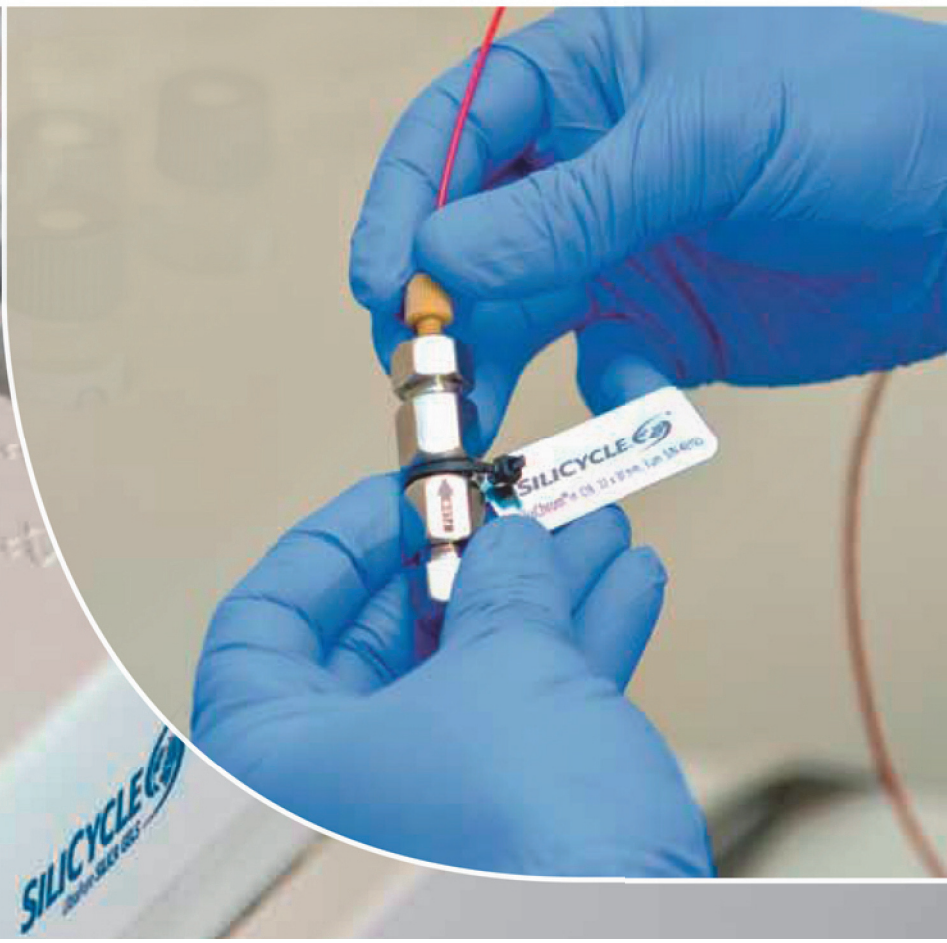
SiliCycle®

Analytical Chemistry Catalog

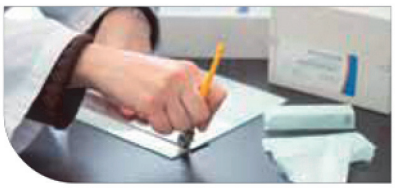


Distributed by

Greyhound Chromatography and Allied Chemicals
6 Kelvin Park, Birkenhead, Merseyside CH41 1LT United Kingdom
Tel: +44 (0)151 649 4000 Fax: +44 (0)151 649 4001
sales@greyhoundchrom.com

www.greyhoundchrom.com

Analytical Products



Greyhound CHROMATOGRAPHY AND ALLIED CHEMICALS

Greyhound Chromatography and Allied Chemicals
6 Kelvin Park, Birkenhead, Merseyside CH41 1LT United Kingdom
Tel: +44 (0)151 649 4000 Fax: +44 (0)151 649 4001
sales@greyhoundchrom.com

www.greyhoundchrom.com

About SiliCycle

We provide solutions to the global chemical industry.

Founded in 1995, SiliCycle® Inc. is a worldwide leader in the development, the manufacturing and the commercialization of high value silica-based and specialty products for chromatography, analytical and organic chemistry.

Our business extends to more than fifty countries and our customer portfolio includes companies in the pharmaceutical and biopharmaceutical industries, contract research and manufacturing organizations as well as university laboratories, hospital research centers, agriculture and food, environmental, petrochemicals, and industrial process companies.

Since we moved to our new state of the art plant in March 2009, SiliCycle has successfully passed 55 audits, and never failed any. As a certified ISO 9001:2008 company, all procedures and all employees are in line to assure you ultimate quality and an unbeatable customer service.

At SiliCycle, we are at the forefront of the chromatography industry, owing to the extraordinary purity of our silica gels and polymeric sorbents, combined with our capacity to rapidly adapt our products to meet the specific requirements of scientists worldwide.

We lead the way in offering innovative products such as Silia*Chrom*® HPLC columns, Silia*Sphere*™ spherical silica gels, Silia*Prep*™ silica-based and Silia*PrepX*™ polymeric SPE cartridges and Well Plates, Silia*Plate*™ TLC plates, Silia*MetS*® metal scavengers, Silia*Cat*® heterogeneous catalysts, Silia*Bond*® functionalized silica gels, Silia*Flash*® irregular silica gels, IMPAQ® angular silica gels, Silia*Sep*™ flash cartridges, QuEChERS, and lab consumables such as syringe & membrane filters, vials & caps.

We offer a wide variety of first-rate *UltraPure* products. Our automated manufacturing process, which includes acid washing and multiple analyses, is continuously optimized to ensure high purity and a low percentage of fine particles, thereby guaranteeing optimal performance. With our multi-ton manufacturing capability, we are your partner of choice for all your analysis, metal removal, catalysis, synthesis, and purification requirements.

We are committed to providing with the highest quality products and services in the industry.

Table of Contents

Analytical Chemistry Fields

SiliCycle has developed products that are used in many field of the analytical industry to help customers for their analytical needs. The SiliCycle Analytical Chemistry Catalog is designed in same way that scientists are developing their applications, starting by the sample treatment (*extraction, purification, enrichment, filtration*), to the final analysis (*determination, recovery, yield and selectivity*) including the use of consumables and accessories. In order to facilitate selection of the best product for your requirements, SiliCycle has introduced icons representing each field of the analytical industry.

Bio-Pharma

Pharmaceutical

Biotechnological & Pharmaceutical

Products and applications for each step of the drug discovery & development, purification, characterization, manufacturing and quality control of small pharmaceutical molecules to large peptides and proteins.

Food

Food & Beverage

Products and applications available for food & beverage industry including the food safety testing, fragrance & flavor, quality control testing of intermediate and final products, neutraceutical and natural products analysis.

Forensic

Forensic

Products and applications used for forensic analysis, clinical study and toxicology testing from the preparation of the sample through the analysis.

Environment

Environment

Products and applications covering environmental testing of broad range of matrices such as water, waste water, soil, sludge and air.

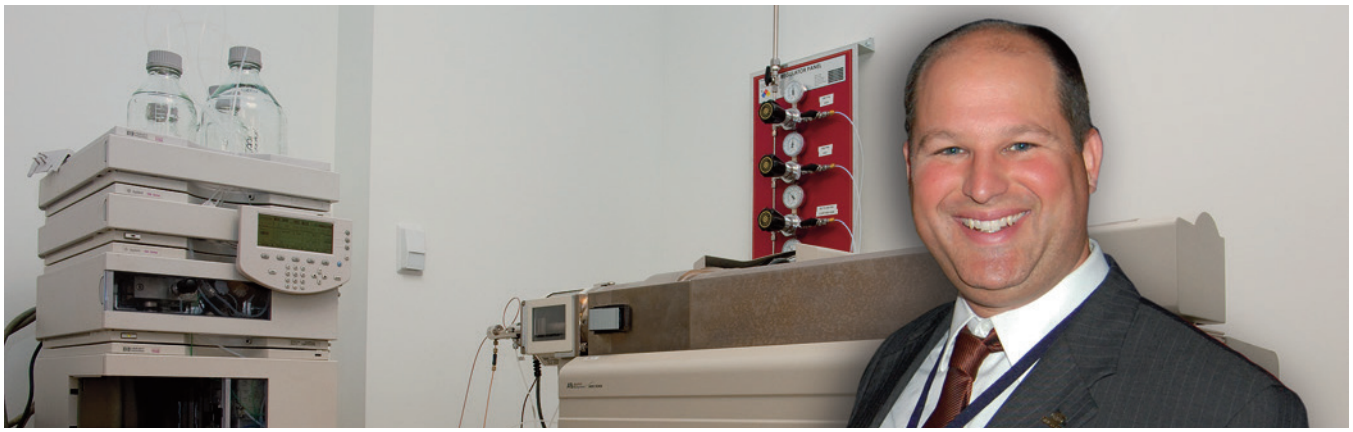
Energy

Energy

Products and applications covering the petrochemical, biodiesel and alternative fuels development, testing and analysis.

Tel: +44 (0)151 649 4000 Fax: +44 (0)151 649 4001 Email: sales@greyhoundchrom.com www.greyhoundchrom.com

Word from the President



Dear Colleague,

We are pleased to present you our New SiliCycle Analytical Chemistry Catalog.

The importance of analytical chemistry has never been greater than it is today. Therefore, we have created this new catalog as an essential tool in providing solutions to today's demand for safe food, pure water, safe consumer goods, and safe APIs. Whether you come from the pharmaceutical or biopharmaceutical industry, from agriculture and food, from petrochemicals, environmental industry, quality assurance, quality control or any other analytical lab, this catalog is meant for you.

As a key feature of our new analytical catalog, you will find for the first time in SiliCycle's history, the new Silia*PrepX*™ family of polymeric SPE cartridges and well plates. This addition of our new polymeric sorbents marks an important milestone for SiliCycle. It is part of our quest to offer you the most appropriate selection of high quality products providing solutions to the most challenging analytical applications. You will also find other novelties such as QuEChERS, syringe filters, vials & caps, and lots of other consumables... Of course, included within this new catalog, you will find our silica-based best-selling products such as our Silia*Chrom*® HPLC columns, Silia*Prep*™ SPE cartridges and well plates, Silia*Sphere*™ spherical silica gels, and our Silia*Plate*™ TLC plates.

In May 2012, we acquired Chromatography Sciences Company (*CSC*) Inc. Founded in 1980, CSC was a Canadian pioneer in the manufacturing of HPLC columns and the marketing of other analytical products for the market of research laboratories in North America. With this acquisition, all manufacturing operations, equipments, and know-how of CSC were transferred to SiliCycle state of the art facility, in Quebec City. The key personnel of CSC, including its President, Mr. Denis Boudriau, also joined the SiliCycle team.

We are confident that you will find herein the perfect fit for your day-to-day work. We invite you to visit our Multi-Currency eCommerce website at www.SiliCycle.com for a secure, fast and easy ordering experience, and to get complementary information with regards to our full product lines and services.

You may also contact our highly skilled representatives and knowledgeable technical support people who are available to assist you in application development, and in finding the right solution to any questions you may encounter in your work.

Finally, with over 18 years of market leadership as a worldwide provider of the highest quality products and services, we remain committed to offering you the best and most diversified product lines for analytical and organic chemistry, as well as chromatography, purification and sample clean-up.

To remain at the forefront of the industry, we have increased our presence worldwide in the past few years. Follow us and meet us through our numerous participations in the major trade shows and conferences around the world. It's always a pleasure to meet our fellow colleagues.

Thank you for your confidence and support.

Hugo St-Laurent
President & CEO

Quality Commitment for SiliCycle Products

Quality assurance

Having rigorous quality controls (*QC*) with high standards does not guarantee absolute satisfaction of the customer. This is why SiliCycle created a Quality Assurance department with a clear goal: always ensure that products are consistently produced and controlled to the quality standards appropriate to their intended use. SiliCycle bases its quality management system (*QMS*) on the ISO standard.

SiliCycle is ISO 9001:2008 certified. This registration shows that we constantly improve the effectiveness of our quality management system; we follow our policies and fulfill our objectives which lead to customer satisfaction.

You can be sure of the outstanding quality of SiliCycle's silica gels because of the tightly controlled manufacturing conditions at our new state of the art facility. Our tight control of every manufacturing process step, affords identical and reproducible properties (*chemical, physical and structural*) and ensures consistant chromatographic selectivities.

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 our website.

Audits

For many years, SiliCycle products have been used by major players in the industry (*pharmaceutical, biotechnology, etc.*) who are regulated by strict rules (*GMP for example*). SiliCycle has been audited by several customers and successfully passed each one.

Bare Silica Gel

The backbone of most of SiliCycle's products is Silia*Flash* F60 (*40-63 µm, 60 Å*) silica gel. It provides superior performance for chromatographic applications due to its narrow particle size distribution and high purity.

Before functionalization, every silica is rigorously characterized and analyzed by the procedures below to ensure lot-to-lot reproducibility.

Quality Control	
Type of Analysis	Performed by:
Bare Silica Gel	
Carbon, nitrogen & sulfur content	Elemental analyzer
Total trace metal	ICP-OES
Surface area & porosity	Nitrogen adsorption analyzer
Particle size distribution	Laser light diffraction
Tapped density analysis	Density measurement
Water content	Moisture balance
pH	pH-meter
Functionalized Silica Gel	
Residual solvent content	Moisture balance
Specific reactivity analysis	GC-FID, GC-MS, LC-MS/MS, ICP-OES
Organic function signature	Infrared spectroscopy
Purity analysis	GC-MS

Functionalized Silica Gel

The process for functionalizing the silica is highly dependent on the group being attached. However, it is still possible to functionalize 90% of the surface, verified by ^{29}Si MAS NMR. The remaining 10% of the surface may be endcapped to provide a completely inert support. After being functionalized, the product is submitted to further analysis and quality control as outlined below.

Analytical Products

Greyhound Chromatography and Allied Chemicals
6 Kelvin Park, Birkenhead, Merseyside CH41 1LT United Kingdom
Tel: +44 (0)151 649 4000 Fax: +44 (0)151 649 4001
sales@greyhoundchrom.com

www.greyhoundchrom.com

SiliaPrep™

Silica-Based SPE Cartridges and Well Plates

Greyhound Chromatography and Allied Chemicals
6 Kelvin Park, Birkenhead, Merseyside CH41 1LT United Kingdom
Tel: +44 (0)151 649 4000 Fax: +44 (0)151 649 4001
sales@greyhoundchrom.com

www.greyhoundchrom.com

Silia*Prep*™ SPE Cartridges and Well Plates

Using Silia*Prep* SPE Cartridges and Well Plates guarantees the following benefits:

- Choice of a wide variety of Silia*Bond* high-quality functionalized silica gels.
- Excellent separation (*tight particle size distribution and no fines*).
- High recovery and yield.
- Less time and solvent required for conditioning the sorbent.
- Reproducible flow rates from lot-to-lot.
- Excellent packing and storage qualities.

Silia*Prep* Solid-Phase Extraction *SPE* Cartridges and Well Plates

Solid-phase extraction (*SPE*) is designed for rapid sample preparation and purification prior to chromatographic analysis. You can optimize your SPE protocols by using SiliCycle Silia*Prep* SPE Cartridges and Well Plates.

SiliCycle offers products to meet your specific purification needs. Silia*Prep* products are available in different formats including SPE cartridges and 48- & 96-well plates, with different sorbents (*Silia*Flash *and Silia*Bond), and in bed weights up to 10 grams (*>10 g are also available in Silia*Sep *OT formats*)

The well plates are used in high throughput drug discovery and screening, metabolic pharmacokinetic applications, and for automated methods such as a multiprobe approach.

By using Silia*Prep* products you will generate higher purity samples and reduce the number of false positives in your screenings, giving you higher quality data. Silia*Prep* cartridges are packed with fines-free Silia*Flash* silica gel sorbents.

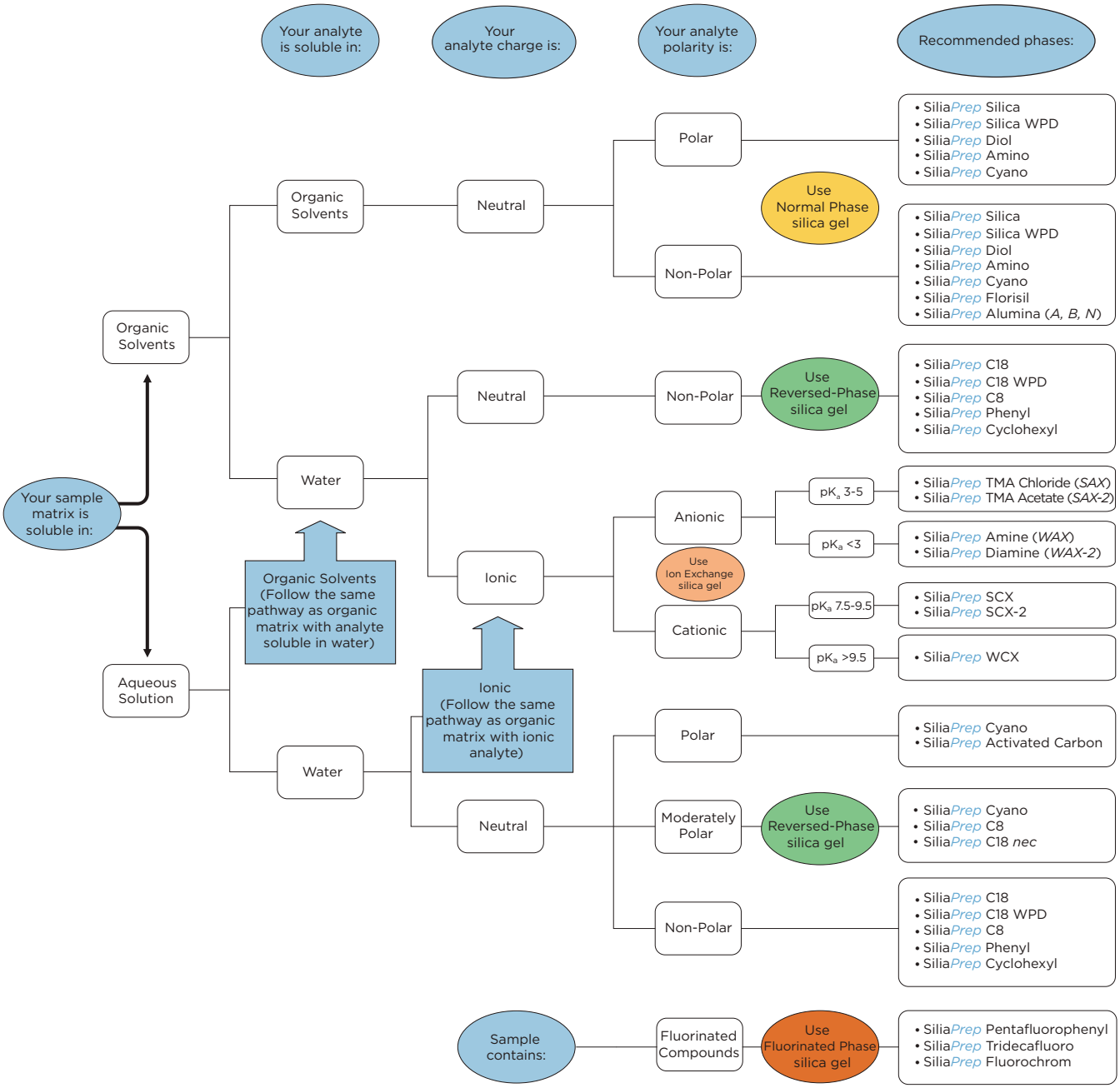
Sorbent Specifications

Silia*Prep* products are packed with SiliCycle's Silia*Flash* *UltraPure* silica gels to provide superior performance for all types of applications. This is due to the narrow particle size distribution and high purity. Although the standard products included in this catalog are made of Silia*Flash* F60 (*40-63 µm, 60 Å*), custom products are available with any type of silica (*irregular, spherical and IMPAQ, etc, in various pore and particle sizes*) offered in our catalog or website and in any format on a custom order basis. Contact us for more information.

