creation

Bulk Sorbents for QuEChERS							
Product		Product Number	Available Quantities				
Silia <i>Quick</i> ™ Anhydrous Magnesium Sulfate (<i>MgS</i>	<i>O</i> ₄)	AUT-0310	• 5 g				
Silia <i>Quick</i> ™ C18		AUT-1313	• 25 g				
Silia QuickIN Drimony Secondary Amine (DSA)	Endcapped	AUT-0312	• 50 g • 100 g				
	Non-endcapped	AUT-1312	• 230 g • 500 g				
Silia <i>Quick</i> ™ Amine		AUT-0412	• 5 kg				
SiliaQuick™ Graphitized Carbon Black (GCB)		AUT-0311	• 25 kg				



т р

Analysis



SiliaPrep[™] and SiliaPrepX[™]

SPE Cartridges and Well Plates

- Wide variety of sorbents
- Very good packing (no fines)
- Tight particle size distribution
- High recovery and yield

Silica-based and polymeric sorbents

Solid-phase extraction (SPE) is designed for rapid sample preparation and purification prior to chromatographic analysis.

Our SiliaPrep (silica-based) and SiliaPrepX (polymeric) families of SPE cartridges and well plates have been created to cover the entire spectrum of solid-phase extraction. This complete range of sorbents allows treatment of most common matrices:

• human and animal biological fluids

- · toxicological residues
- food and beverage

• petrochemical residues

· waste waters

Silia*Prep* and Silia*PrepX* products are made using state-of-the-art technology giving you the highest quality and the best lot-to-lot reproducibility. These advanced sorbents are providing you a clean extract, which reduces ion suppression and increases selectivity for LC/MS/MS applications. All our ultra pure Silia*Flash* silica gels and functionalized Silia*Bond* silica gels are available in SPE formats. Just tell us what you need!

Cartridge sizes

We can provide a complete range of SPE cartridge lengths and diameters.



Bigger sizes (70 mL, 150 mL & 276 mL) are also available under SiliaSep OT branding.

Tips for your method development

	Tips for your method development						
Sorbent Type	Silica-Based (SiliaPrep)	Polymeric (<i>SiliaPrepX</i>)					
Sorbent Capacity	Load up to 5 % of bed weight: 100 mg of silica-based sorbent will retain up to 5 mg of sample	Load up to 10 % of bed weight: 100 mg of polymeric sorbent will retain up to 10 mg of sample					

Not enough sorbent: ANALYTE LOSS => low recovery and reproducibility

Too much sorbent: MORE EXPENSIVE => more solvent used, taller SPE cartridges

Concentrated samples: double the bed weight to avoid analyte loss



Catalysis Synthesis

Available formats

			SiliaPrep Formats			
Silica Cartridges	Large Reservoir Volume Silica Cartridges	Mini-SPE Silica Cartridges	96 Well Plates Silica	Polymeric Cartridges	96 Well Plates Polymeric	Tips Micro-SPE Cartridges
 1 mL / 50 mg 1 mL / 100 mg 3 mL / 200 mg 3 mL / 500 mg 6 mL / 500 mg 6 mL / 1 g 6 mL / 2 g 12 mL / 2 g 25 mL / 5 g 	 10 mL / 200 mg 10 mL / 500 mg 	• 500 mg • 1 g	 2 mL / 50 mg 2 mL / 100 mg 	 1 mL / 30 mg 3 mL / 30 mg 3 mL / 60 mg 6 mL / 100 mg 6 mL / 200 mg 6 mL / 500 mg 	 2 mL / 10 mg 2 mL / 30 mg 	 10 μL / 30 μg 200 μL / 75 μg 200 μL / 400 μg 10 μL / 4 mg 200 μL / 10 mg 1,000 μL / 50 mg

Also available, under SiliaSep OT branding: 70 mL with 10 g / 15 g / 20 g, 150 mL with 25 g / 50 g / 70 g and 276 mL with 100 g.