Plastic Device Specifications

Standard Silia*Prep* cartridges are made with flanged polypropylene (*PP*) tubes and 20 µm polyethylene (*PE*) frits. Other plastic materials (*Teflon®, HDPE, etc.*), frit porosity (*10 µm*), and cartridge rim's (*flangeless*) are available on a custom order basis.

Product Selection Guide by Sample Properties



« I had a difficult time purifing a compound having a basic center by the conventional chromatography on silica gel. Then, I could purify the compound quickly and cleanly with the SiliaPrep SCX cartridge. »

Sangdon Han, Ph.D. from Arena Pharmaceuticals, San Diego, CA, USA

Product Selection Guide by Manufacturer

Product Selection Guide by Manufacturer				
SiliCycle Silia*Prep*	SiliCycle Part Number	Agilent Bond Elut®	Biotage Isolute®	Macherey-Nagel Chromabond®
Non Polar Phases				
Silia*Prep* C18 *nec* (23 %)	SPE-R30130B-xxx		C18	
Silia*Prep* C18 (17 %)	SPE-R31930B-xxx	C18	C18 (EC)	C18 ec
Silia*Prep* C18 *nec* (17 %)	SPE-R35530B-xxx	C18 OH		C18
Silia*Prep* C18 WPD	SPE-R33229G-xxx		MFC18	C18 ec f
Silia*Prep* C8	SPE-R31030B-xxx		C8 (EC)	
Silia*Prep* C8 *nec*	SPE-R31130B-xxx		C8	C8
Silia*Prep* Cyclohexyl	SPE-R61530B-xxx	CH	CH (EC)	C_6H_{11}ec
Silia*Prep* Phenyl	SPE-R34030B-xxx	PH	PH (EC)	C_6H_5
Polar Phases				
Silia*Prep* Silica	SPE-R10030B-xxx	SI	SI	SiOH
Silia*Prep* Silica WPD	SPE-R10029G-xxx			
Silia*Prep* Cyano	SPE-R38030B-xxx	Cyano	CN (EC)	CN
Silia*Prep* Diol *nec*	SPE-R35030B-xxx	Diol (2OH)[b]	DIOL	OH
Silia*Prep* Florisil	SPE-AUT-0014-xxx	Florisil	FL	Florisil
Silia*Prep* Florisil PR	SPE-AUT-0015-xxx			
Silia*Prep* Alumina Acidic	SPE-AUT-0053-xxx	Alumina A (AL-A)	AL-A	Alox A
Silia*Prep* Alumina Neutral	SPE-AUT-0054-xxx	Alumina N (AL-N)	AL-N	Alox N
Silia*Prep* Alumina Basic	SPE-AUT-0055-xxx	Alumina B (AL-B)	AL-B	Alox B
Ion Exchange Phases				
Silia*Prep* SAX *nec*	SPE-R66530B-xxx	SAX[b]	SAX	SB
Silia*Prep* SAX-2 *nec*	SPE-R66430B-xxx	PRS[b]	PE-AX	
Silia*Prep* SCX	SPE-R60530B-xxx	SCX[b]	SCX-3[b]	SA
Silia*Prep* SCX-2	SPE-R51230B-xxx		SCX-2[b]	PSA
Silia*Prep* WAX	SPE-R52030B-xxx	NH_2[b]	NH_2	NH_2
Silia*Prep* Diamine (*WAX-2*)	SPE-R49030B-xxx	PSA[b]	Diamino	Diamino
Silia*Prep* WCX	SPE-R70030B-xxx	CBA	CBA[b]	PCA
Mixed-Mode and Specialty Phases				
Silia*Prep* C8/SAX-2 *nec*	SPM-R026630B-xxx	Certify II	HAX	
Silia*Prep* SCX-2/SAX *nec*	SPM-R802830B-xxx	AccuCAT		
Silia*Prep* CleanDRUG	SPEC-R651230B-xxx	Certify[b]	HCX[d]	Drug 1
Silia*Prep* CleanENVI	SPEC-R31930B-xxx			C18 PAH
Silia*Prep* Activated Carbon	SPE-AUT-0110-xxx	Carbon		
Silia*Prep* DL AC/WAX	SP2-R11098-xxx			
Silia*Prep* DL AC/Diamine	SP2-R11007-xxx			
Silia*Prep* PCB *nec*	SP2-R00650030B-xxx			SA/SiOH

[a] Mallinkrodt Baker, [b] Non-endcapped, [c] Endcapped, [d] Ion exchange phase is non-endcapped xxx = Formats

Avantor Performance Material[a] Bakerbond®	Phenomenex Strata®	Supelco Discovery® and SupelClean®	Thermo Scientific HyperSep	Waters Sep-Pak®
Octadecyl (C18)	C18-E	DSC-18 and ENVI-18	C18	tC18
Light Load Octadecyl	C18-U			
	C18-T			C18
Octyl (C8)	C8	DSC-8 and ENVI-8	C8	C8
Cyclohexyl (C_6H_{11})				
Phenyl (C_6H_5)	Phenyl	DSC-Ph and LC-Ph	Phenyl	
Silica gel (SiOH)	Silica (Si-1)	Silica	Silica	
				Silica
Cyano (CN)	Cyano (CN)[b]	DSC-CN and LC-CN	Cyano	Cyanopropyl
Diol (COHCOH)		DSC-Diol and LC-Diol	Diol	Diol[b]
Florisil (Mg_2SiO_3)		ENVI-Florisil	Florisil	Florisil
	Florisil (FL-PR)			
		LC-Alumina-A		Alumina A
Alumina Neutral	Alumina-N (AL-N)	LC-Alumina-N		Alumina N
		LC-Alumina-B		Alumina B
Quaternary Amine	SAX[b]	DSC-SAX and LC-SAX	SAX	Accell Plus QMA
Aromatic Sulfonic Acid	SCX[b]	DSC-SCX and LC-SCX	SCX	
Amino (NH_2)	NH_2/WAX[b]	DSC-NH_2 and LC-NH_2[b]	Aminopropyl	Aminopropyl
Diamino (NH_2NH)		PSA		PSA
Carboxylic Acid (COOH)	WCX[b]	DSC-WCX & LC-WCX		Accell Plus CM
	Screen-A	DSC-MCAX	Verify AX	
			Verify CX	
		ENVI-Carb		AC2
		ENVI-Carb/NH_2		Carbon Black/Amino
		ENVI-CarbII/PSA		Carbon Black/PSA

All SiliCycle products are endcapped unless noted by « nec » (*non-endcapped*)

Standard Method Development Procedure

Solid-phase extraction methodology will vary depending on the sorbent (*normal, reversed, ion exchange*). Here, we propose generic methods for each mode based on sample and sorbent properties. However, procedures can be slightly different from one sample to another.

Standard Method Development Procedure

Procedure Step	Reversed-Phase	Ion Exchange Phase	Normal Phase
Analyte properties	Non-polar, uncharged or neutralized, hydrophobic	Ionized or charged	Slightly to moderately polar, uncharged
Matrix sample properties	Organic solvents and aqueous (*buffer*)	Aqueous (*buffer*) and pH-ajusted solutions	Organic solvents
Conditioning step	Water-miscible organic solvents	Water-miscible organic solvents or aqueous buffered solution	Sample solvent or methanol
Sample loading	Dissolve analyte in highly polar solvents	Dissolve analyte in highly polar solvents	Dissolve analyte in low polar solvents
Washing	Aqueous or buffered solution and polar solvents	Aqueous solutions containing salts	Non-polar solvents
Elution	Polar or non-polar organic solvents	Polar solvents, may contain acids or bases	Mixture of non-polar (*5 - 50%*) and polar solvents

Suggested Elution Solvents

Reversed-Phase	Polarity	Ion Exchange Phase	Polarity	Normal Phase
THF Acetone Ethyl Acetate Acetonitrile Methanol	Low ↓ High	For complete ionization, sample should be adjusted 2 pH units above or below the analyte pKa. pH can be used to neutralize analyte or sorbent. Use 2% strong acid or base in acetonitrile or methanol.	Low ↓ High	Hexane CH_2Cl_2 THF Acetone Acetonitrile

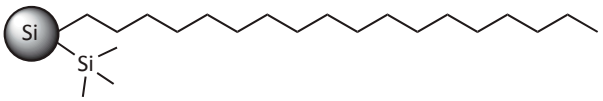
SiliaPrep Reversed-Phases

Description

SiliaPrep C18

SiliCycle recently developed an innovative C18 phase characterized by a homogeneous coverage of the silane on the surface. This strongly hydrophobic and non-polar sorbent is used to extract acidic, neutral and basic compounds from aqueous solutions, various organic compounds from water, and drugs and metabolites from physiological fluids.

C18



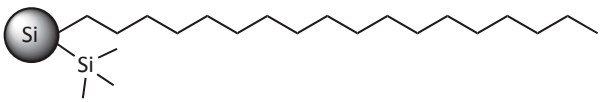
- SiliCycle Sorbent Number: R31930B
- Loading: 17% C
- Endcapping: Yes
- Silica type: 60 Å, 500 m^2/g, 40 - 63 µm

Description

SiliaPrep C18 WPD

This strongly hydrophobic, non-polar and high-loading capacity sorbent is similar to SiliaPrep C18 but can accommodate larger molecules and untreated matrices.

C18 WPD



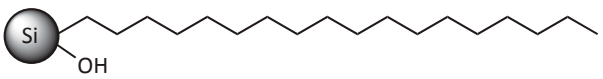
- SiliCycle Sorbent Number: R33229G
- Loading: 13% C
- Endcapping: Yes
- Silica type: 125 Å, 300 m^2/g, 37 - 55 µm

Description

SiliaPrep C18 *nec*

This strongly hydrophobic and non-polar sorbent is similar to SiliaPrep C18, but presents higher retention and polar selectivity for basic compounds. Unreacted surface OH's can be used for soft condition catch and release purification of glucoronides.

C18 *nec*



- SiliCycle Sorbent Number: R35530B
- Loading: 17 %C
- Endcapping: No
- Silica type: 60 Å, 500 m^2/g, 40 - 63 µm

Silia*Prep* Reversed-Phases C18

Silia*Prep* Reversed-Phases C18 SPE Formats				
Formats	Qty/Box	Silia*Prep* C18	Silia*Prep* C18 WPD	Silia*Prep* C18 *nec*
Silia*Prep* SPE Cartridges				
1 mL/50 mg	100	SPE-R31930B-01B	SPE-R33229G-01B	SPE-R35530B-01B
1 mL/100 mg	100	SPE-R31930B-01C	SPE-R33229G-01C	SPE-R35530B-01C
3 mL/200 mg	50	SPE-R31930B-03G	SPE-R33229G-03G	SPE-R35530B-03G
3 mL/500 mg	50	SPE-R31930B-03P	SPE-R33229G-03P	SPE-R35530B-03P
6 mL/500 mg	50	SPE-R31930B-06P	SPE-R33229G-06P	SPE-R35530B-06P
6 mL/1 g	50	SPE-R31930B-06S	SPE-R33229G-06S	SPE-R35530B-06S
6 mL/2 g	50	SPE-R31930B-06U	SPE-R33229G-06U	SPE-R35530B-06U
12 mL/2 g	20	SPE-R31930B-12U	SPE-R33229G-12U	SPE-R35530B-12U
25 mL/5 g*	20	SPE-R31930B-20X	SPE-R33229G-20X	SPE-R35530B-20X
Silia*Prep* Large Reservoir Volume SPE Cartridges				
10 mL/200 mg	50	SPC-R31930B-10G	SPC-R33229G-10G	SPC-R35530B-10G
10 mL/500 mg	50	SPC-R31930B-10P	SPC-R33229G-10P	SPC-R35530B-10P
Mini-Silia*Prep* SPE Cartridges				
500 mg	50	SPS-R31930B-P	SPS-R33229G-P	SPS-R35530B-P
1,000 mg	50	SPS-R31930B-S	SPS-R33229G-S	SPS-R35530B-S
Silia*Prep* 96-Well Plates				
2 mL/50 mg	1	96W-R31930B-B	96W-R33229G-B	96W-R35530B-B
2 mL/100 mg	1	96W-R31930B-C	96W-R33229G-C	96W-R35530B-C

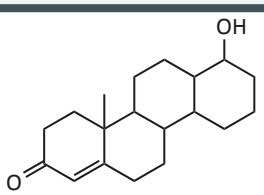
*Commercialized under Silia*Sep* OT branding

Forensic

Determination of Testosterone in Human Urine

General Procedure

1. Mini-Silia*Prep* C18 WPD (*PN: SPS-R33229G-P*) was conditioned with 5 mL of methanol and 5 mL of H_2O.
2. The urine sample (*2 mL*) was then slowly aspirated through the cartridge.
3. Cartridge was washed with 5 mL of H_2O and 5 mL of hexane.
4. Analyte was eluted with 5 mL of methanol.
5. The sample was evaporated under a nitrogen stream for 30 min at 40˚C.
6. The analyte was derivatized using 800 µL of Girard-P (*100 mM ammonium acetate buffer, pH 4.2*) and 200 µL of methanol maintained at room temperature for 12 h.
7. Quantification was done using LC-MS/MS apparatus.

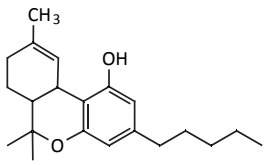
Testosterone Recovery		
Testosterone	Recovery (%)[a]	
	lot #1	lot #2
	94 ± 2	96 ± 1

[a]Mean Recovery n = 3, 250 ng/mL

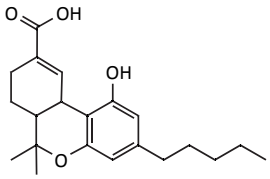
Forensic

Δ⁹-Tetrahydrocannabinol in Human Plasma

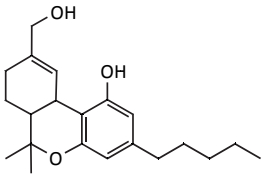
SiliaPrep C18 3 mL/500 mg
SiliCycle PN: SPE-R31930B-03P



Δ⁹-Tetrahydrocannabinol (THC)



11-nor-9-Carboxy-Δ⁹-Tetrahydrocannabinol (THC-COOH)



11-nor-9-Hydroxy-Δ⁹-Tetrahydrocannabinol (THC-OH)

Sample Preparation
- Mix 250 µL of plasma with 1 mL of phosphate buffer (*0.1M pH 6.0*)

Conditioning Step
- 3 mL of MeOH, 3 mL of HCl 1M and 3 mL of H_2O

Loading Step
- Pass the treated sample through the cartridge

Washing Step
- 2 mL of H_2O
- 1 mL of acetic acid 1M
- 2 mL of of (*20/80*) MeOH/H_2O (*v/v*)

Elution Step
- 3 mL of of (*50/50*) CH_2Cl_2/Acetone (*v/v*)

Evaporation Step
- Evaporate under a stream of nitrogen (*10 min at 40°C*)

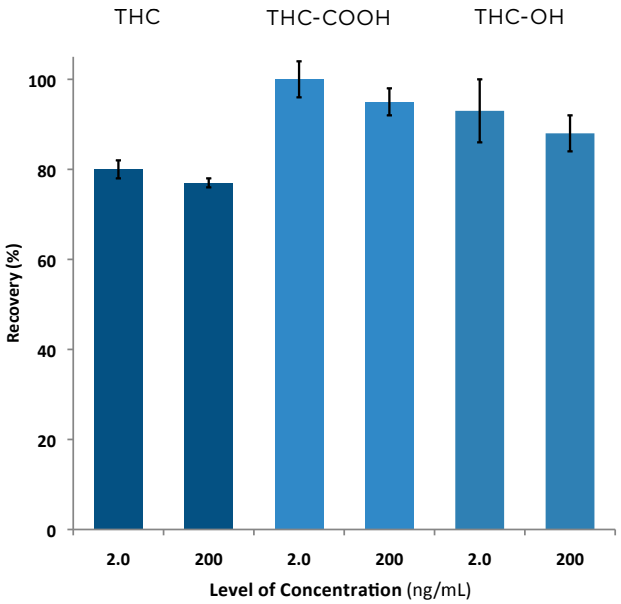
Derivatization Step
- Mix under vortex 100 µL of carbonate buffer 0.1M with 200 µL of dansyl chloride solution for 1 min (*1 mg/mL in acetone*)
- Incubate 40 min at 40°C

Liquid-liquid Extraction
- Add 2 mL of 1-chlorobutane
- Centrifugate at 3000 rpm for 5 min

Flash/Freeze Recuperation Step
- Flash/freeze the excess of water from the organic phase in a bath of dry ice/acetone for 3 min

Reconstitution Step
- Evaporate under a stream of nitrogen (*10 min at 40°C*)
- Reconstitute with 200 µL of (*80/20*) ACN/H_2O, 0.1% formic acid (*v/v*)

Recovery Results (*n* = 6)



Chromatographic Conditions:

Column:	SiliaChrom dt C18, 2.5 µm
Column Size:	3.0 x 30 mm
SiliCycle PN:	H141802E-H030
Mobile Phase:	MPA: 1 mM ammonium formate in (*10/90*) H_2O/ACN, 0.1% formic acid (*v/v*)
	MPB: 1 mM ammonium formate in (*90/10*) H_2O/ACN, 0.1% formic acid (*v/v*)
Temperature:	23°C
Flow Rate:	1.000 mL/min
Detector:	Sciex API 3000

Turbo Ion Spray Heater Gas Flow: 8,000 cc/min
Turbo Ion Spray Heater Temperature: 325° C, ESI⁺, MRM SCAN
Injection Volume: 5 µL

Gradient		
Time (min)	MPA (%)	MPB (%)
0	10	90
1.00	10	90
1.01	0	100
3.50	0	100
3.51	10	90
5.00	10	90

Silia*Prep* Reversed-Phases

Description

Silia*Prep* C8 and **Silia*Prep* C8 *nec***

A moderately hydrophobic and non-polar sorbent used to extract extremely non-polar compounds. This phase is more selective than Silia*Prep* C18 for large compounds such as PAH, vitamin D, and oils as well as greasy compounds.