Available phases

	SPE Cartridges & Well Plates Portfolio					
Mode	SiliaPrep Phase	Application				
	SiliaPrep C18 (Plus, WPD, nec)	For organic compounds from water, drugs & metabolites from fluids				
Reversed-Phases: non-polar sorbents	SiliaPrep C8 (endcapped & nec)	For extremely non-polar and large compounds (PAH, vitamin D, oils)				
	SiliaPrep Phenyl & Pentafluorophenyl (PFP)	For aromatic compounds, complex natural products				
	SiliaPrep Cyano	For acidic, basic and neutral compounds from aqueous solutions				
	SiliaPrep Diol nec	For polar compounds from non-polar solvents, structural isomers				
Normal Phases: polar sorbents	SiliaPrep Silica & Silica WPD (Widepore)	For various compounds from non-polar solvents, structural isomers				
	SiliaPrep Florisil & Florisil Pesticide Residues	For chlorinated pesticides, PCB's and polysaccharides				
	SiliaPrep Alumina (Acidic, Neutral & Basic)	For aromatic compounds and aliphatic amines				
	SiliaPrep SAX & SAX-2 (TMA Chloride & Acetate)	For weak acidic molecules (pK_a 3 - 5)				
	SiliaPrep Carbonate	For scavenging of TFA, extraction of acids (boronic acids & acidic phenols)				
Ion Exchange Phases: ionic sorbents	SiliaPrep WAX (Amine)	For strong acidic molecules ($pK_a < 3$), structural isomers, saccharides				
	SiliaPrep SCX & SCX-2 (Tosic & Propylsulfonic Acids)	For weak basic molecules ($pK_a 7 - 9$), catch & release of amines				
	SiliaPrep WCX (Carboxylic Acid)	For strong basic compounds ($pK_a > 9$)				
	SiliaPrep C8/SAX-2 nec	For isolation of acidic & neutral drugs / metabolites from physiological fluids				
	SiliaPrep SCX-2/SAX nec	For separation of acidic and basic molecules from non ionizable ones				
Mixed Mode & Specialty Phases	SiliaPrep PCB nec	For extraction of PCB's from waste oil (hexane extract)				
	SiliaPrep CleanDRUG	For drugs of abuse applications				
	SiliaPrep CleanENVI & PAH	For PAH's, PCB's, herbicides and pesticides from waste waters				
	SiliaPrepX HLB & DVB	For drugs & metabolites from biological fluids, API from tablets and cream				
Polymeric Phases	SiliaPrepX SAX & WAX	For acidic compounds & metabolites, highly stable in organic solvents				
	SiliaPrepX SCX & WCX	For basic compounds, highly stable in organic solvents				
	SiliaPrep Thiol	For scavenging of various metals (Ag, Hg, Os, Pd, Ru, etc.)				
Metal Scavongoro	SiliaPrep DMT	For scavenging of various metals (Ir, Ni, Os, Pd, Pt, Rh, Ru, etc.)				
wetal Scavenyers	SiliaPrep Cysteine	For scavenging of various metals (Cd, Fe, Ir, Os, Ru, Sc, Sn, etc.)				
	SiliaPrep Imidazole	For scavenging of various metals (Cd, Co, Cu, Fe, Ir, Li, Mg, Ni, Os, W, Zn)				





SiliaChrom® Plus

HPLC Columns

- Excellent efficiency and column-to-column reproducibility
- Long lifetime
- Broad pH range from 1.5 to 9
- Compatibility with 100 % aqueous and organic mobile phases
- High surface coverage presenting no bleeding for LC/MS applications

SiliCycle offers a wide range of chromatographic selectivities: reversed-phase, normal phase and ion exchange phase columns for analysis of acidic, neutral and basic compounds. We also have solutions for biochromatography of large molecules and analysis by SFC (*Supercritical Fluid Chromatography*).