- SiliCycle Sorbent Number: R31030B and R31130B (*nec*)
- Loading: 12% C
- Endcapping: Yes (*R31030B*) and No (*R31130B*)
- Silica Type: 60 Å, 500 m^2/g, 40 - 63 µm

Description

Silia*Prep* Phenyl

A moderately hydrophobic and non-polar sorbent used to extract non-polar compounds with different selectivities through π-π interactions including aromatic compounds and other non-polar phases.

- SiliCycle Sorbent Number: R34030B
- Loading: 9% C
- Endcapping: Yes
- Silica Type: 60 Å, 500 m^2/g, 40 - 63 µm

Description

Silia*Prep* Cyano

A moderately polar sorbent used as a normal phase (*less polar compared to silica*) to extract acidic, basic and neutral compounds from aqueous solutions. It is also used as a reversed-phase (*less hydrophobic than C8 and C18*).

- SiliCycle Sorbent Number: R38030B
- Loading: 7% C
- Endcapping: Yes
- Silica Type: 60 Å, 500 m^2/g, 40 - 63 µm

Silia*Prep* Reversed-Phases SPE Formats

Formats	Qty/Box	Silia*Prep* C8	Silia*Prep* C8 *nec*	Silia*Prep* Phenyl	Silia*Prep* Cyano
Silia*Prep* SPE Cartridges					
1 mL/50 mg	100	SPE-R31030B-01B	SPE-R31130B-01B	SPE-R34030B-01B	SPE-R38030B-01B
1 mL/100 mg	100	SPE-R31030B-01C	SPE-R31130B-01C	SPE-R34030B-01C	SPE-R38030B-01C
3 mL/200 mg	50	SPE-R31030B-03G	SPE-R31130B-03G	SPE-R34030B-03G	SPE-R38030B-03G
3 mL/500 mg	50	SPE-R31030B-03P	SPE-R31130B-03P	SPE-R34030B-03P	SPE-R38030B-03P
6 mL/500 mg	50	SPE-R31030B-06P	SPE-R31130B-06P	SPE-R34030B-06P	SPE-R38030B-06P
6 mL/1 g	50	SPE-R31030B-06S	SPE-R31130B-06S	SPE-R34030B-06S	SPE-R38030B-06S
6 mL/2 g	50	SPE-R31030B-06U	SPE-R31130B-06U	SPE-R34030B-06U	SPE-R38030B-06U
12 mL/2 g	20	SPE-R31030B-12U	SPE-R31130B-12U	SPE-R34030B-12U	SPE-R38030B-12U
25 mL/5 g*	20	SPE-R31030B-20X	SPE-R31130B-20X	SPE-R34030B-20X	SPE-R38030B-20X
Silia*Prep* Large Reservoir Volume SPE Cartridges					
10 mL/200 mg	50	SPC-R31030B-10G	SPC-R31130B-10G	SPC-R34030B-10G	SPC-R38030B-10G
10 mL/500 mg	50	SPC-R31030B-10P	SPC-R31130B-10P	SPC-R34030B-10P	SPC-R38030B-10P
Silia*Prep* 96-Well Plates					
2 mL/50 mg	1	96W-R31030B-B	96W-R31130B-B	96W-R34030B-B	96W-R38030B-B
2 mL/100 mg	1	96W-R31030B-C	96W-R31130B-C	96W-R34030B-C	96W-R38030B-C

*Commercialized under Silia*Sep* OT branding

SiliaPrep Normal Phases

Description

SiliaPrep Silica

The most polar sorbent, which presents a slightly acidic character and is used to extract various compounds from non-polar solvents through hydrogen bonding.

- SiliCycle Sorbent Number: R10030B
- Silica Type: 60 Å, 500 m^2/g, 40 - 63 µm

Description

SiliaPrep Silica WPD

The Silica WPD sorbent is used for the same application as the Silica sorbent but can accommodate larger molecules and untreated matrices.

- SiliCycle Sorbent Number: R10029G
- Silica Type: 125 Å, 300 m^2/g, 37 - 55 µm

Description

SiliaPrep Diol *nec*

Moderate polar sorbent presenting neutral character used to extract polar compounds from non-polar solvents and structural isomers. Alternative to silica when the acidic character is problematic.

- SiliCycle Sorbent Number: R35030B
- Loading: 8% C
- Endcapping: No
- Silica Type: 60 Å, 500 m^2/g, 40 - 63 µm

SiliaPrep Normal Phases SPE Formats

Formats	Qty/Box	SiliaPrep Silica	SiliaPrep Silica WPD	SiliaPrep Diol *nec*
SiliaPrep SPE Cartridges				
1 mL/50 mg	100	SPE-R10030B-01B	SPE-R10029G-01B	SPE-R35030B-01B
1 mL/100 mg	100	SPE-R10030B-01C	SPE-R10029G-01C	SPE-R35030B-01C
3 mL/200 mg	50	SPE-R10030B-03G	SPE-R10029G-03G	SPE-R35030B-03G
3 mL/500 mg	50	SPE-R10030B-03P	SPE-R10029G-03P	SPE-R35030B-03P
6 mL/500 mg	50	SPE-R10030B-06P	SPE-R10029G-06P	SPE-R35030B-06P
6 mL/1 g	50	SPE-R10030B-06S	SPE-R10029G-06S	SPE-R35030B-06S
6 mL/2 g	50	SPE-R10030B-06U	SPE-R10029G-06U	SPE-R35030B-06U
12 mL/2 g	20	FLH-R10030B-15U	FLH-R10029G-15U	SPE-R35030B-12U
25 mL/5 g*	20	FLH-R10030B-25X	FLH-R10029G-25X	SPE-R35030B-20X
SiliaPrep Large Reservoir Volume SPE Cartridges				
10 mL/200 mg	50	SPC-R10030B-10G	SPC-R10029G-10G	SPC-R35030B-10G
10 mL/500 mg	50	SPC-R10030B-10P	SPC-R10029G-10P	SPC-R35030B-10P
Mini-SiliaPrep SPE Cartridges				
500 mg	50	SPS-R10030B-P	SPS-R10029G-P	SPS-R35030B-P
1,000 mg	50	SPS-R10030B-S	SPS-R10029G-S	SPS-R35030B-S
SiliaPrep 96-Well Plates				
2 mL/50 mg	1	96W-R10030B-B	96W-R10029G-B	96W-R35030B-B
2 mL/100 mg	1	96W-R10030B-C	96W-R10029G-C	96W-R35030B-C

*Commercialized under SiliaSep OT branding

Silia*Prep* Normal Phases

Description

Silia*Prep* Florisil and **Silia*Prep* Florisil PR**

A polar sorbent (MgO_3Si) presenting a basic character used to extract non-polar to moderately polar compounds from non-polar solvents. The magnesium ion allows retention of chlorinated pesticides, polychlorinated biphenyl (*PCB's*) and polysaccharides.

- SiliCycle Sorbent Number: AUT-0014
  AUT-0015 (*PR*)
- Florisil Type: 75 - 150 µm
- Florisil PR Type: 150 - 200 µm

Description

Silia*Prep* Alumina-Acidic, **Neutral** and **Basic**

Alumina can present either cationic, neutral and acidic character. It is used in a similar fashion as for the Silia*Prep* Silica. The difference is that Alumina is more stable at high pH than silica. These sorbents present favorable retention of aromatic compounds, aliphatic amines and compounds containing electronegative functions.

- SiliCycle Sorbent Number: Acidic: AUT-0053
  Neutral: AUT-0054, Basic: AUT-0055
- Alumina Type: 60 Å, 0.9 g/mL, 50 - 200 µm

Silia*Prep* Normal Phases SPE Formats

Formats	Qty/Box	Silia*Prep* Florisil	Silia*Prep* Florisil PR	Silia*Prep* Acidic Alumina	Silia*Prep* Neutral Alumina	Silia*Prep* Basic Alumina
Silia*Prep* SPE Cartridges						
1 mL/50 mg	100	SPE-AUT-0014-01B	SPE-AUT-0015-01B	SPE-AUT-0053-01B	SPE-AUT-0054-01B	SPE-AUT-0055-01B
1 mL/100 mg	100	SPE-AUT-0014-01C	SPE-AUT-0015-01C	SPE-AUT-0053-01C	SPE-AUT-0054-01C	SPE-AUT-0055-01C
3 mL/200 mg	50	SPE-AUT-0014-03G	SPE-AUT-0015-03G	SPE-AUT-0053-03G	SPE-AUT-0054-03G	SPE-AUT-0055-03G
3 mL/500 mg	50	SPE-AUT-0014-03P	SPE-AUT-0015-03P	SPE-AUT-0053-03P	SPE-AUT-0054-03P	SPE-AUT-0055-03P
6 mL/500 mg	50	SPE-AUT-0014-06P	SPE-AUT-0015-06P	SPE-AUT-0053-06P	SPE-AUT-0054-06P	SPE-AUT-0055-06P
6 mL/1 g	50	SPE-AUT-0014-06S	SPE-AUT-0015-06S	SPE-AUT-0053-06S	SPE-AUT-0054-06S	SPE-AUT-0055-06S
6 mL/2 g	50	SPE-AUT-0014-06U	SPE-AUT-0015-06U	SPE-AUT-0053-06U	SPE-AUT-0054-06U	SPE-AUT-0055-06U
12 mL/2 g	20	SPE-AUT-0014-12U	SPE-AUT-0015-12U	SPE-AUT-0053-12U	SPE-AUT-0054-12U	SPE-AUT-0055-12U
25 mL/5 g*	20	SPE-AUT-0014-20X	SPE-AUT-0015-20X	SPE-AUT-0053-20X	SPE-AUT-0054-20X	SPE-AUT-0055-20X
Silia*Prep* Large Reservoir Volume SPE Cartridges						
10 mL/200 mg	50	SPC-AUT-0014-10G	SPC-AUT-0015-10G	SPC-AUT-0053-10G	SPC-AUT-0054-10G	SPC-AUT-0055-10G
10 mL/500 mg	50	SPC-AUT-0014-10P	SPC-AUT-0015-10P	SPC-AUT-0053-10P	SPC-AUT-0054-10P	SPC-AUT-0055-10P
Mini-Silia*Prep* SPE Cartridges						
500 mg	50	SPS-AUT-0014-P	SPS-AUT-0015-P	SPS-AUT-0053-P	SPS-AUT-0054-P	SPS-AUT-0055-P
1,000 mg	50	SPS-AUT-0014-S	SPS-AUT-0015-S	SPS-AUT-0053-S	SPS-AUT-0054-S	SPS-AUT-0055-S
Silia*Prep* 96-Well Plates						
2 mL/50 mg	1	96W-AUT-0014-B	96W-AUT-0015-B	n/a	n/a	n/a
2 mL/100 mg	1	96W-AUT-0014-C	96W-AUT-0015-C	n/a	n/a	n/a

*Commercialized under Silia*Sep* OT branding

SiliaPrep Ion Exchange Phases

Description

SiliaPrep TMA Chloride *nec* (*Si-SAX*)

Strong anion exchanger sorbent positively charged under all conditions. Used to extract acidic molecules (pK_a *3 - 5*).

- SiliCycle Sorbent Number: R66530B
- Loading: ≥ 1.01 mmol/g (*or meq/g*)
- Endcapping: No
- Silica Type: 60 Å, 500 m²/g, 40 - 63 µm

Description

SiliaPrep TMA Acetate *nec* (*Si-SAX-2*)

Strong anion exchanger (*low-selectivity acetate counter ion*) sorbent positively charged under all conditions. Used to extract acidic molecules (pK_a *3 - 5*).

- SiliCycle Sorbent Number: R66430B
- Loading: ≥ 0.71 mmol/g (*or meq/g*)
- Endcapping: No
- Silica Type: 60 Å, 500 m²/g, 40 - 63 µm

Description

SiliaPrep Amine (*Si-WAX*)

A weak anion exchanger used instead of a strong anion exchanger for strong anions, thus avoiding irreversible retention (*acidic molecules* pK_a *< 3*). This sorbent is used in different applications such as the separation of peptides, drugs and metabolites from physiological fluids, poly- and monosaccharides and structural isomers.

- SiliCycle Sorbent Number: R52030B
- Loading: ≥ 1.20 mmol/g (*or meq/g*)
- Endcapping: Yes
- Silica Type: 60 Å, 500 m²/g, 40 - 63 µm

SiliaPrep Ion Exchange Phases SPE Formats

Formats	Qty/Box	SiliaPrep TMA Chloride *nec*	SiliaPrep TMA Acetate *nec*	SiliaPrep Amine
SiliaPrep SPE Cartridges				
1 mL/50 mg	100	SPE-R66530B-01B	SPE-R66430B-01B	SPE-R52030B-01B
1 mL/100 mg	100	SPE-R66530B-01C	SPE-R66430B-01C	SPE-R52030B-01C
3 mL/200 mg	50	SPE-R66530B-03G	SPE-R66430B-03G	SPE-R52030B-03G
3 mL/500 mg	50	SPE-R66530B-03P	SPE-R66430B-03P	SPE-R52030B-03P
6 mL/500 mg	50	SPE-R66530B-06P	SPE-R66430B-06P	SPE-R52030B-06P
6 mL/1 g	50	SPE-R66530B-06S	SPE-R66430B-06S	SPE-R52030B-06S
6 mL/2 g	50	SPE-R66530B-06U	SPE-R66430B-06U	SPE-R52030B-06U
12 mL/2 g	20	SPE-R66530B-12U	SPE-R66430B-12U	SPE-R52030B-12U
*25 mL/5 g	20	SPE-R66530B-20X	SPE-R66430B-20X	SPE-R52030B-20X
SiliaPrep Large Reservoir Volume SPE Cartridges				
10 mL/200 mg	50	SPC-R66530B-10G	SPC-R66430B-10G	SPC-R52030B-10G
10 mL/500 mg	50	SPC-R66530B-10P	SPC-R66430B-10P	SPC-R52030B-10P
Mini-SiliaPrep SPE Cartridges				
500 mg	50	SPS-R66530B-P	SPS-R66430B-P	SPS-R52030B-P
1,000 mg	50	SPS-R66530B-S	SPS-R66430B-S	SPS-R52030B-S
SiliaPrep 96-Well Plates				
2 mL/50 mg	1	96W-R66530B-B	96W-R66430B-B	96W-R52030B-B
2 mL/100 mg	1	96W-R66530B-C	96W-R66430B-C	96W-R52030B-C

*Commercialized under SiliaSep OT branding

Silia*Prep* Ion Exchange Phases

Description

Silia*Prep* Tosic Acid (*Si-SCX*)

Strong cation exchanger sorbent positively charged under all conditions. Used to extract basic molecules (pK_a *7 - 10*).

- SiliCycle Sorbent Number: R60530B
- Loading: ≥ 0.54 mmol/g (*or meq/g*)
- Endcapping: Yes
- Silica Type: 60 Å, 500 m^2/g, 40 - 63 µm

Description

Silia*Prep* Propylsulfonic Acid (*Si-SCX-2*)

Strong cation exchanger sorbent positively charged under all conditions. Used to extract basic molecules (pK_a *7 - 10*).

- SiliCycle Sorbent Number: R51230B
- Loading: ≥ 0.63 mmol/g (*or meq/g*)
- Endcapping: Yes
- Silica Type: 60 Å, 500 m^2/g, 40 - 63 µm

Description

Silia*Prep* Carboxylic Acid (*Si-WCX*)

A weak cation exchanger sorbent used to extract strong basic compounds (pK_a *> 9*).

- SiliCycle Sorbent Number: R70030B
- Loading: ≥ 0.92 mmol/g (*or meq/g*)
- Endcapping: Yes
- Silica Type: 60 Å, 500 m^2/g, 40 - 63 µm

Silia*Prep* Ion Exchange Phases SPE Formats

Formats	Qty/Box	Silia*Prep* Tosic Acid	Silia*Prep* Propylsulfonic Acid	Silia*Prep* Carboxylic Acid
Silia*Prep* SPE Cartridges				
1 mL/50 mg	100	SPE-R60530B-01B	SPE-R51230B-01B	SPE-R70030B-01B
1 mL/100 mg	100	SPE-R60530B-01C	SPE-R51230B-01C	SPE-R70030B-01C
3 mL/200 mg	50	SPE-R60530B-03G	SPE-R51230B-03G	SPE-R70030B-03G
3 mL/500 mg	50	SPE-R60530B-03P	SPE-R51230B-03P	SPE-R70030B-03P
6 mL/500 mg	50	SPE-R60530B-06P	SPE-R51230B-06P	SPE-R70030B-06P
6 mL/1 g	50	SPE-R60530B-06S	SPE-R51230B-06S	SPE-R70030B-06S
6 mL/2 g	50	SPE-R60530B-06U	SPE-R51230B-06U	SPE-R70030B-06U
12 mL/2 g	20	SPE-R60530B-12U	SPE-R51230B-12U	SPE-R70030B-12U
25 mL/5 g*	20	SPE-R60530B-20X	SPE-R51230B-20X	SPE-R70030B-20X
Silia*Prep* Large Reservoir Volume SPE Cartridges				
10 mL/200 mg	50	SPC-R60530B-10G	SPC-R51230B-10G	SPC-R70030B-10G
10 mL/500 mg	50	SPC-R60530B-10P	SPC-R51230B-10P	SPC-R70030B-10P
Mini-Silia*Prep* SPE Cartridges				
500 mg	50	SPS-R60530B-P	SPS-R51230B-P	SPS-R70030B-P
1,000 mg	50	SPS-R60530B-S	SPS-R51230B-S	SPS-R70030B-S
Silia*Prep* 96-Well Plates				
2 mL/50 mg	1	96W-R60530B-B	96W-R51230B-B	96W-R70030B-B
2 mL/100 mg	1	96W-R60530B-C	96W-R51230B-C	96W-R70030B-C

*Commercialized under Silia*Sep* OT branding

SiliaPrep Mixed-Mode and Specialty Phases

Description

SiliaPrep C8/SAX-2 *nec*

Mixed-mode sorbent designed to extract or isolate acidic and neutral drugs and metabolites from physiological fluids.

- SiliCycle Sorbent Number: R661230B
- Loading: 11% C
- Silica Type: 60 Å, 500 m^2/g, 40 - 63 µm

Description

SiliaPrep SCX-2/SAX *nec*

This mixed-mode sorbent is typically used for the separation of acidic and basic molecules from non-ionizable molecules.

- SiliCycle Sorbent Number: R802830B
- Silica Type: 60 Å, 500 m^2/g, 40 - 63 µm

Description

SiliaPrep PCB *nec*

This special phase is specially designed for extraction of PCB's from waste oil (*hexane extract*).

- SiliCycle Sorbent Number: R00650030B
- Endcapping: No
- Silica Type: 60 Å, 500 m^2/g, 40 - 63 µm

Energy

SiliaPrep Mixed-Mode and Specialty Phases SPE Formats

Formats	Qty/Box	SiliaPrep C8/SAX-2	SiliaPrep SCX-2/SAX	SiliaPrep PCB nec
SiliaPrep SPE Cartridges				
1 mL/50 mg	100	SPM-R661230B-01B	SPM-R802830B-01B	n/a
1 mL/100 mg	100	SPM-R661230B-01C	SPM-R802830B-01C	n/a
3 mL/200 mg	50	SPM-R661230B-03G	SPM-R802830B-03G	n/a
3 mL/500 mg	50	SPM-R661230B-03P	SPM-R802830B-03P	n/a
6 mL/500 mg	50	SPM-R661230B-06P	SPM-R802830B-06P	n/a
6 mL/1 g	50	SPM-R661230B-06S	SPM-R802830B-06S	SP2-R00650030B-06S
6 mL/2 g	50	SPM-R661230B-06U	SPM-R802830B-06U	n/a
12 mL/2 g	20	SPM-R661230B-12U	SPM-R8028230B-12U	n/a
25 mL/5 g*	20	SPM-R661230B-20X	SPM-R802830B-20X	n/a
SiliaPrep Large Reservoir Volume SPE Cartridges				
10 mL/200 mg	50	SPC-R661230B-10G	SPC-R802830B-10G	n/a
10 mL/500 mg	50	SPC-R661230B-10P	SPC-R802830B-10P	n/a

*Commercialized under SiliaSep OT branding

Silia*Prep* CleanDRUG

Description

Silia*Prep* CleanDRUG

Silia*Prep* CleanDRUG is designed to extract specific analytes with more reproducibility and efficacy when using sensitive detectors. This product was developed, tested, and quality controlled for drugs of abuse applications.

- SiliCycle Sorbent Number: R651230B
- Silica Type: 60 Å, 500 m^2/g, 40 - 63 µm

Easy SPE Method for Drugs of Abuse Determination in Human Urine

Forensic

General Procedure

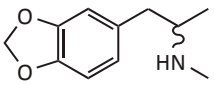
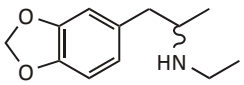
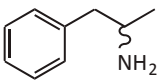
1. Sample (*0.5 mL*) is mixed with 2.5 mL of aqueous H_2SO_4 (*0.1 M*).
2. Silia*Prep* CleanDRUG (*3 mL/200 mg cartridges*) is conditioned with 2 column volumes of methanol, then 2 column volumes of aqueous H_2SO_4 (*0.1 M*).
3. Slowly force or aspirate the sample of urine through the cartridge.
4. Wash the cartridge with 3 mL of phosphate buffer (*KH_2PO_4/K_2HPO_4 pH = 7.0*), then with 3 mL of aqueous H_2SO_4 (*0.1 M*), and finally with 3 mL of methanol.
5. Analyte is eluted with 2 x 3 mL of aqueous NH_4OH (*5% v/v*).
6. Sample is evaporated under a nitrogen stream and, reconstituted with distilled water and methanol (*9:1 v/v*). Finally, the quantification is done using LC-MS apparatus.

Silia*Prep* CleanDRUG SPE Formats

Formats	Qty/Box	Silia*Prep* Product Number
Silia*Prep* SPE Cartridges		
1 mL/50 mg	100	SPEC-R651230B-01B
1 mL/100 mg	100	SPEC-R651230B-01C
3 mL/200 mg	50	SPEC-R651230B-03G
3 mL/500 mg	50	SPEC-R651230B-03P
6 mL/500 mg	50	SPEC-R651230B-06P
6 mL/1 g	50	SPEC-R651230B-06S
6 mL/2 g	50	SPEC-R651230B-06U
12 mL/2 g	20	SPEC-R651230B-12U
25 mL/5 g*	20	SPEC-R651230B-20X

*Commercialized under Silia*Sep* OT branding

Drugs of Abuse Recovery

Drugs	 MDMA	 MDEA	 Amphetamine
Recovery (%)[a]	96	98	99

[a]Mean Recovery n = 2, 10 ng/mL to 100 ng/mL

Forensic

Fentanyl and Norfentanyl in Urine

SiliaPrep CleanDRUG 1 mL/100 mg
SiliCycle PN: SPEC-R651230B-01C

Sample Preparation
- Spike 200 µL of urine and 600 µL of sodium acetate in H_2O (*100 mM, pH 6.0*) with 40 µL of internal standard (*fentanyl-d_5 and norfentanyl-d_5, 200 ng/mL in MeOH*)

Conditioning Step
- 1 mL of MeOH, 1 mL of H_2O and 1 mL of sodium acetate in H_2O (*100 mM, pH 6.0*)

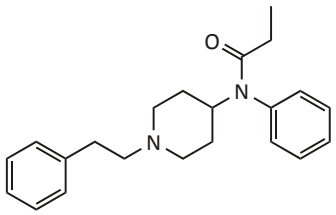
Loading Step
- Pass the treated sample through the cartridge

Washing Step
- 1 mL of H_2O
- 1 mL of MeOH

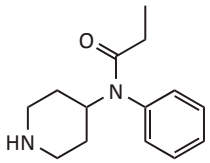
Elution Step
- 1 mL of of (*78/20/2*) EtOAc/IPA/NH_4OH (*v/v*)

Spoting Step*
- Spot 2 µL in a LazWell™ plate

*Organic phase can be evaporated and reconstituted



Fentanyl



Norfentanyl

LDTD-MS/MS Conditions:

Detector: Phytronix LDTD System on Thermo Vantage Mass Spectrometer
Gas Flow: 3 L/min
Mode: MRM, ESI^+

Laser Pattern

Time (s)	Power (%)
0	0
2.0	0
5.0	45
7.0	45
7.1	0
8.0	0

MRM Transition

Drug	MRM Transition	CE	S-Lens
Fentanyl	337 → 188	22	120
Fentanyl-d5	342 → 188	22	120
Norfentanyl	233 → 150	15	85
Norfentanyl-d5	238 → 155	15	85

Accuracy and Precision Results

Parameters	Fentanyl			Norfentanyl		
	QC Low	QC Med	QC High	QC Low	QC Med	QC High
Concentration (ng/mL)	25	100	500	25	100	500
N	12	12	12	12	12	12
Mean (ng/mL)	26.38	95.25	481.44	37.58	93.17	489.69
% RSD	2.0	3.9	1.4	15.6	8.1	6.2
% Nominal	105.5	95.2	96.3	110.3	93.2	97.9

Silia*Prep* CleanENVI

Description

Silia*Prep* CleanENVI

Silia*Prep* CleanENVI is designed for typical environmental samples such as PAH's, PCB's, herbicides and herbicides from water or waste water.

- SiliCycle Sorbent Number: R31930B
- Silica Type: 60 Å, 500 m^2/g, 40 - 63 µm

Easy SPE Method of Pesticides Determination from Drinking Water

Environment Food

General Procedure

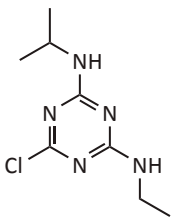
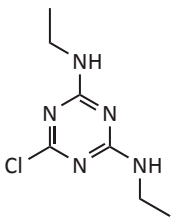
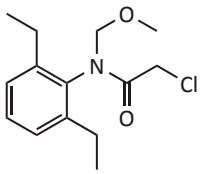
1. Silia*Prep* CleanENVI (*6 mL/500 mg cartridge*) is conditioned with 2 column volumes of methanol, then 2 column volumes of distilled water.
2. Slowly force or aspirate 10 mL of drinking water through the cartridge.
3. Wash the cartridge with 2 column volumes of distilled water (*2 x 5 mL*).
4. Analyte is eluted with 2 x 3 mL acetone.
5. Sample is evaporated under a nitrogen stream and, reconstituted with distilled water and methanol (*1:1 v/v*). Finally, the quantification is done using LC-MS apparatus.

Silia*Prep* CleanENVI SPE Formats

Formats	Qty/Box	Silia*Prep* Product Number
Silia*Prep* SPE Cartridges		
1 mL/50 mg	100	SPEC-R31930B-01B
1 mL/100 mg	100	SPEC-R31930B-01C
3 mL/200 mg	50	SPEC-R31930B-03G
3 mL/500 mg	50	SPEC-R31930B-03P
6 mL/500 mg	50	SPEC-R31930B-06P
6 mL/1 g	50	SPEC-R31930B-06S
6 mL/2 g	50	SPEC-R31930B-06U
12 mL/2 g	20	SPEC-R31930B-12U
25 mL/5 g*	20	SPEC-R31930B-20X

*Commercialized under Silia*Sep* OT branding

Pesticides Recovery

Pesticides	 Atrazine	 Simazine	 Alachlor
Recovery (%)[a]	95	96	86

[a]Mean Recovery n = 2, 10 ng/mL to 100 ng/mL

SiliaPrepX™

Polymeric SPE Cartridges and Well Plates

Greyhound CHROMATOGRAPHY AND ALLIED CHEMICALS

Greyhound Chromatography and Allied Chemicals
6 Kelvin Park, Birkenhead, Merseyside CH41 1LT United Kingdom
Tel: +44 (0)151 649 4000 Fax: +44 (0)151 649 4001
sales@greyhoundchrom.com

www.greyhoundchrom.com

Silia*PrepX*™ Polymeric SPE Cartridges and Well Plates

Using Silia*PrepX* Polymeric SPE Cartridges and Well Plates guarantees the following benefits:

- High quality products covering a broad spectrum of applications for a wide range of complex matrices.
- Exceptional lot-to-lot reproducibility.
- High recovery and yield.
- Very good separation and flow characteristics (*high loadability and great elution properties allowing low solvent consumption and economical analysis*).
- No contamination from the matrix (*clean extract reducing the ion suppression and increasing the selectivity for LC-MS/MS applications*).

Silia*PrepX* Polymeric; An Addition to Our Silica-Based SPE Cartridges

At SiliCycle, as leaders in the industry, we are committed to offer the best and most diversified portfolio for analytical, chromatography and organic chemistry. Although we are primarily renowned for *UltraPure* silica gels, we have created the Silia*PrepX* family of polymeric SPE cartridges and well plates to cover the whole spectrum of your solid-phase extraction needs. This new family of polymeric sorbents includes all the phases currently used in the field of sample purification, namely Hydrophilic-Lipophilic Balance (*HLB*), Divinylbenzene (*DVB*), Strong Cation Exchanger (*SCX*), Strong Anion Exchanger (*SAX*), Weak Cation Exchanger (*WCX*) and Weak Anion Exchanger (*WAX*). This complete range of sorbents allows the treatment of the most common matrices, such as human and animal biological fluids, waste waters, petrochemical residues, toxicological residues, food and beverage.

Our new Silia*PrepX* polymeric products are made using state of the art technology that provides the highest quality and lot-to-lot reproducibility. In addition, we conduct strict quality controls and analysis during the manufacturing process to remove any impurity or defect that could alter our products.

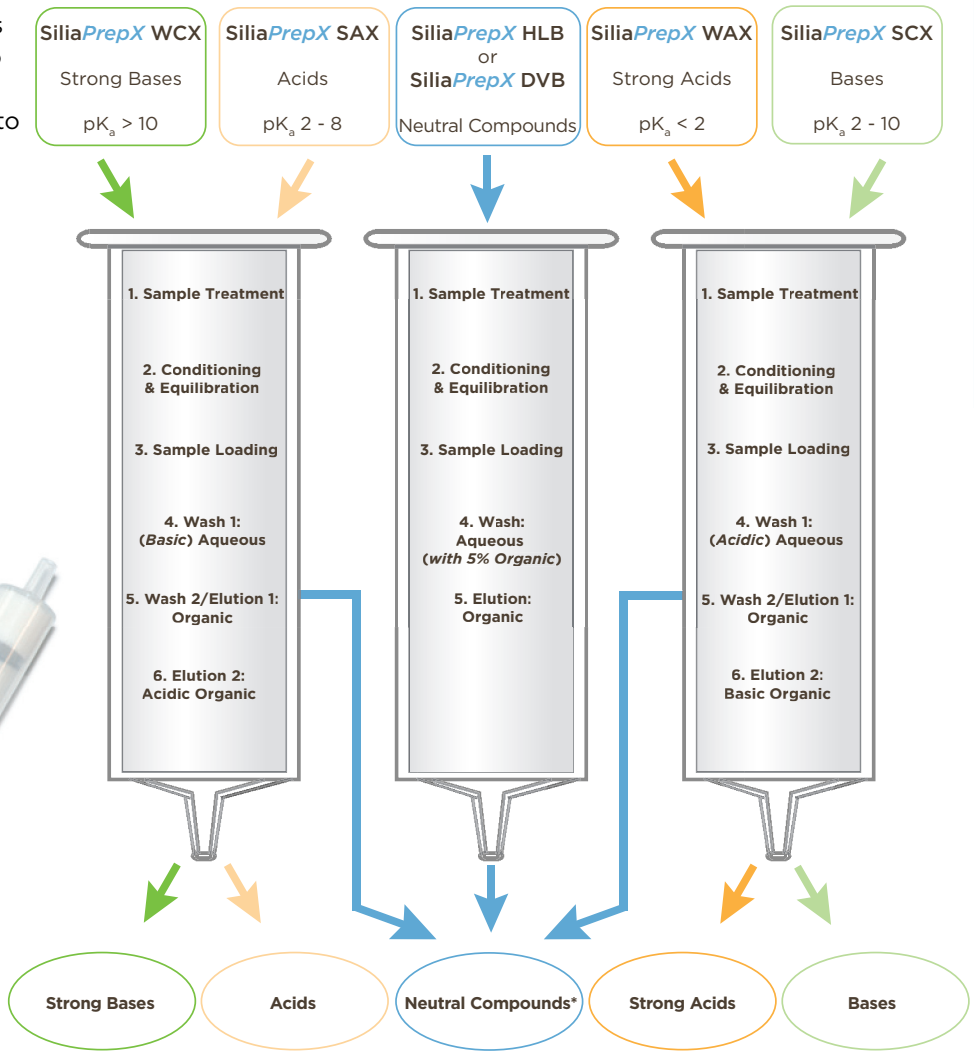
Plastic Device Specifications

Standard Silia*PrepX* cartridges are made with flanged polypropylene (*PP*) tubes and 20 µm polyethylene (*PE*) frits. Other plastic materials (*Teflon®, HDPE, etc.*), frit porosity (*10 µm*), and/or cartridge rim's (*flangeless*) are also available on a custom order basis.

Determination of the Optimal SiliaPrepX Polymeric Phase by a Simple & Logical Method

Follow the simple and logical steps outlined in the flow chart beside to determine the optimal SiliaPrepX polymeric phase to use, as well as to achieve high recovery and clean extract.

- Determine the classification of the analyte (*neutral, acidic or basic compound*)
- Determine the pK_a of the analyte
- Select the SiliaPrepX phase
- Apply the indicated treatment
- Determine recovery by LC analysis



*Polar compounds as organic acids and bases can also be eluted after the Wash/Elution 1.

Product Selection Guide by Manufacturer

Product Selection Guide by Manufacturers					
SiliCycle®	Waters®	Phenomenex®	Agilent®	Supelco®	Macherey-Nagel®
SiliaPrepX HLB	Oasis® HLB	Strata™-X	Plexa® or Nexus®	Supel™ Select HLB	Chromabond® HR-X
SiliaPrepX DVB	Oasis® HLB	Strata™-XL	Plexa® or SimpliQ® PS-DVB	Supel™ Select HLB	Chromabond® HR-P
SiliaPrepX SCX	Oasis® MCX	Strata™-X-C	Plexa® PCX or SimpliQ® SCX	Supel™ Select SCX	Chromabond® HR-XC
SiliaPrepX SAX	Oasis® MAX	Strata™-X-A	Plexa® PAX or SimpliQ® SAX	Supel™ Select SAX	Chromabond® HR-XA
SiliaPrepX WCX	Oasis® WCX	Strata™-X-CW	Nexus® WCX or SimpliQ® WCX	n/a	Chromabond® HR-XCW
SiliaPrepX WAX	Oasis® WAX	Strata™-X-AW	SimpliQ® WAX	n/a	Chromabond® HR-XAW

Silia*PrepX* HLB Phase

Description

Silia*PrepX* HLB is a wettable copolymer presenting a Hydrophilic-Lipophilic Balance (*HLB*) allowing a strong retention for neutral, acidic and basic compounds and a higher stability in organic solvents.

- Particle Size: 40 µm
- Pore Size: 110 Å
- Surface Area: 850 m^2/g
- pH Stability: 0 to 14

Typical Applications

- Drugs and metabolites in biological fluids
- API from tablets, creams, in waste water & drinking water
- Environmental analysis: trace of PAHs, pesticides, herbicides, phenols and PCB in water
- Antibiotics and pesticides in food & beverage

Silia*PrepX* HLB General Extraction Procedure	
Conditioning step	1 x Column volume of CH_3OH
Equilibration step	1 x Column volume of H_2O
Loading step	Dilute sample (*with* H_2O)
Washing step	1 x Column volume of 5% CH_3OH in H_2O
Elution step	1 x Column of CH_3OH

Note: This procedure is a convenient starting point for method development (*format 1 mL/30 mg*). In general, SPE protocols tend to be very specific to each molecule. Further optimization may be required to tailor the method to your application needs.

Silia*PrepX* DVB Phase

Description

Silia*PrepX* DVB is a polystyrene-divinylbenzene copolymer presenting a high hydrophobicity used as a reversed-phase for the extraction of neutral, acidic and basic compounds in viscous matrices or for post synthesis clean-up.