R&D works to continually enhance our portfolio to suit customer's requirements. Whether you need stability with 100 % aqueous or organic mobile phases, large pH stability or low bleed material for LC/MS applications: we have the solution for you.

All our columns are available in 3, 5 & 10 µm, with internal diameters from 2.1 to 50 mm. Scaling-up has never been easier!

Both our raw materials and finished HPLC columns are QC-validated in our ISO 9001-2015 registered manufacturing facilities.

Manufacturing is done following strict SOPs to guarantee:

- Extremely pure silica
- · Complete endcapping (meaning reduced silanol activity)
- Controlled surface coverage
- High surface area & loading capacity
- · Exceptional chemical and mechanical stability
- Uniform column bed
- Enhanced chromatographic resolution
- · Very good peak symmetry
- · Robust columns with extended lifetime
- · Lot-to-lot & column-to-column reproducibility







• C18 & C18-300 (USP L1)

SiliaChrom Plus SAX

SiliaChrom Plus SCX

SiliaChrom dt C18

3, 5, 10

3, 5, 10

3, 5, 10

100

SiliaChrom Plus

For your everyday separations

• Amine (USP L8)

 C8 & C8-300 (USP L7) C4 & C4-300 (USP L26) PFP (USP L43) Phenyl (USP L11) Cyano (USP L10) 	 Diol (i Silica SAX (SCX (USP L20) & Silica-300 ((USP L14) (USP L9)	USP L3)					
			Main Charact	eristics				
 Wide range of selectivities Ultra pure metal-free silica High column performance Enhanced batch-to-batch r Extended column lifetime Reduced silanol activity, be Extremely low bleeding for Easy scale-up to preparativ 		Ultra pure metal High sensitivity f Stable from 100 Universal: acidic Enhanced retent Inertness for aci	free silica (99.9 or LC/MS % aqueous to 1 , neutral and ba ion of hydrophil dic and basic ar	999 % pu .00 % orga .sic analys ic molecul nalytes	rity) anic mobile ph iss les	ase		
<u>Ч</u>			HPLC Columns Ch	aracteristics				
SiliaChrom Phases	Particle Size (µm)	Pore Size (Å)	Specific Surface Area (m²/g)	Carbon Load (%)	pH Range	USP Code	T Limit (°C)	Pressure Limit (psi)
SiliaChrom Plus C18	3, 5, 10	100	370 - 430	15	2.0 - 8.0	L1	60	5,500
SiliaChrom Plus C18-300	3, 5, 10	300	80 - 120	8	2.0 - 8.0	L1	60	4,000
SiliaChrom Plus C8	3, 5, 10	100	370 - 430	8	2.0 - 8.0	L7	60	5,500
SiliaChrom Plus C8-300	3, 5, 10	300	80 - 120	5	2.0 - 8.0	L7	60	4,000
SiliaChrom Plus C4	3, 5, 10	100	370 - 430	6	2.0 - 8.0	L26	60	5,500
SiliaChrom Plus C4-300	3, 5, 10	300	80 - 120	3	2.0 - 8.0	L26	60	4,000
SiliaChrom Plus PFP	3, 5, 10	120	320 - 360	9	2.0 - 8.0	L43	60	5,500
SiliaChrom Plus Phenyl	3, 5, 10	100	370 - 430	7	2.0 - 8.0	L11	60	5,500
SiliaChrom Plus Cyano	3, 5, 10	100	370 - 430	7	2.0 - 8.0	L10	60	5,500
SiliaChrom Plus Amine	3, 5, 10	100	370 - 430	8	2.0 - 8.0	L8	60	5,500
SiliaChrom Plus Diol	3, 5, 10	100	370 - 430	7	2.0 - 8.0	L20	60	5,500
SiliaChrom Plus Silica	3, 5, 10	100	370 - 430	-	2.0 - 8.0	L3	60	5,500
SiliaChrom Plus Silica-300	3, 5, 10	300	80 - 120	-	2.0 - 8.0	L3	60	4,000

HPLC Columns Portfolio

• C18 (USP L1)

SiliaChrom dt

100 % aqueous compatible

18



2.0 - 8.0

2.0 - 8.0

1.5 - 9.0

L14

L9

L1

60

60

60

4,500

4,500

5,000



25

Proprietary information

410 - 440



SiliaSphere[™]

Spherical Silica Gels

SiliaSphere, the right choice for superior...