- Particle Size: 85 µm
- Pore Size: 60 Å
- Surface Area: 950 m^2/g
- pH Stability: 0 to 14

Typical Applications

- Drugs & metabolites in biological fluids
- API from tablets, creams, in waste water & drinking water
- Environmental analysis: trace of PAHs, pesticides, herbicides, phenols & PCBs in water

Silia*PrepX* DVB General Extraction Procedure	
Conditioning step	1 x Column volume of CH_3OH
Equilibration step	1 x Column volume of H_2O
Loading step	Dilute sample (*with* H_2O)
Washing step	1 x Column volume of 5% CH_3OH in H_2O
Elution step	1 x Column of CH_3OH

Note: This procedure is a convenient starting point for method development (*format 1 mL/30 mg*). In general, SPE protocols tend to be very specific to each molecule. Further optimization may be required to tailor the method to your application needs.

Silia*PrepX* HLB and DVB Polymeric Formats			
Formats	Qty/Box	Silia*PrepX* HLB	Silia*PrepX* DVB
Silia*PrepX* Polymeric SPE Cartridges			
1 mL/30 mg	100	SPE-P0002-01AA	SPE-P0001-01AA
3 mL/60 mg	50	SPE-P0002-03BB	SPE-P0001-03BB
6 mL/100 mg	30	SPE-P0002-06C	SPE-P0001-06C
6 mL/200 mg	30	SPE-P0002-06G	SPE-P0001-06G
6 mL/500 mg	30	SPE-P0002-06P	SPE-P0001-06P
Custom formats available on request			
Silia*PrepX* Polymeric 96-Well Plates			
2 mL/10 mg	1	96W-P0002-1A	96W-P0001-1A
2 mL/30 mg	1	96W-P0002-AA	96W-P0001-AA

Silia*PrepX* SCX Phase

Description

Silia*PrepX* SCX is a polystyrene-divinylbenzene copolymer functionalized by a strong cation exchanger presenting a high selectivity for bases (*pK_a 2 - 10*). It is highly stable in organic solvents.

Typical Applications

- Basic drugs from biological fluids & tissues
- Pesticides, herbicides, fungicides & melamine from food & beverage

- Particle Size: 85 µm
- Pore Size: 60 Å
- Surface Area: 800 m^2/g
- pH Stability: 0 to 14
- Ionic Capacity: ≥ 0.85 mmol/g (or *meq/g*)

Silia*PrepX* SCX General Extraction Procedure	
Conditioning step	1 x Column volume of CH_3OH
Equilibration step	1 x Column volume of H_2O
Loading step	Dilute sample with 1% AcOH in H_2O (*pH 4-5*)
Washing step 1	1 x Column volume of H_2O
Washing step 2	1 x Column volume of CH_3OH
Elution step	1 x Column of 5% NH_4OH in CH_3OH

Note: This procedure is a convenient starting point for method development (*format 1 mL/30 mg*). In general, SPE protocols tend to be very specific to each molecule. Further optimization may be required to tailor the method to your application needs.

Silia*PrepX* SAX Phase

Description

Silia*PrepX* SAX is a polystyrene-divinylbenzene copolymer functionalized by a strong anion exchanger presenting a high selectivity for acids (*pK_a 2 - 8*). It is highly stable in organic solvents.

Typical Applications

- Acidic compounds & metabolites from biological fluids & tissues
- Food additives & contaminants
- Phenolic acids
- Acidic herbicides

- Particle Size: 85 µm
- Pore Size: 60 Å
- Surface Area: 900 m^2/g
- pH Stability: 0 to 14
- Ionic Capacity: ≥ 0.25 mmol/g (or *meq/g*)

Silia*PrepX* SAX General Extraction Procedure	
Conditioning step	1 x Column volume of CH_3OH
Equilibration step	1 x Column volume of H_2O
Loading step	Dilute sample with 5% NH_4OH in H_2O (*pH 7-8*)
Washing step 1	1 x Column volume of H_2O
Washing step 2	1 x Column volume of CH_3OH
Elution step	1 x Column of 2% HCO_2H in CH_3OH

Note: This procedure is a convenient starting point for method development (*format 1 mL/30 mg*). In general, SPE protocols tend to be very specific to each molecule. Further optimization may be required to tailor the method to your application needs.

Silia*PrepX* Strong Exchangers Polymeric Formats			
Formats	Qty/Box	Silia*PrepX* SCX	Silia*PrepX* SAX
Silia*PrepX* Polymeric SPE Cartridges			
1 mL/30 mg	100	SPE-P0005-01AA	SPE-P0010-01AA
3 mL/60 mg	50	SPE-P0005-03BB	SPE-P0010-03BB
6 mL/100 mg	30	SPE-P0005-06C	SPE-P0010-06C
6 mL/200 mg	30	SPE-P0005-06G	SPE-P0010-06G
6 mL/500 mg	30	SPE-P0005-06P	SPE-P0010-06P
Custom formats available on request			
Silia*PrepX* Polymeric 96-Well Plates			
2 mL/10 mg	1	96W-P0005-1A	96W-P0010-1A
2 mL/30 mg	1	96W-P0005-AA	96W-P0010-AA

Silia*PrepX* WCX Phase

Description

Silia*PrepX* WCX is a polystyrene-divinylbenzene copolymer functionalized by a weak cation exchanger used to catch and release strong basic compounds (pK_a *>10*). It is highly stable in organic solvents.

Typical Applications

- Strong basic compounds from biological fluids & tissues
- Streptomycin from food

- Particle Size: 85 µm
- Pore Size: 60 Å
- Surface Area: 800 m^2/g
- pH Stability: 0 to 14
- Ionic Capacity: ≥ 0.65 mmol/g (or *meq/g*)

Silia*PrepX* WCX General Extraction Procedure	
Conditioning step	1 x Column volume of CH_3OH
Equilibration step	1 x Column volume of H_2O
Loading step	Dilute sample with 5% NH_4OH in H_2O (*pH 7-8*)
Washing step 1	1 x Column volume of H_2O
Washing step 2	1 x Column volume of CH_3OH
Elution step	1 x Column of 2% HCO_2H in CH_3OH

Note: This procedure is a convenient starting point for method development (*format 1 mL/30 mg*). In general, SPE protocols tend to be very specific to each molecule. Further optimization may be required to tailor the method to your application needs.

Silia*PrepX* WAX Phase

Description

Silia*PrepX* WAX is a polystyrene-divinylbenzene copolymer functionalized by a weak anion exchanger used to catch and release strong acidic compounds (pK_a *<2*). It is highly stable in organic solvents.

Typical Applications

- Strong acidic compounds & metabolites from biological fluids & tissues
- Sulfonates & perfluorinated surfactants

- Particle Size: 85 µm
- Pore Size: 60 Å
- Surface Area: 800 m^2/g
- pH Stability: 0 to 14
- Ionic Capacity: ≥ 0.65 mmol/g (or *meq/g*)

Silia*PrepX* WAX General Extraction Procedure	
Conditioning step	1 x Column volume of CH_3OH
Equilibration step	1 x Column volume of H_2O
Loading step	Dilute sample with 1% AcOH in H_2O (*pH 4-5*)
Washing step 1	1 x Column volume of H_2O
Washing step 2	1 x Column volume of CH_3OH
Elution step	1 x Column of 5% NH_4OH in CH_3OH

Note: This procedure is a convenient starting point for method development (*format 1 mL/30 mg*). In general, SPE protocols tend to be very specific to each molecule. Further optimization may be required to tailor the method to your application needs.

Silia*PrepX* Weak Exchangers Polymeric Formats			
Formats	Qty/Box	Silia*PrepX* WCX	Silia*PrepX* WAX
Silia*PrepX* Polymeric SPE Cartridges			
1 mL/30 mg	100	SPE-P0015-01AA	SPE-P0020-01AA
3 mL/60 mg	50	SPE-P0015-03BB	SPE-P0020-03BB
6 mL/100 mg	30	SPE-P0015-06C	SPE-P0020-06C
6 mL/200 mg	30	SPE-P0015-06G	SPE-P0020-06G
6 mL/500 mg	30	SPE-P0015-06P	SPE-P0020-06P

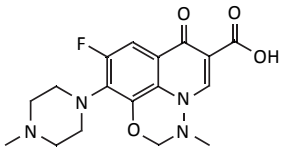
Food

Marbofloxacin & Sarafloxacin in Salmon

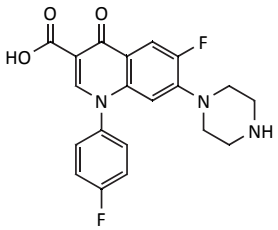
Marbofloxacin and Sarafloxacin are fluoroquinolone antibiotics used in veterinary medicine for infection treatment of skin and respiratory system. The excessive use of fluoroquinolones in food from animals has led to fluoroquinolone-resistant Salmonella causing several human health diseases. In 1998, the World Health Organization (***WHO***) has encouraged the promotion of prudent use of quinolones in veterinary medicine in order to minimize the emergence of antimicrobial resistance.

SiliaPrepX SCX 3 mL/60 mg

SiliCycle PN: SPE-P0005-03BB



Marbofloxacin



Sarafloxacin

Sample Preparation

- Add 2 g of salmon and 15 mL of 3% H_3PO_4 aqueous solution in a 50 mL tube
- Shake the tube in a horizontal position for 15 min
- Add 5 mL of hexane and vortex for 2 min
- Centrifugate at 3,000 rpm for 5 min
- Recuperate the aqueous phase from the gelled organic phase by filtration

Conditioning Step

- 3 mL of MeOH, 3 mL of HCl 1M and 3 mL of H_2O

Loading Step

- Pass 3 mL of the filtered sample through the cartridge

Washing Step

- 2 mL of HCl 2M
- 1 mL of MeOH

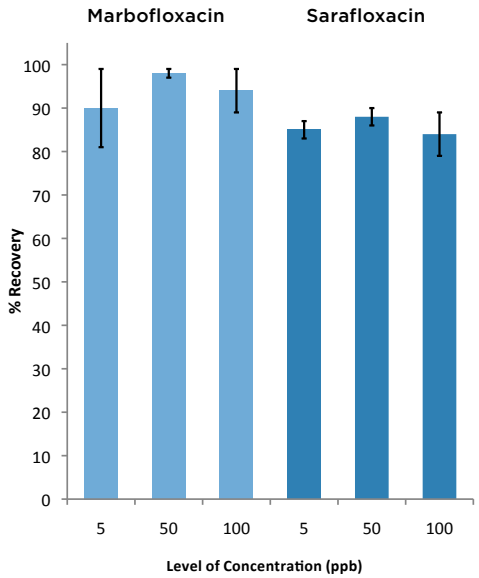
Elution Step

- 3 mL of 10% NH_4OH in MeOH

Reconstitution Step

- Evaporate under a stream of nitrogen (*20 min at 40°C*)
- Reconstitute with 1 mL of (*20/80*) MeOH/H_2O (*v/v*)

Recovery Results (*n = 3*)



Chromatographic Conditions:

Column: SiliaChrom dt C18, 3 µm
Column Size: 3.0 x 30 mm
SiliCycle PN: H141803E-H030
Mobile Phase: MPA: 1 mM ammonium formate in (*10/90*) MeOH/H_2O, 0.1% formic acid (*v/v*)
MPB: 1 mM ammonium formate in (*90/10*) MeOH/H_2O, 0.1% formic acid (*v/v*)
Temperature: 23°C
Flow Rate: 0.800 mL/min
Detector: Sciex API 3000
Turbo Ion Spray Heater Gas Flow: 8,000 cc/min
Turbo Ion Spray Heater Temperature: 400°C, ESI^+
MRM Transition: Marbofloxacin 363.1 → 320.2
Sarafloxacin 386.3 → 368.3
Injection Volume: 5 µL

Gradient		
Time (min)	MPA (%)	MPB (%)
0	90	10
0.50	90	10
0.51	65	35
1.50	65	35
1.51	0	100
2.25	0	100
2.26	90	10
4.00	90	10

Acrylamide Determination in Fried Potato Chips

Food

Acrylamide is a chemical contaminant produced during the cooking step at high temperature of foods containing high levels of carbohydrate and low levels of protein. High levels of acrylamide have been detected in french fries and potato chips as well as other fried foods. Acrylamide is suspected to be a cancer agent. Health Canada is currently collecting information on the properties and prevalence of this substance in order to make their assessment. Other governemental health organizations have added acrylamide to the list of potentially cancerogenic substances.

Silia*PrepX* HLB 6 mL/200 mg
SiliCycle PN: SPE-P0002-06G

Sample Preparation

- First extraction:
- In a PTFE tube, add 1 g of potato chips, 8 mL of 4M NaCl aqueous solution and vortex 1 min
- Incubate 30 min at 60°C (*vortex 10 sec each 10 min*)
- Centrifugate for 10 min at 4,500 rpm and collect the supernatant
- Second extraction: repeat previous 3 steps with same potato chips
- Add 1 mL of Cirraz 1[a] solution and 1 mL of Cirraz 2[b] solution
- Vortex 1 min and centrifugate at 4,500 rpm for 5 min

[a]Cirraz 1 solution: 15 g $K_3[Fe(CN)_6]$ in 100 mL H_2O
[b]Cirraz 2 solution: 30 g $Zn(O_2CCH_3)_2$ in 100 mL H_2O

Step 1: Silia*PrepX* HLB 6 mL/200 mg

Conditioning Step

- 3 mL of MeOH and 3 mL of H_2O

Loading Step

- Pass 1.5 mL of the treated sample through the cartridge

Washing Step

- 1.5 mL H_2O

Elution Step

- 3 mL 1% HCO_2H in MeOH

Step 2: Silia*PrepX* SCX 3 mL/60 mg

Conditioning Step

- 3 mL of MeOH

Loading Step

- Pass the treated sample from step 1 through the cartridge by gravity and collect this fraction

Washing Step

- 1 mL of MeOH and mix the collected fraction

Reconstitution Step

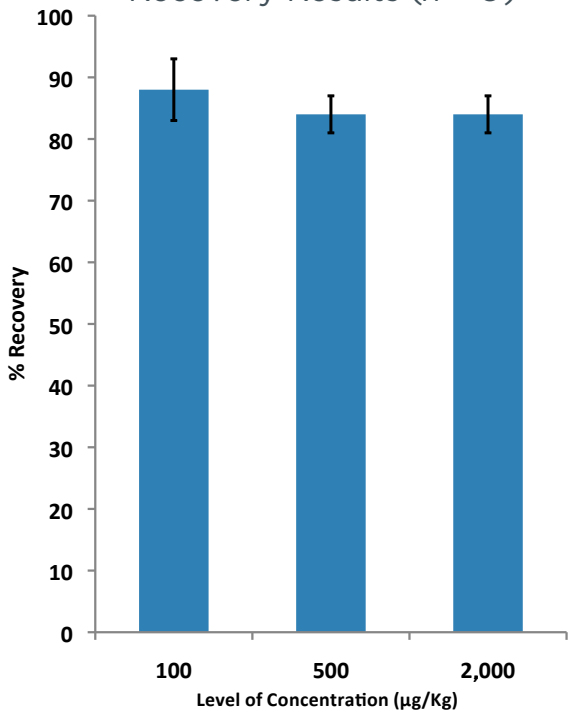
- Evaporate to dryness with a rotary evaporator at 45°C
- Reconstitute with 2 mL of (*5/95*) MeOH/H_2O (*v/v*)

Silia*PrepX* SCX 3 mL/60 mg
SiliCycle PN: SPE-P0005-03BB

Chromatographic Conditions:

Column:	Silia*Chrom* dt C18, 2.5 µm
Column Size:	2.0 x 50 mm
SiliCycle PN:	H141802E-E050
Mobile Phase:	1 mM ammonium formate in (*2/98*) MeOH/H_2O, 0.1% formic acid (*v/v*)
Temperature:	23° C
Flow Rate:	0.600 mL/min
MS Splitting Flow:	0.300 mL/min
Detector:	Sciex API 3000
Turbo Ion Spray Heater Gas Flow:	8,000 cc/min
Turbo Ion Spray Heater Temperature:	400° C, ESI^+
MRM Transition:	71.9 → 55.1
Injection Volume:	10 µL

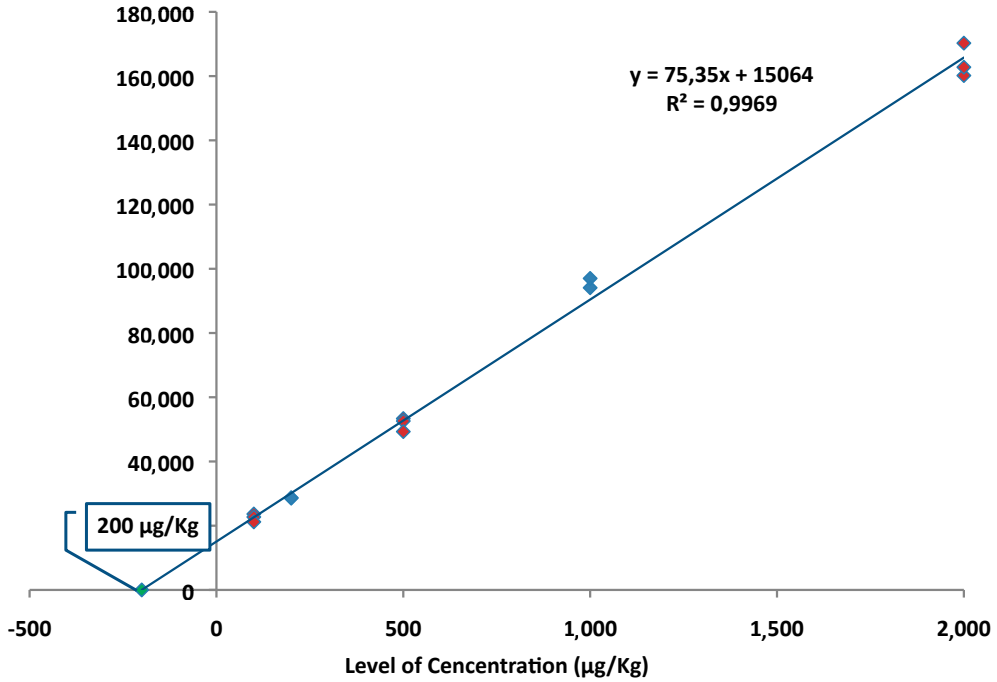
Recovery Results (*n = 3*)



Food

Acrylamide Determination in Fried Potato Chips (*con't*)

Calibration Curve (*100 - 2,000 µg/Kg, n = 3*)



HIGH PRECISION

Method Precision Results (*n = 3*)		
Acrylamide added (µg/Kg)	Theoritical Concentration (µg/Kg)	Measured Concentration (µg/Kg)
0	200	195 ± 15
100	300	308 ± 19
200	400	394 ± 11
500	700	699 ± 11
1,000	1,200	1,260 ± 28
2,000	2,200	2,116 ± 47

GREAT ACCURACY

Method Accuracy Results (*n = 3*)		
Level of Concentration (µg/Kg)	Accuracy (%)	CV (%)
100	102 ± 6	4.9
500	99 ± 2	1.0
2,000	96 ± 2	3.2

Determination of Carbendazim in Orange Juice

Food

Carbendazim is a fungicide used in some countries to preserve agricultural crops. The use of this fungicide on oranges and orange juice concentrates is not approved by the Environmental Protection Agency (***EPA***) and is illegal in the United States. Recently, the Food and Drug Administration (***FDA***) has received reports that low levels of the fungicide have been found in some orange juice that contain imported orange juice concentrates.