- Chromatographic performance
- Loading capacity

- Reproducibility
- Chemical & physical stability

SiliaSphere as a Silica Matrix

SiliCycle has a strong know-how and expertise in silica gel manufacturing. To support the increasing demand on our spherical silicas, we have developed an optimized and highly controlled large-scale production process for all of our SiliaSphere products without decreasing the guality of the silica.

Particle shape, pore & particle size distributions, silica gel purity and surface properties, all have their influence on chromatographic performance. Therefore, in order to develop the most efficient process, all these parameters need to be evaluated and optimized to ensure batch-to-batch reproducibility.

Silia.Sphere is manufactured from an organic form of silicon (alkoxydes). This ensures very low metal content as the starting material is purified by distillation. Deionized water is used to hydrolyze the silicon alkoxydes. Careful monitoring and control of the parameters that induce precipitation provide spherical silica gels with the desired characteristics. Silia Sphere products are characterized by a very low metal content and exceptional stability. Furthermore, our manufacturing process ensures quality and reproducibility in pore size, surface area, particle size and morphology for all SiliaSphere products.

Perfectly Spherical Particle Shape



Competitor

The perfectly spherical shape of SiliaSphere silicas, combined to their smooth surfaces free of any cracks, cavities and fines make them the packing of choice for chromatography.

SiliaSphere sphericity compares favorably to well-known brands in spherical silica gel, as demonstrated by the scanning electron microscope (SEM) left picture.

Features and Benefits of SiliaSphere Spherical Silica Gels

- · High purity silica gels Consistency, reliability & reproducibility
- · Perfect spherical shape, free of any cavities or cracks Ease of column packing and high resolution
- Exceptional narrow particle size distribution Optimal separation and resolution
- Strong mechanical stability Low back-pressure without surface abrasion
- Same well controlled processes for all SiliaSphere Easy scalability
- · Availability in bulk quantities at affordable price On-time delivery

Characteristics

SiliaSphere Monodispersed Characteristics							
Pore Diameter	60 Å	80 Å	100 Å	120 Å	300 Å	1,000 Å	
Specific Surface Area (<i>m²/g</i>)	≥ 450	≥ 450	≥ 400	≥ 300	≥ 80	≥ 20	
Pore Volume (mL/g)	0.85 - 1.15 0.75 - 1.05						
pH (5 % <i>w/w</i>)	4 - 7						
Available Particle Sizes (µm)	3, 5, 10, 15	1.8, 2.2, 3, 5, 10, 15, 20	1.8, 2.2, 3, 5, 7, 10, 15, 20		3, 5, 10, 15	10, 15	



Formats: 100 g, 500 g, 1 kg, 5 kg, 10 kg, 25 kg, etc.

	Bare Monodispersed Spherical Silicas							
Dertiele Cine	Pore Diameter							
Particle Size	60 Å	80 Å	100 Å	120 Å	300 Å	1,000 Å		
1.8 μm	N/A	S10001F-A	S10001E-A	S10001G	N/A	N/A		
2.2 μm	N/A	S10002F-A	S10002E-A	S10002G	N/A	N/A		
3 µm	S10003B	S10003F-A	S10003E-A	S10003G-A	S10003M	N/A		
5 µm	S10005B	S10005F-A	S10005E-A	S10005G-A	S10005M	N/A		
7 µm	N/A	N/A	S10006E-A	S10006G-A	N/A	N/A		
10 µm	S10007B	S10007F-A	S10007E-A	S10007G-A	S10007M	S10007T		
15 µm	S10008B	S10008F-A	S10008E-A	S10008G-A	S10008M	S10008T		
20 µm	N/A	S10009F-A	S10009E-A	S10009G-A	N/A	N/A		