Silia*PrepX* SCX 3 mL/60 mg

SiliCycle PN: SPE-P0005-03BB

Sample Preparation

- Centrifugate 5 mL of orange juice 5 min at 3,000 rpm
- Sample 1 mL of the supernatant
- Add 2 mL of acetic acid 10% and vortex 1 min

Conditioning Step

- 3 mL of MeOH and 3 mL of acetic acid 10%

Loading Step

- Pass 3 mL of the treated sample through the cartridge

Washing Step

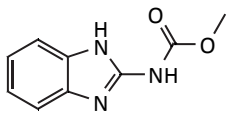
- 2 mL of acetic acid 10%
- 2 mL of MeOH

Elution Step

- 3 mL of 5% NH_4OH in MeOH

Reconstitution Step

- Evaporate under a stream of nitrogen (*10 min at 40°C*)
- Reconstitute with 3 mL of (*10/90*) MeOH/H_2O (*v/v*)

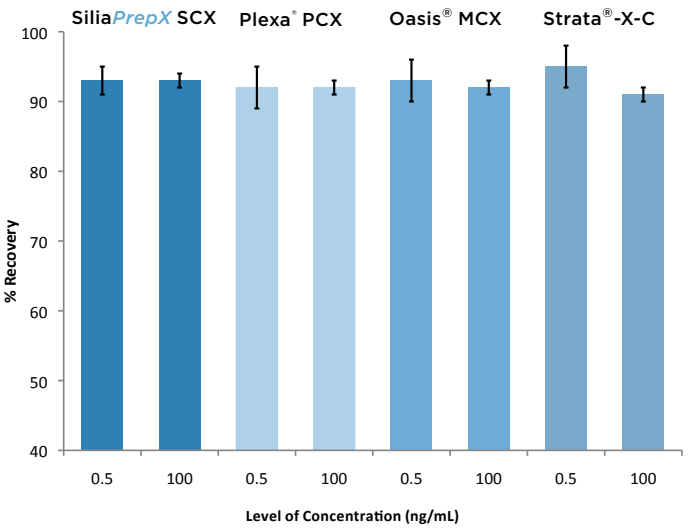


Carbendazim

Chromatographic Conditions:

Column: Silia*Chrom* dt C18, 2.5 µm
Column Size: 3.0 x 30 mm
SiliCycle PN: H141802E-H030
Mobile Phase: 1 mM ammonium formate in (*20/80*) MeOH/H_2O, 0.1% formic acid (*v/v*)
Temperature: 23°C
Flow Rate: 0.800 mL/min
MS Splitting Flow: 0.300 mL/min
Detector: Sciex API 3000
Turbo Ion Spray Heater Gas Flow: 8,000 cc/min
Turbo Ion Spray Heater Temperature: 400°C, ESI^+
MRM Transition: 192.1 → 160.2
Injection Volume: 5 µL

Recovery Results at 0.5 & 100 ng/mL (*n = 3*)



Method Accuracy Results (*n = 3*)

Level of Concentration	Concentration (ng/mL)	Accuracy (%)
LLQC	0.5	89 ± 4
QC1 (3x LLQC)	1.5	106 ± 2
QC2 (30% ULQC)	30	89 ± 1
QC3 (70% ULQC)	70	94 ± 1
ULQC	100	107 ± 1

Ion Suppression Measured at 100 ng/ml (*n = 3*)

Brand	Ion Suppression (%)
Silia*PrepX* SCX	-11
Plexa® PCX	-11
Oasis® MCX	-10
Strata®-X-C	-11

Forensic

Amphetamine Quantification in Human Urine

SiliaPrepX HLB 3 mL/60 mg

SiliCycle PN: SPE-P0002-03BB

Sample Preparation

- 10 mL of urine is treated with 100 µL of TFA

Conditioning Step

- 3 mL of MeOH and 3 mL of H_2O

Loading Step

- Pass 1 mL of the treated sample through the cartridge

Washing Step

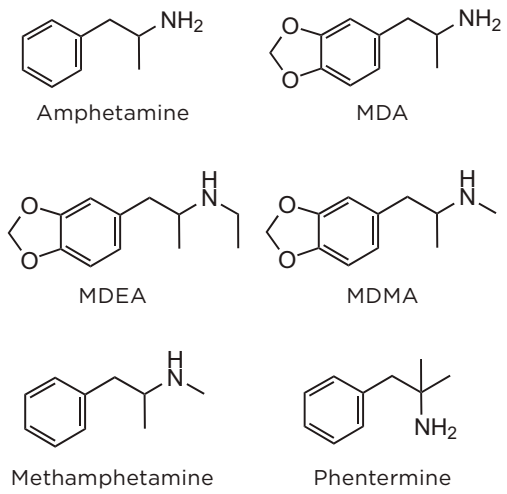
- 3 mL (*5/95*) MeOH/H_2O , 2% NH_4OH (*v/v*)
- 3 mL (*20/80*) MeOH/H_2O , 2% NH_4OH (*v/v*)
- 1 mL (*80/20*) MeOH/H_2O (*v/v*)

Elution Step

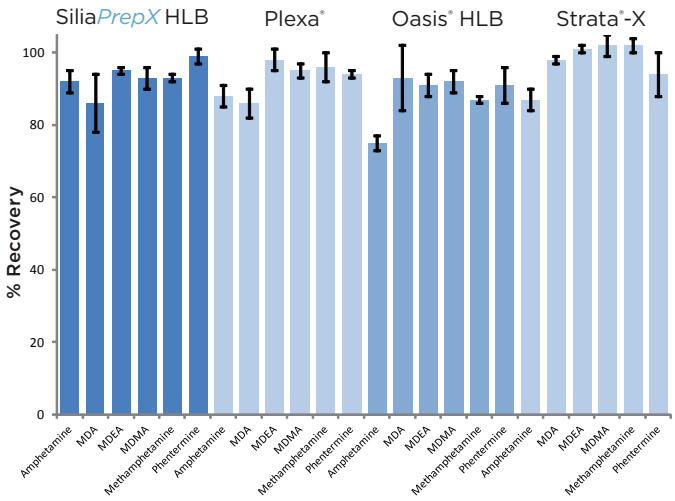
- 3 mL MeOH
- 3 mL 2% formic acid in MeOH

Reconstitution Step

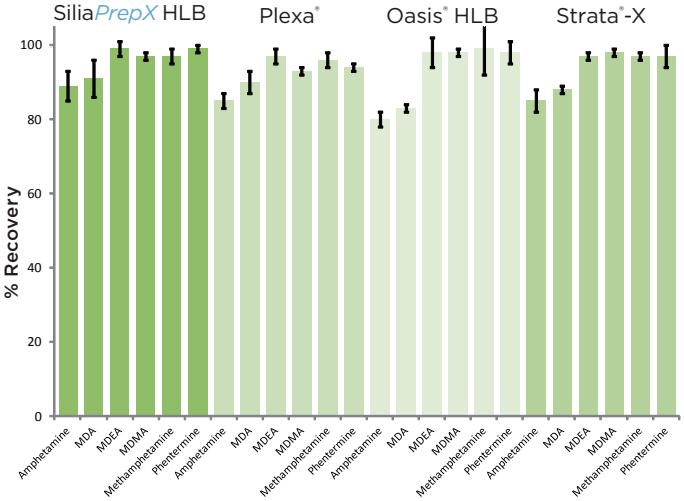
- Evaporate under a stream of nitrogen (*20 min at 40°C*)
- Reconstitute with 3 mL of the mobile phase solution



Recovery Results 5 ng/mL (*n = 3*)



Recovery Results 250 ng/mL (*n = 3*)



Chromatographic Conditions:

Column:	SiliaChrom XT C18, 5 µm
Column Size:	4.6 x 50 mm
SiliCycle PN:	H171805H-N050
Mobile Phase:	1 mM ammonium formate in (*70/30*) MeOH/H_2O, 0.1% NaOH (*v/v*)
Temperature:	23°C
Flow Rate:	1.000 mL/min
Detector:	Sciex API 3000

Turbo Ion Spray Heater Gas Flow: 8,000 cc/min
Turbo Ion Spray Heater Temperature: 350°C, ESI^+, MRM SCAN
Injection Volume: 5 µL

Ion Suppression Measured at 250 ng/mL (*n = 3*)

Compounds	SiliaPrepX HLB (%)	Plexa® (%)	Oasis® HLB (%)	Strata®-X (%)
Amphetamine	-9	-4	-4	7
MDA	-7	-5	-5	3
MDEA	-6	-5	-4	-2
MDMA	-12	-11	-12	-10
Methamphetamine	-7	-3	-4	7
Phentermine	11	15	15	21

Sulfonamides, Tetracyclines & Pyrimethamines in Milk

Food Environment

Silia*PrepX* HLB 3 mL/60 mg
SiliCycle PN: SPE-P0002-03BB

Sample Preparation
- Vortex (*2 min*) 250 µL of 20% trichloroacetic acid (TCA) in H_2O (*w/v*) with 600 µL of bovine milk
- Add 2.5 mL of McIlvain buffer (*vortex 3 min*)
- pH adjustment of the solution at 5.5 with NaOH 1.0 M
- Centrifuge at 3,000 rpm for 5 min

Conditioning Step
- 3 mL of MeOH and 3 mL of H_2O

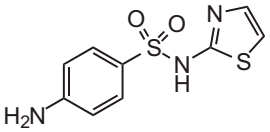
Loading Step
- Pass 1 mL of the treated sample through the cartridge

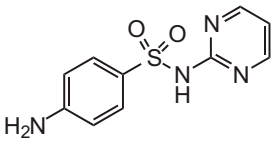
Washing Step
- 2 x 3 mL (*10/90*) MeOH/buffer ammonium acetate pH 5.5 (*v/v*) and dry the cartridge

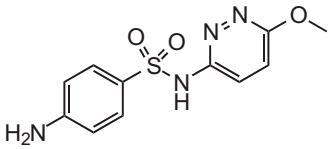
Elution Step
- 3 mL of MeOH

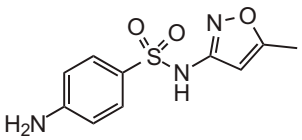
Reconstitution Step
- Evaporate under a stream of nitrogen (*40 min at 40°C*)
- Reconstitute with 300 µL of (*90/10*) MeOH/H_2O (*v/v*)

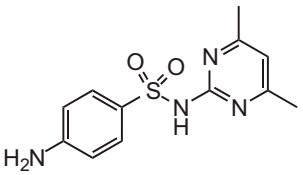
Silia*PrepX* DVB 3 mL/60 mg
SiliCycle PN: SPE-P0001-03BB

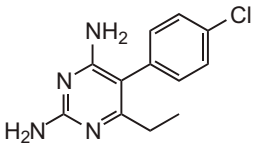

Sulfathiazole

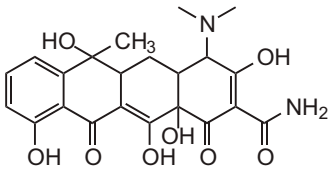

Sulfadiazine

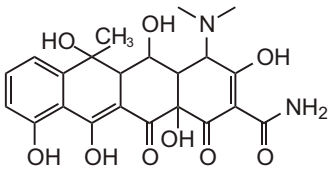

Sulfamethoxypyridazine


Sulfamethazole


Sulfamethazine


Pyrimethamine


Tetracycline


Oxytetracycline

Chromatographic Conditions:

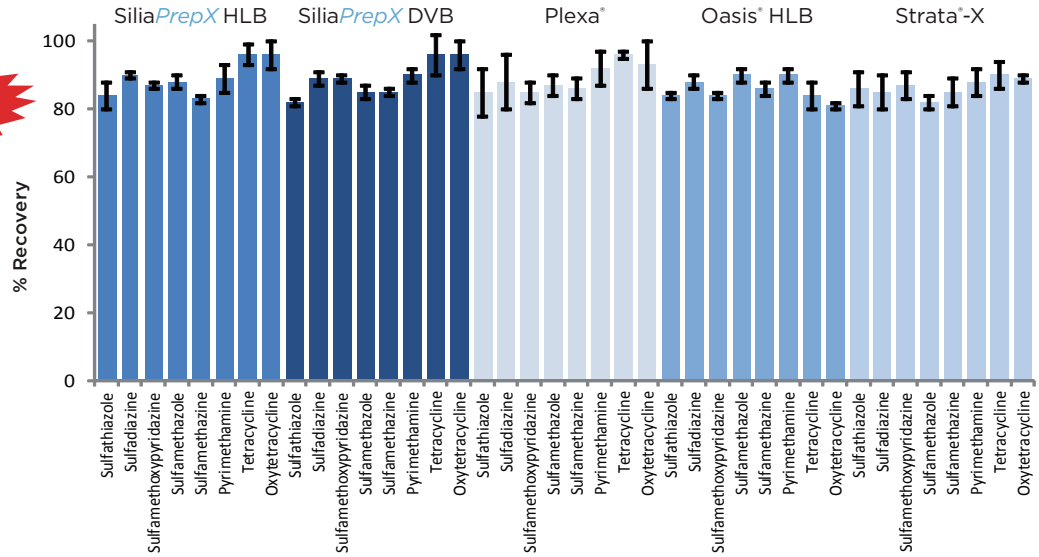
Column: Silia*Chrom* dt C18, 2.5 µm
Column Size: 3.0 x 30 mm
SiliCycle PN: H141802E-H030
Mobile Phase: MPA 1 mM ammonium formate in (*90/10*) MeOH/H_2O, 0.1% formic acid (*v/v*)
MPB 1 mM ammonium formate in (*10/90*) MeOH/H_2O, 0.1% formic acid (*v/v*)
Temperature: 23°C
Flow Rate: 1.000 mL/min
Detector: Sciex API 3000
Turbo Ion Spray Heater Gas Flow: 8,000 cc/min
Turbo Ion Spray Heater Temperature: 375°C, ESI^+, MRM SCAN
Injection Volume: 10 µL

Gradient		
Time (min)	MPA (%)	MPB (%)
0	90	10
1.25	90	10
2.51	60	40
3.00	60	40
3.01	90	10
5.00	90	10

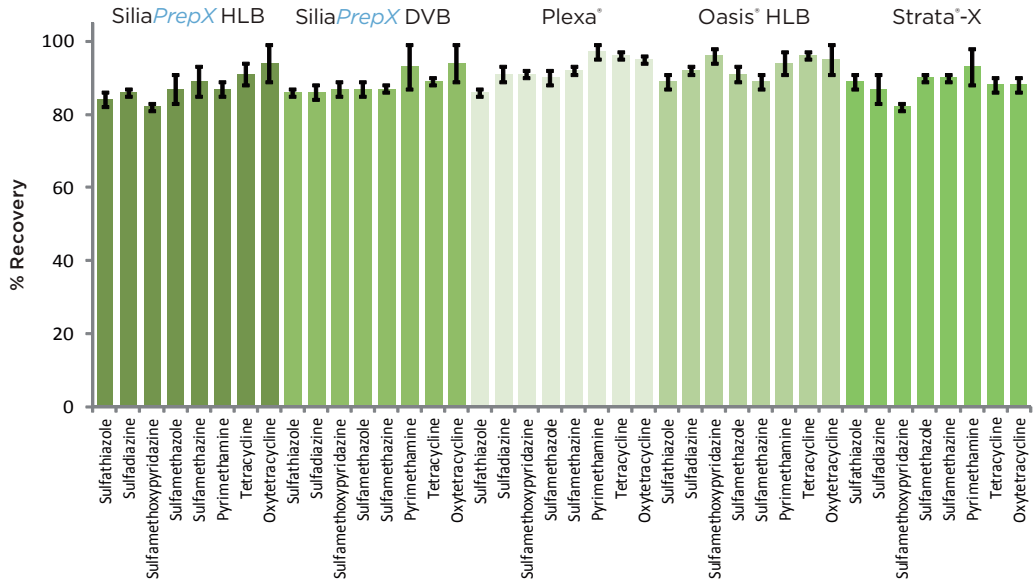
Sulfonamides, Tetracyclines & Pyrimethamines in Milk *(con't)*

GREAT RECOVERY

Recovery Results 10 ng/mL (*n = 3*)



Recovery Results 100 ng/mL (*n = 3*)



LOW ION SUPPRESSION

Ion Suppression Measured at 100 ng/mL (*n = 3*)

Compounds	SiliaPrepX HLB (%)	SiliaPrepX DVB (%)	Plexa® (%)	Oasis® HLB (%)	Strata®-X (%)
Sulfathiazole	-1	-1	1	-2	-2
Sulfadiazine	-1	-2	-2	-3	2
Sulfamethoxypyridazine	-6	-3	-5	-13	-6
Sulfamethazole	7	8	1	7	7
Sulfamethazine	5	6	1	5	7
Pyrimethamine	-12	-9	-4	-7	-7
Tetracycline	-5	-1	-1	-5	-4
Oxytetracycline	1	-5	-1	-3	2

Environment

Determination of Trace Pesticides in Water

SiliaPrepX HLB 6 mL/200 mg
SiliCycle PN: SPE-P0002-06G

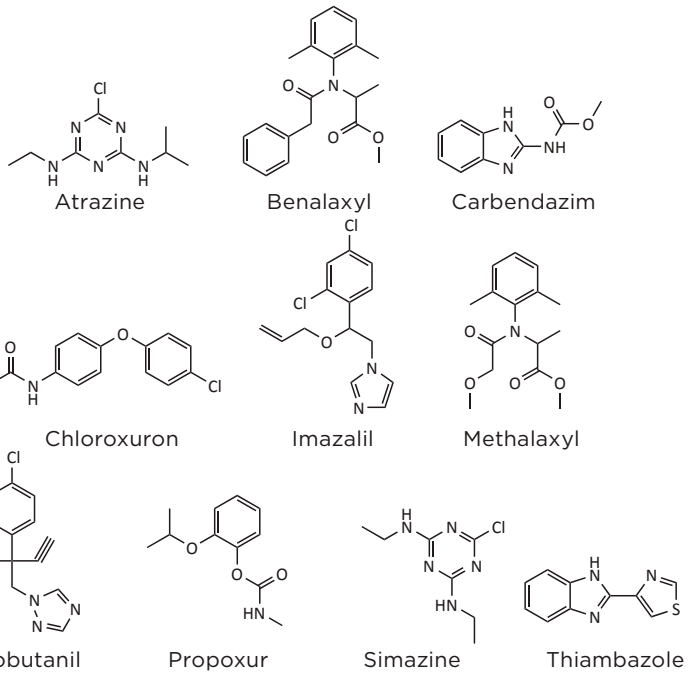
Conditioning Step
- 6 mL of MeOH and 3 mL of H_2O (*HPLC grade*)

Loading Step
- Pass 100 mL of drinking water through the cartridge

Washing Step
- 6 mL of H_2O (*HPLC grade*)

Elution Step
- 2 x 6 mL of MeOH

Reconstitution Step
- Evaporate under a stream of nitrogen (*10 min at 50°C*)
- Reconstitute with 2 x 3 mL of MeOH



Chromatographic Conditions:

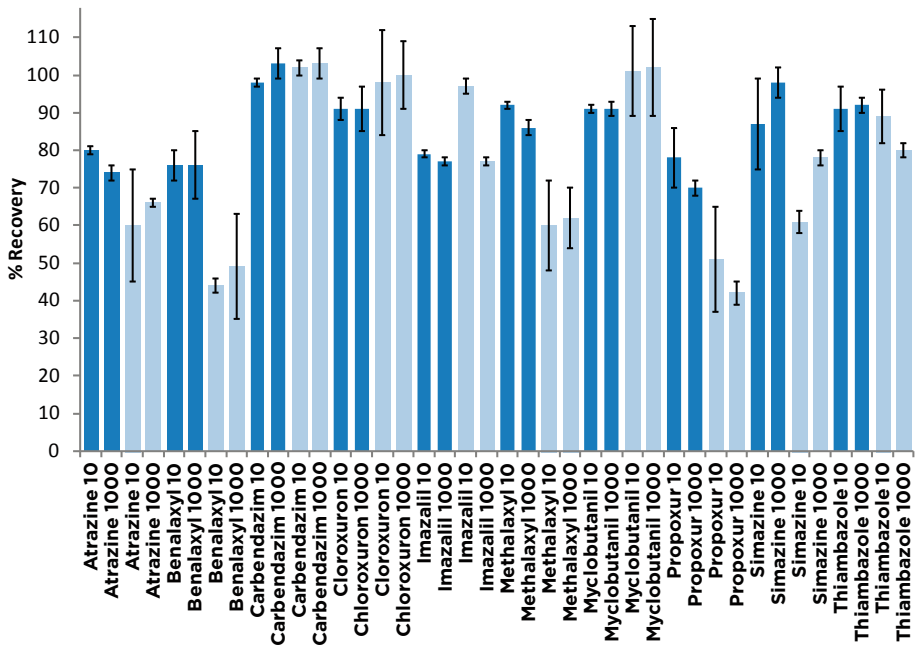
Column: SiliaChrom dt C18, 3 µm
Column Size: 3.0 x 30 mm
SiliCycle PN: H141803E-H030
Mobile Phase: MPA: 1 mM ammonium formate in (*10/90*) MeOH/H_2O, 0.1% formic acid (*v/v*)
MPB: 1 mM ammonium formate in (*90/10*) MeOH/H_2O, 0.1% formic acid (*v/v*)
Temperature: 23°C
Flow Rate: 0.800 mL/min
MS Splitting Flow: 0.300 mL/min
Detector: Sciex API 3000
Turbo Ion Spray Heater Gas Flow: 8,000 cc/min
Turbo Ion Spray Heater Temperature: 375°C, ESI^+, MRM
Injection Volume: 5 µL

Gradient & MRM Transition

Time (min)	MPA (%)	MPB (%)
0.00	100	0
10.00	0	100
10.01	100	0
12.00	100	0

Analyte	MRM Transition
Atrazine	216.1 → 174.1
Benalaxyl	326.2 → 148.2
Carbendazim	192.1 → 160.2
Chloroxuron	291.1 → 72.0
Imazalil	297.0 → 159.1
Methalaxyl	280.2 → 220.3
Myclobutanil	289.1 → 70.0
Propoxur	210.1 → 111.2
Simazine	202.1 → 174.2
Thiambazole	202.2 → 175.1

Recovery Results at 10 & 1,000 pg/mL (*n = 3*)



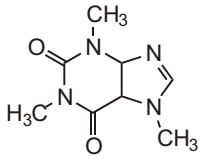
SiliaPrepX HLB
Waters Oasis® HLB

Forensic

Caffeine, Cotinine & Nicotine in Human Urine

SiliaPrepX HLB 3 mL/60 mg

SiliCycle PN: SPE-P0002-03BB



Caffeine

Sample Preparation

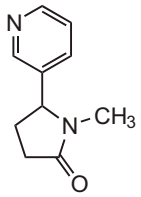
- Mix 500 µL of urine with 1.5 mL of NaOH 0.1 M

Conditioning Step

- 3 mL of MeOH and 3 mL of H_2O

Loading Step

- Pass 1 mL of the treated sample through the cartridge



Cotinine

Washing Step

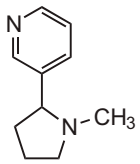
- 3 mL H_2O and dry the cartridge

Elution Step

- 3 mL of MeOH

Reconstitution Step

- Evaporate under a stream of nitrogen (*20 min at 40 °C*)
- Reconstitute with 1.5 mL (*80/20*) MeOH/H_2O (*v/v*)



Nicotine

Chromatographic Conditions:

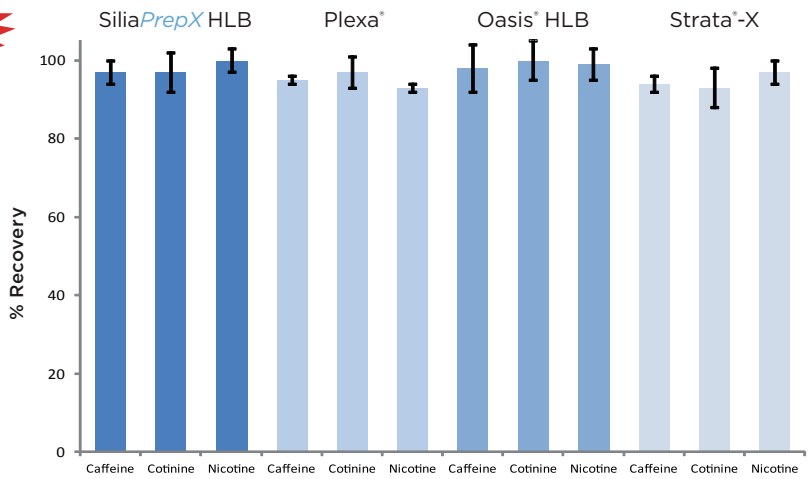
Column: SiliaChrom XT C18, 5 µm
Column Size: 4.6 x 50 mm
SiliCycle PN: H171805H-N050
Mobile Phase: MPA 1 mM ammonium formate in (*90/10*) MeOH/H_2O, 0.1% formic acid (*v/v*)
MPB 1 mM ammonium formate in (*10/90*) MeOH/H_2O, 0.1% formic acid (*v/v*)
Temperature: 23°C
MS Splitting Flow: 0.25 mL/min
Flow Rate: 1.000 mL/min
Detector: Sciex API 3000
Turbo Ion Spray Heater Gas Flow: 8,000 cc/min
Turbo Ion Spray Heater Temperature: 375° C, ESI^+, MRM SCAN
Injection Volume: 10 µL

Gradient		
Time (min)	MPA (%)	MPB (%)
0	75	25
1.25	75	25
1.26	10	90
2.50	10	90
2.51	100	0
3.00	100	0
3.01	0	100
5.00	0	100

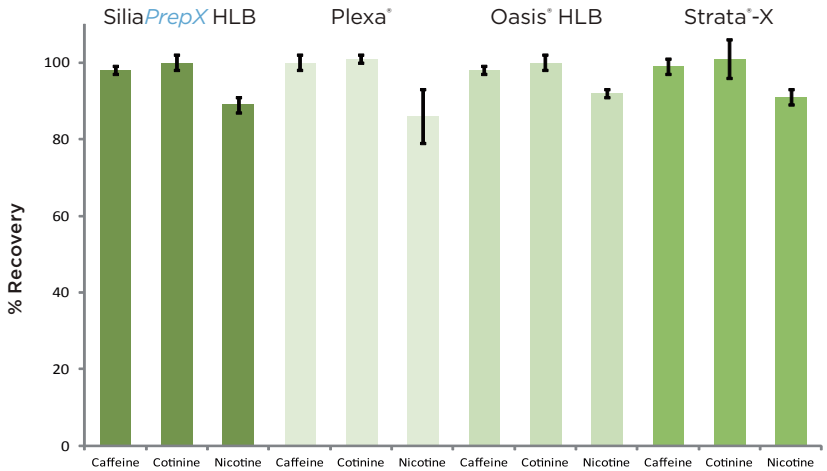
Caffeine, Cotinine & Nicotine in Human Urine (*con't*)

GREAT RECOVERY

Recovery Results 10 ng/mL (*n = 3*)



Recovery Results 100 ng/mL (*n = 3*)



LOW ION SUPPRESSION

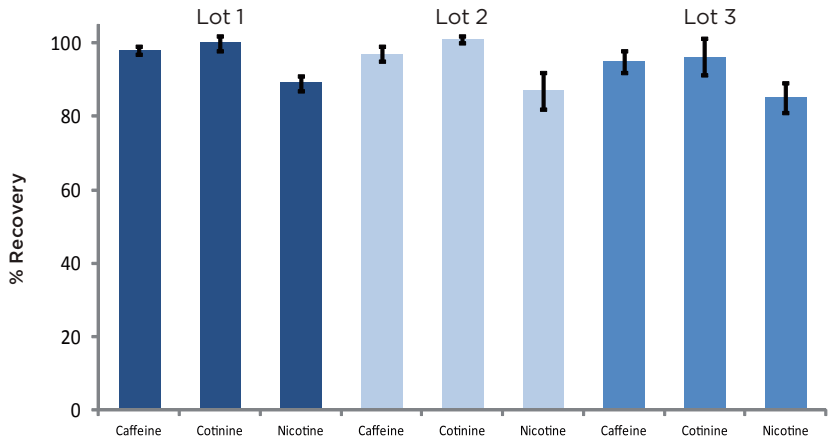
Ion Suppression Measured at 100 ng/mL (*n = 3*)

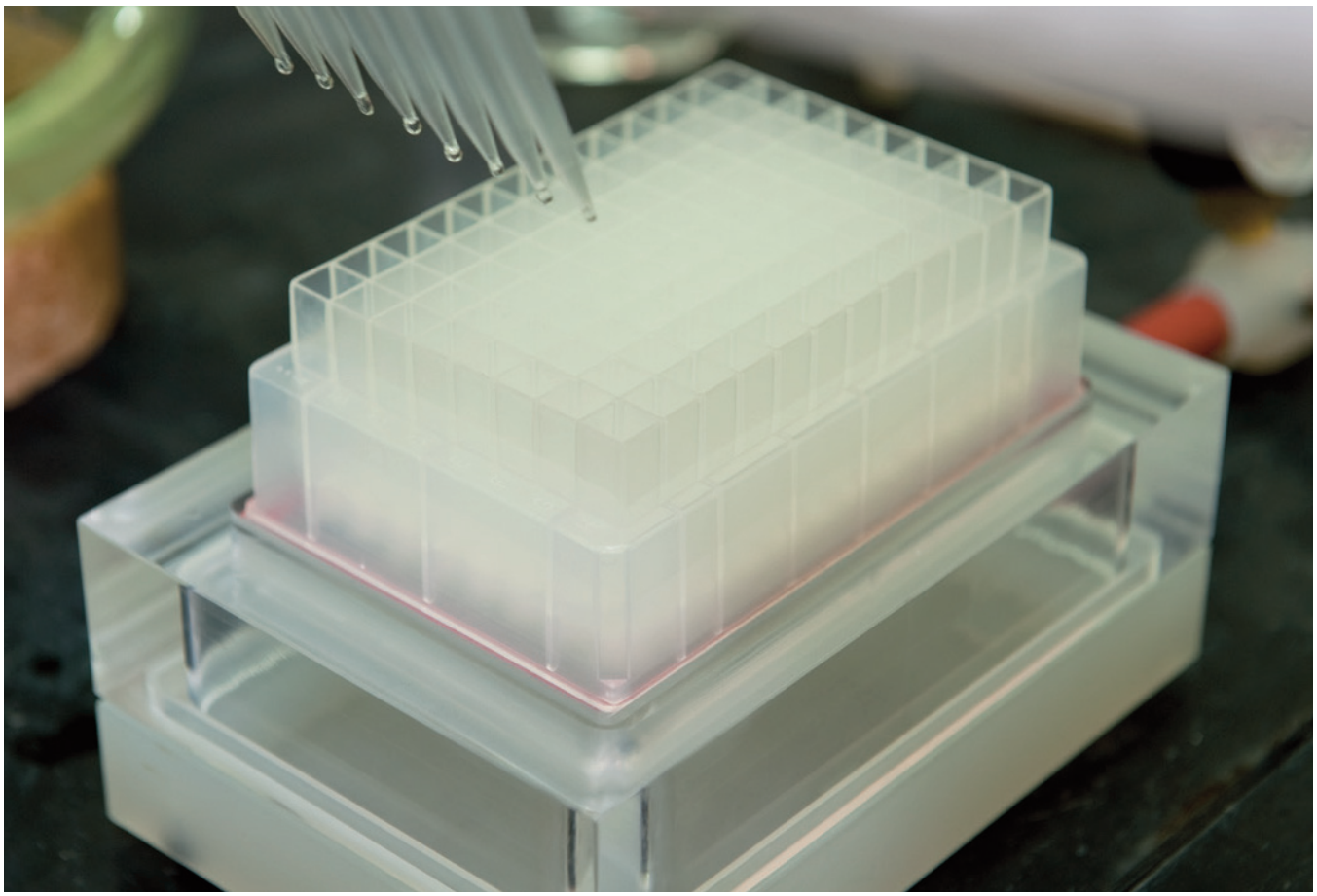
Compounds	SiliaPrepX HLB (%)	Plexa® (%)	Oasis® HLB (%)	Strata®-X (%)
Caffeine	-10	-10	-6	-6
Cotinine	-13	-13	-14	-14
Nicotine	8	9	8	8

Caffeine, Cotinine & Nicotine in Human Urine (*con't*)

SiliaPrepX HLB

Lot-to-lot Reproducibility 100 ng/mL (*n = 3*)

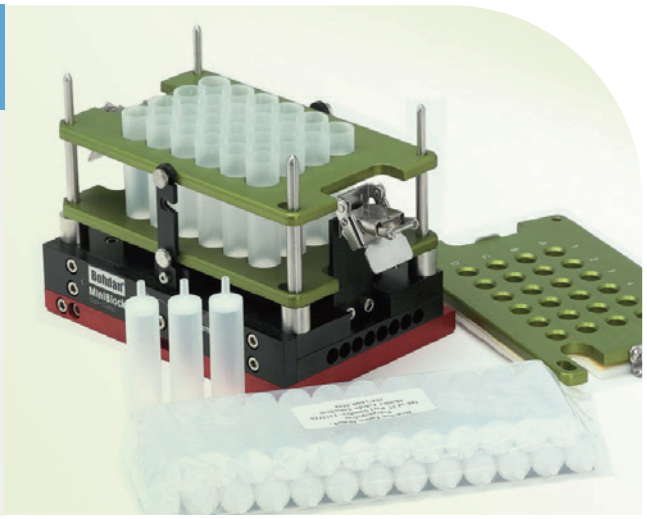




Silia*PrepMB*™ SPE for MiniBlock® Systems

SiliCycle Products and Mettler-Toledo MiniBlock - An Ideal Partnership

- The productivity enhancement of MiniBlock combined with the cutting-edge technology available from SiliCycle enable chemists to design reactions that eliminate tedious work-up and purification issues.
- The MiniBlock is compatible with the full range of SiliCycle products from the synthesis through the purification.
- SiliCycle has the exclusive distribution of the MiniBlock product line in North America.



Mettler-Toledo MiniBlock

The MiniBlock is an easy to use reaction block designed for parallel synthesis and screening. The unique valve body design of the MiniBlock enables processes where filtration is critical, including solid-phase organic synthesis, use of scavenger resins with solution phase synthesis and parallel purification via Solid-Phase Extraction (*SPE*).

MiniBlock Reactors

Patented reactor with built-in value design. Available in 48, 24, 12, and 6-position arrays for reaction vessel volumes respectively of 4mL, 10mL, 20mL and 40mL.

Shaking and Washing Station

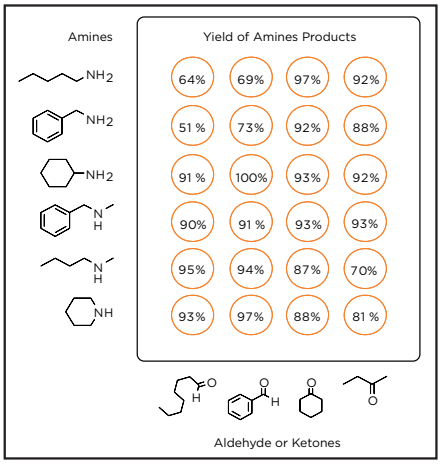
High performance orbital shaker with integrated basins for wash and rinse capability. Customized and configured to provide vigorous vortex mixing for up to 2 (*compact*) and 6 (*high capacity*) MiniBlocks.

Parallel Synthesis & Purification

MiniBlock is ideal for parallel synthesis and post-reaction cleanup using Silia*PrepMB* SPE prepacked with either our chromatographic and ion exchange phases, our silica-supported reagents and catalysts, or our metal or organic scavengers. This is achieved by transferring reaction products from one block to a second MiniBlock or by passing through an SPE filter plate.

Webinar on Applications Developed by SiliCycle

Reductive Amination

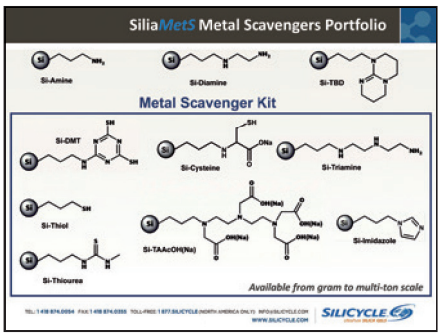


A library of 24 amines (secondary and tertiary) was synthesized in parallel using a Silia*Bond* Cyanoborohydride reagent. The reductive amination reaction produced the desired products through screening reaction conditions in parallel (time of reaction, solvents) and improved yields from minimal effort. In addition workup was also minimized and performed in parallel via filtration of the reaction mixtures.

Carbon-Carbon Coupling Reactions

Carbon-carbon coupling reactions have generated a lot of interest over the past few years to make novel structures and expand the possibilities that chemists have at their disposal. This webinar will present results from Suzuki, Sonogashira, and Heck coupling reactions run in parallel using novel Silia*Cat* heterogeneous catalysts for screening and library generation.