	Most Popular Bonded Phases						
Mode	Normal (NP) Reversed (RP)		Ion Exchange (IEX)				
Mode Mechanism	Polar or hydrophilic	Non-polar or lipophilic / hydrophobic	Ionic				
Typical Stationary Phase	Bare silica or polar functionalized silica (<i>Amine, Cyano or Diol</i>)	Functionalized silica (mostly C18, C8, C4, Cyano, Phenyl and PFP)	Ionic functionalized silica (SAX, SCX, WAX, WCX)				
Stationary Phase Polarity	Polar	Non-polar	Anionic or cationic exchanger				
Typical Mobile Phase	Non-polar organic solvents such as hexane, dichloromethane, THF	Mixtures of water or aqueous buffers and organic solvents (<i>mostly ACN, MeOH, THF</i>), ion pairing agents can also be added	Water, buffers, acid, base				
Mobile Phase Polarity	Non-polar	Polar	Buffer or ionic				

Typical Applications of Most Common Phases					
Sorbent Phase	Mode NP RP IEX			Typical Applications	
C18				Great start for method development. Presents the maximum retention of non-polar compounds. Typically used for peptides, pesticides, PCBs, PAHs, drugs, etc.	
C8		\checkmark		Presents less retention compared to C18. Mainly used for highly hydrophobic pesticides, small peptides and heavy drugs.	
C4		\checkmark		Presents less retention compared to C18 and C8. Widely used for molecules with large hydrophobic regions such as peptides, proteines and zwitterions (in 300 Å).	
C1		\checkmark		Lower retention compared to other reversed-phases. Used for the purification of polar and non-polar pharmaceutical products, highly hydrophobic molecules.	
Phenyl (PHE)		\checkmark		Moderate non-polar sorbent with different selectivity for aromatic compounds compared to other non-polar sorbents.	
Pentafluorophenyl (PFP)		\checkmark		For a new selectivity approach or the purification of conjugated compounds (isomers).	
Cyano (CN)	~	~		In reversed-phase: moderate non-polar sorbent with less hydrophobicity than C18 or C8. Purification of cyclosporine and carbohydrates. In normal phase: less polar sorbent compared to silica, used for the purification of polar organic compounds.	
Diol	\checkmark			Moderate polar sorbent with a neutral character. Used to extract polar compounds. Alternative to silica when acidic character is problematic.	
Silica	\checkmark			Most polar sorbent with a slight acidic character. Used for purification of polar and non-ionic compounds.	
Amine (<i>NH</i> ₂ , <i>WAX</i>)	~		~	In normal phase: polar sorbent with a basic character, with less retention and a different selectivity for acidic / basic compounds compared to silica. In ion exchange mode: a weak anion exchanger with pK _a of 9.8. At pH 7.8 or below, the functional groups are positively charged. It facilitates the rapid release of very strong anions (<i>such as sulfonic acids</i>) that may be retained irreversibly on SAX.	
Tosic Acid (SCX)			\checkmark	Due to the very low pK_a (< 1), this silica is a strong cation exchanger. The most common use is likely for catch and release purification of weak cations.	
TMA Chloride (SAX)			\checkmark	The quaternary amine is permanently positively charged, and commonly used for the extraction of weak anions that may not bind strongly enough to weaker anion exchangers (<i>WAX</i>).	
TMA Acetate (SAX-2)			\checkmark	The acetate counter ion is easier to exchange compared to the chloride ion. It is used for compounds with $pK_a < 5$, such as carboxylic acids, or to selectively purify acidic compounds or remove acidic impurities from reaction mixtures.	





SiliCycle R&D Services

We thrive on making your projects come to life!

- We listen. We understand. We work with you
- We are flexible, commited, reliable, innovative, fast & affordable
- · Our objective: invest our experts' talent in your very own expertise
- Assistance to start-ups & young tech companies
- Wide range of services offered

SiliCycle is a leading service provider, offering turnkey solutions based on its long expertise in organic chemistry, catalysis, material science and analytical chemistry. We are recognized worldwide for the development, the manufacturing and the commercialization of high value silica gels and specialty products for chromatography, analytical and organic chemistry.

Our Scientific Team Expertise & Talents

Analytical Chemistry

- Analytical method development and optimization (HPLC, GC, etc.)
- Extraction of natural compounds
- Sample preparation using various techniques (SPE, QuEChERS, etc.)

Medicinal & Organic Chemistry

- Total synthesis of natural products, active ingredients and small molecules
- Synthesis of very elaborated heterocycles, building blocks and complex intermediates
- · Enantioselective total synthesis and asymmetric catalytic synthesis of various compounds
- o Boronic acids, fluorine and peroxide-based chemistries
- $\circ\,$ Green chemistry and organic chemistry in water

Catalysis & Organometallic Chemistry

- Homogeneous and heterogeneous catalysis (coupling, hydrogenation, oxidation, etc.)
- $\circ\,$ Development of solid-supported catalysts

Chemical Engineering, Material Chemistry

- Encapsulation of active ingredients in various matrices
- Materials characterization using various techniques
- o Surface modifications and functionalization of materials
- o Synthesis of organosilanes and organosilicon compounds



Certification

As a certified ISO 9001:2015 company, we have rigourous quality system in place: all procedures and employees are in line to assure you ultimate quality and an unbeatable customer service.



Chromatography

Analysis

R&D Services

Extraction - Purification

We offer R&D services to pharmaceutical & medicinal industries, to drug discovery, development & manufacturing markets, to analytical, clinical & QC labs, official organizations as well as academic & government institutions.

Our R&D Services are categorized into 7 streams:

Metal & Organic Scavenging Screenings

- Best Screening Conditions Evaluation
- Process Scale-Up & Transfer to Production

Synthetic Chemistry Services

- Custom Chemical Synthesis
- Catalysis Services
- Process Services

Separation Center

- Compound Extraction & Sample Preparation
- · Method Development, Optimization & Transfer
- Impurity Isolation & Structure Elucidation

Custom Column Packing

- Exotic Phases & Column Dimensions Available
- Packing of Custom-Made Phases
- Batch Reservation

Material Science

- Grafting & Encapsulation
- · Optimization of Grafted Catalysts
- Customized Particle Size Distribution

Analytical Laboratory & Quality Control

- Cost-Effective Quality Control Support
- SOPs
- Regulatory Compliance Assistance

Facility & Lab Infrastructure

Built in 2009 and located in Quebec City (*Canada*), the SiliCycle Headquarters is a new cutting-edge plant with a multi-ton scale manufacturing capability. Since its construction, SiliCycle has been successfully audited on numerous occasions (*more than 100 audits*).



With state-of-the-art instrumentation park in the areas of chromatography, spectroscopy and manufacturing combined to an application support laboratory, we are devoted to extend your R&D and make your project a success.





SiliCycle expands!

An investment of \$ 16 millions to expand our facilities, adding 21,000 square feet to the existing plant.

This expansion allow SiliCycle to increase the production capacity of currently marketed products, but will also enable the development and production of plant, forest, and marine biomass extracts via a new Extraction-Purification technologic platform.

This project includes, among other things, the addition of numerous specialized equipment and a large-scale production area (*CMO*) that complies with good manufacturing practices (*GMP*). Thus, ingredients such as CBD / THC molecules, polyphenols, omega-3, and purified extracts and ingredients addressing the pharmaceutical industry but also the food, nutraceutical, natural health products, animal nutrition, and cosmetic industries will be marketed.

Contact us

Email: services@silicycle.com





Extraction & Purification



SiliCycle, your partner of choice when it comes down to ingredients from various biomasses.

Ingredients

Benefit from the perfect combination of SiliCycle's purification expertise and raw natural material of the highest quality:



Cannabis Oil THC, CBD & other cannabinoids of very high purity



Omega-3 & Marine Extracts

Ultra pure fatty acids & ingredients from marine biomasses, offered in liquid or solid form



Essential Oils & Hydrosols Distilled from boreal forest trees & wild plants



Tree Extracts & Molecules of Interest Derived from forest exploitation by-products



Purified Vegetal Extracts

Produced from plants, fruits & mushrooms from the Province of Quebec



Probiotic Strains Benefit from our two exclusive probiotic strains and their bacteriocins' protective effect Learn more: www.silicycle.com/probiotics

Contact us

Email: extraction-purification@silicycle.com



Specialized Services in Extraction - Purification

Our Extraction & Purification Division offers services to help other companies to develop or purifiy their products.

- · Water or solvent extraction of your molecule
- Refining, distillation and fractionation
- Enrichment & purification of your ingredient
- Process development
- · Industrial scale up
- Analysis & characterization services



The *in silica*[™] Carrier

Our porous silica microspheres technology improves your high value, delicate or unstable ingredients by offering:

- Protection & stability
- Modulated release
- Vectorization

Contact us

Email: extraction-purification@silicycle.com





Contact Us

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@SiliCycle_Inc

You Tube www.youtube.com/user/SiliCycle

SiliCycle, your worldwide partner



Technical Support

At SiliCycle, we are committed to providing the best technical support possible. Our worldwide Technical Support Group is comprised of a team of highly qualified M. Sc., Ph. D. Chemists and Engineers, Technical Support Professionals and Service Coordinators who are prepared to troubleshoot, answer questions and provide solutions for your service and applications needs.

In order to better respond to your technical inquiries, feel free to contact us in three different ways:

E-mail: support@silicycle.com

- Phone: International +1 418.874.0054
 - USA and Canada +1 877.745.4292 (Toll-Free)



SiliCycle 2018/12 - BROGEN v3



Founded in 1995, SiliCycle® is specialized in high value silica-based and specialty products for chromatography, analytical and organic chemistry and purification.

E-PAK®: FLOW CARTRIDGES FOR METAL REMOVAL



- Eliminates the use of insoluble • particulates in reactors
- High adsorption capacity and flow rate
- Various sizes available for easy scale-up from lab to industrial scale

SAMPLE PREPARATION



- SPE & Well Plates
- Micro-SPE Tips
- QuEChERS & FaPEx NEW
- SPE Hardware & Manifold •

EXTRACTION & PURIFICATION



- Extraction & Purification Services
- Essential Oils & Hydrosols •
- Purified Natural Extracts
- Probiotics & Bacteriocins

METAL & ORGANIC SCAVENGING



Removal of

- Metals •
- Electrophiles & Nucleophiles •
- Potential Genotoxic Impurities (PGI) •
- Other organic residues •

HIGH PRESSURE CHROMATOGRAPHY



- SFC Columns
- Guard Cartridges & Accessories •

R&D SERVICES



- Custom Column Packing

CATALYSIS & SYNTHESIS



- Couplings (Suzuki, Stille, Heck, ...)
- Debenzylations & Hydrogenations
- Oxidations
- · And Many More Reactions

LOW PRESSURE **CHROMATOGRAPHY**



- · Bulk Silica Gels (Irregular & Spherical)
- · Bonded Phases
- **TLC Plates**
- Pre-packed Flash Cartridges

SILICYCLE 🥢

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You Tube	www.youtube.com/user/silicycle

- Scavenging Screening •
- Method Development & Optimization
- Impurities Identification •

Bulk Sorbents • HPLC Columns •



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