Metal Scavenging



SiliaMetS Metal Scavengers are known as an efficient solution for removing residual trace metals within valuable materials, such as Active Pharmaceutical Ingredients (APIs). Metal scavenging results depend on quite a few parameters such as: temperature, nature of the catalyst, solvent, etc. MiniBlock can be used in conjunction with SiliaMetS Metal Scavengers to quickly determine the most efficient conditions with limited time and resources.

Note: Scan QR Codes to view the full webinar hosted by Mettler-Toledo.

All SiliCycle Silia*Bond* Functionalized Silica Gels, Silia*MetS* Metal Scavengers & Silia*Cat* Heterogeneous Catalysts are available in prepacked Silia*PrepMB* SPE Cartridges in two different formats (*4.5 mL and 10.0 mL, rimless*).

*Contact us for ordering your Silia*PrepMB* products or to get more details.

SiliaPrep™ Accessories

SiliaPrep Accessories; the #1 solution to simplify your solid-phase extractions.

- Great complement to our SiliaPrep & SiliaPrepX SPE Cartridges and Well Plates products.
- Wide variety of accessories available to increase your productivity therby save time and money.

Maximize your Productivity with SiliaPrep Accessories

SiliCycle offers various accessories for SPE Cartridges and Well Plates to simplify method development and expedite highthroughput analysis.

SiliaPrep Adapters

Enable cartridge stacking or easy SPE cartridge connection with syringe or gas lines (*for positive pressure*).

AUT-0172 SiliaPrep Adapter for 1, 3, 6 & 12 mL SPE (*10/box*)

AUT-0173 SiliaPrep Adapter for 25 & 60 mL SPE (*10/box*)

AUT-0172

AUT-0173

SiliaPrep Vacuum Adapters

Fast, user friendly, and economical adapters for SPE cartridges. Only a vacuum source is needed.

SiliaPrep Vacuum Adapter - Flasks

Joint	PN	Description
20/40	AUT-0043	20/40 - SiliaPrep Vacuum Adapter
19/22	AUT-0044	19/22 - SiliaPrep Vacuum Adapter
14/22	AUT-0045	14/22 - SiliaPrep Vacuum Adapter

Note: One unit per box.

SiliaPrep Vacuum Adapter - Screw Thread Vials

Thread	PN	Description
22/400	AUT-0046	22/400 Vial - SiliaPrep Vacuum Adapter Without Vial Connector
22/400	AUT-0047	22/400 Vial - SiliaPrep Vacuum Adapter With Vial Connector

Note: One unit per box.

AUT-0043

AUT-0044

AUT-0045

AUT-0046

AUT-0047

SiliaPrep Empty Tubes

Looking to pack your own SPE cartridges using our bulk sorbent, use our SiliaPrep Empty Tubes with frits for this purpose.

SiliaPrep Empty Tubes	
Formats	Description
SIM-0007-001	Empty 1 mL SPE tube with 2 frits (*100/box*)
SIM-0008-003	Empty 3 mL SPE tube with 2 frits (*100/box*)
SIM-0002-006	Empty 6 mL SPE tube with 2 frits (*100/box*)
SIM-0003-012	Empty 12 mL SPE tube with 2 frits (*100/box*)
SIM-0004-020	Empty 25 mL SPE tube with 2 frits (*100/box*)
SIM-0006-060	Empty 60 mL SPE tube with 2 frits (*100/box*)
SIM-0009-150	Empty 150 mL SPE tube with 2 frits (*20/box*)

SiliaPrep SPE Vacuum Manifolds

Run multiple samples simultaneously with a controlled flow rate for higher reproducibility with SiliaPrep SPE Vacuum Manifolds. These manifolds are available in 12, 16 and 24 position configurations and allow consistent extraction and no possibility of cross-contamination from one sample to another.

The design consists in a clair glass chamber equipped with replacable individual stopcocks (*also known as control valves*) and solvent guide needles. The adjustable racks allow the use of a wide variety of collection vessels including 13 and 16 mm test tubes, autosampler & scintillations vials, volumetric and Erlenmeyer flasks.

Simply apply a vacuum source to elute sample through a cartridge or a disk directly to the collection vessel of choice.

Complete Set Includes

- Glass chamber, vacuum gauge & bleed valve
- Cover, gasket, male and female luer fittings
- Individual stopcocks and needles
- Collection racks (*6*) wih supporting legs, retaining clips, shelves and posts

SiliaPrep SPE Vacuum Manifolds (*complete set*)	
Product Number	Description
AUT-0128-12	SiliaPrep SPE Vacuum Manifold - 12 positions
AUT-0128-16	SiliaPrep SPE Vacuum Manifold - 16 positions
AUT-0129-24	SiliaPrep SPE Vacuum Manifold - 24 positions

SiliaPrep Flash Cartridge Vacuum Manifold

The latest addition to our SPE manifold portfolio is the SiliaPrep Flash Cartridge Vacuum Manifold for large volume samples. This 10 ports manifold can handle 150 mL flash column and collection vessel up to 15 cm long. The complete set comes with the same equipment as the SiliaPrep SPE Vacuum Manifold excepts that it has only four collection racks.

NEW

SiliaPrep Flash Cartridge Vacuum Manifold (*complete set*)	
Product Number	Description
AUT-0130-10	SiliaPrep Flash Cartridge Vacuum Manifold - 10 positions

Silia*Prep* Vacuum Manifold Accessories

NEW

Various replacement parts are available for each Silia*Prep* Vacuum Manifold offers by SiliCycle.

Silia*Prep* Vacuum Manifold Accessories				
Description	10 positions Vacuum Manifold	12 positions Vacuum Manifold	16 positions Vacuum Manifold	24 positions Vacuum Manifold
Silia*Prep* Vacuum Manifold Complete Set	AUT-0130-10 *(1/box)*	AUT-0128-12 *(1/box)*	AUT-0128-16 *(1/box)*	AUT-0129-24 *(1/box)*
Glass Chamber [Dimensions: Length x Width x Heigh]	AUT 0162 *(1/box)* [12" x 5.25" x 12"]	AUT-0163 *(1/box)* [7" x 5.25" x 7"]	AUT-0184 *(1/box)* [12" x 5.25" x 7"]	AUT-0185 *(1/box)* [12" x 5.25" x 7"]
Vacuum Gauge, Valve & Glass Chamber Kit	AUT-0186 *(1/box)*	AUT-0187 *(1/box)*	AUT-0188 *(1/box)*	AUT-0189 *(1/box)*
Top Cover Gasket	AUT-0190 *(2/box)*	AUT-0174 *(2/box)*	AUT-0175 *(2/box)*	AUT-0193 *(2/box)*
Polypropylene Stopcocks	AUT-0194 *(10/box)*	AUT-0146 *(12/box)*	AUT-0195 *(16/box)*	AUT-0147 *(24/box)*
Teflon® Stopcocks	AUT-0149-25 *(25/box)* or AUT-0149-50 *(50/box)*			
Polypropylene Needles	AUT- 0196 *(10/box)*	AUT-0154 *(12/box)*	AUT-0197 *(16/box)*	AUT-0155 *(24/box)*
Stainless Steel Needles	AUT-0198 *(10/box)*	AUT-0178 *(12/box)*	AUT-0199 *(16/box)*	AUT-0179 *(24/box)*
Teflon® Needles	AUT-0200 *(100/box)*			
Collection Racks Kit (*supporting legs, retaining clips, shelves and posts included*)	AUT-0201 *(1/box)*	AUT-0202 *(1/box)*	AUT-0203 *(1/box)*	AUT-0204 *(1/box)*
Plate for 13 mm Test Tubes	-	AUT-0205 *(1/box)*	AUT-0206 *(1/box)*	AUT-0207 *(1/box)*
Plate for 16 mm Test Tubes	-	AUT-0208 *(1/box)*	AUT-0209 *(1/box)*	AUT-0210 *(1/box)*
Plate for 19 mm Test Tubes	AUT-0211 *(1/box)*	-	-	-
Plate for 25 mm Test Tubes	AUT-0212 *(1/box)*	-	-	-
Plate for Autosampler Vials	-	AUT-0213 *(1/box)*	-	-
Plate for Volumetric Flasks	AUT-0214 *(1/box)*	-	-	-

Silia*Prep* Waste Containers

Disposable solvent resistant polypropylene containers are available for the 12 port manifolds. These waste containers greatly simplify sample preparation, solvent disposal and clean-up. Depending on the nature of the solvent used, the waste container can be reused many times prior to discarding.

AUT-0176 *(10/box)*

Silia*Prep* Drying Manifold Covers

Silia*Prep* Drying Manifold Covers can be used to concentrate samples with a flow of air or gaz (*nitrogen*). These covers are available for the 12, 16 and 24 ports vacuum manifolds.

Silia*Prep* Drying Manifold Covers *(1/box)*	
Product Number	Description
AUT-0215-12	Silia*Prep* Drying Manifold Cover - 12 positions
AUT-0215-16	Silia*Prep* Drying Manifold Cover - 16 positions
AUT-0215-24	Silia*Prep* Drying Manifold Cover - 24 positions

AUT-0215-12

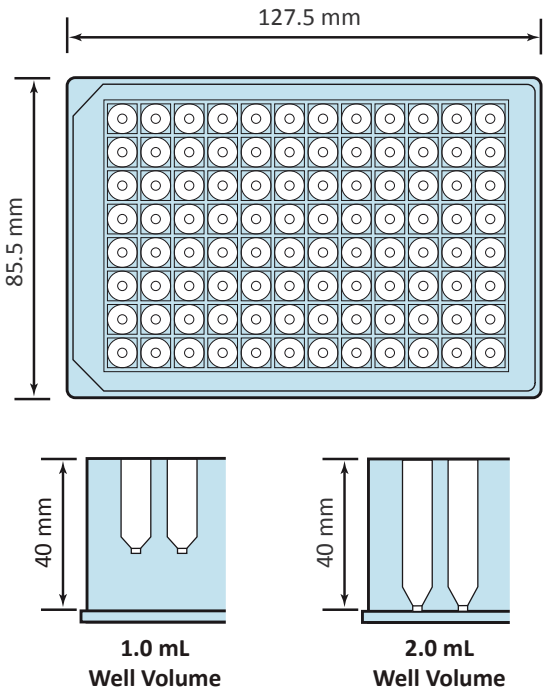
SiliaPrep 96-Well Collection Plates

NEW

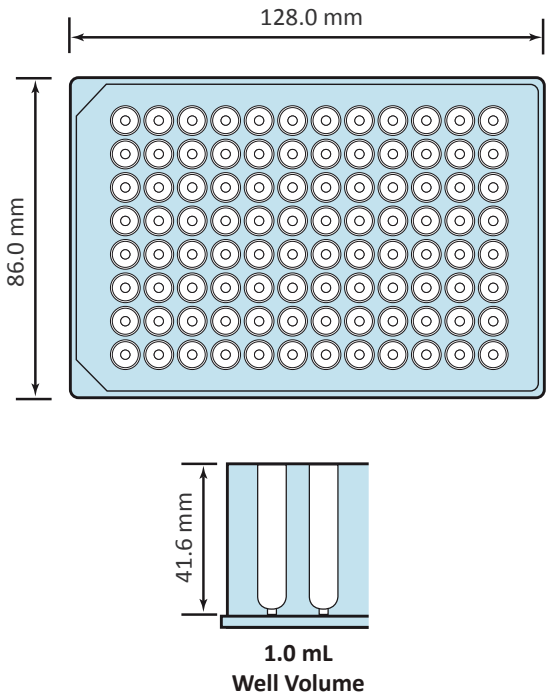
SiliCycle offers SiliaPrep 96-Well Collection Plates made from polypropylene with extremly low extractable levels. These collection plates are available with square deep shape in both 1.0 mL and 2.0 mL well volume and with round bottom in 1 mL only. Cap mats are available for all these collection plates (*See page 50 for more details*).

SiliaPrep 96-Well Collection Plates	
Product Number	Description
96W-0009	SiliaPrep 96 Well Collection Plate Square Bottom, 2 mL (*50/box*)
96W-0010	SiliaPrep 96 Well Collection Plate Square Bottom, 1 mL (*50/box*)
96W-0011	SiliaPrep 96 Well Collection Plate Round Bottom, 1 mL (*50/box*)

96-Well Collection Plates Square Shape



96-Well Collection Plates Round Shape



SiliaPrep Disposable Reservoir Trays for 96-Well Plates

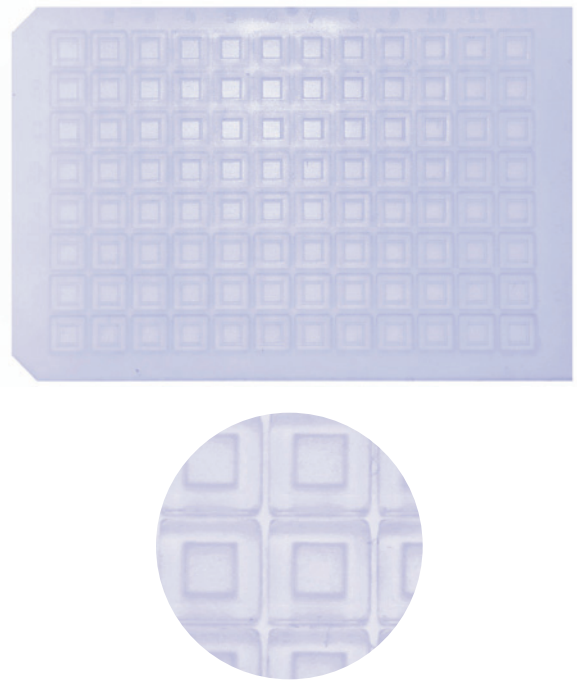
SiliCycle offers SiliaPrep Disposable Reservoir Trays to collect waste solvents used during activation, loading and washing steps. These disposable trays are made in PVC and are compatible with all manifolds used with well plates.

SiliaPrep Disposable Reservoir Trays	
Product Number	Description
96M-0012	SiliaPrep Disposable Reservoir Trays (*25/box*)

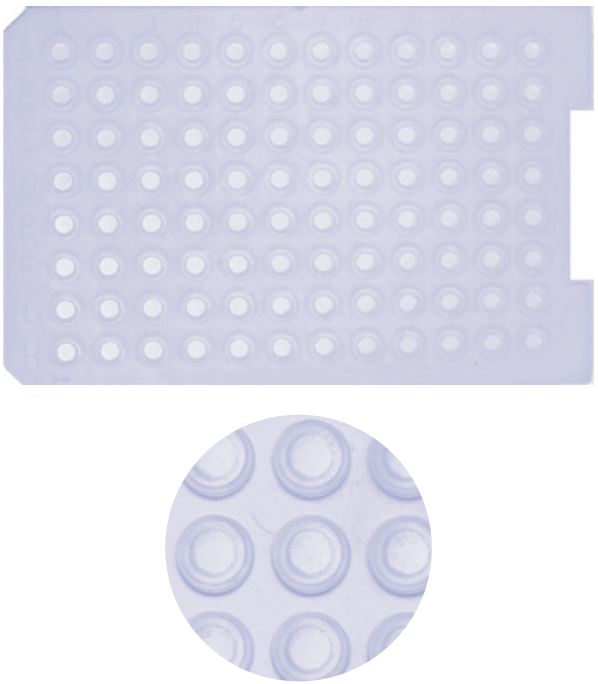
Silia*Prep* 96-Well Plate Cap Mats

NEW

SiliCycle offers Silia*Prep* 96-Well Plate Cap Mats compatible with most 96-Well Plate available on the market. These cap mats are made from a premium silicone quality with a PTFE coating for ultra low bleed. Slit and 384 well plate cap mats are available under request. Contact us for more details.



Silia*Prep* 96 Well Plate Square Silicone/PTFE Cap Mats



Silia*Prep* 96 Well Plate Round Silicone/PTFE Cap Mats

Silia*Prep* 96-Well Plate Cap Mats Ordering Information

Silia*Prep* 96-Well Plate Cap Mats			
Well Shape	Quantity per box	Product Number	Description
Square	5 / box	96M-0001S	Silia*Prep* 96-Well Plate Square Silicone/PTFE Cap Mats (*use with 96W-0009 & 96W-0010 collection plate*)
	25 / box	96M-0001S-25	
	50 / box	96M-0001S-50	
	100 / box	96M-0001S-100	
Round	5 / box	96M-0001R	Silia*Prep* 96-Well Plate Round Silicone/PTFE Cap Mats (*use with 96W-0011 collection plate*)
	25 / box	96M-0001R-25	
	50 / box	96M-0001R-50	
	100 / box	96M-0001R-100	

* Contact us if you are looking for a cap mat not listed inside this table.

SiliaPrep Phase Separator Cartridges

NEW

SiliCycle offers SiliaPrep Phase Separator Cartridges to separate aqueous phase from chlorinated solvents under gravity. These ready-to-use cartridges are fitted with a proprietary hydrophobic frit and are a great alternative to liquid-liquid extraction, the most popular technique to do this separation. However, this last method is time consuming, requires the use of a glass funnel which needs to be washed between each separate extraction and is not suitable for multiple extractions. SiliaPrep Phase Separator Cartridges solve these drawbacks and offer many advantages such as:

Why choose SiliaPrep Phase Separator Cartridges

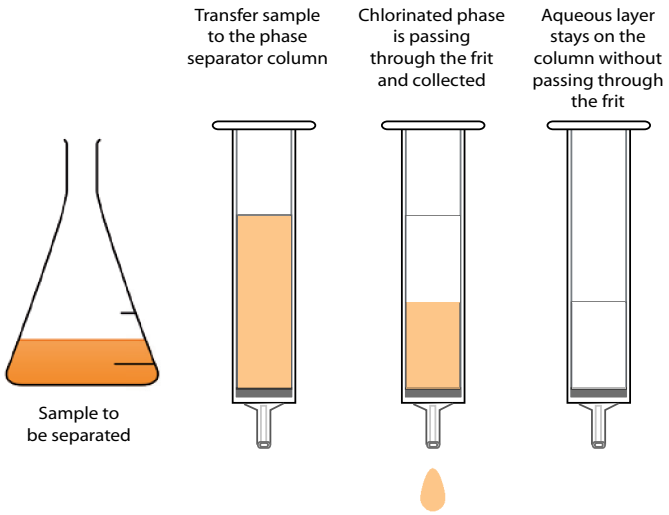
- Ease of use
- Efficient and cost saving
- Comply with "Green Chemistry" philosophy
- Compatible with automated systems

SiliaPrep Phase Separator Cartridges

Product Number	Description
PS-012	SiliaPrep Phase Separator Column 12 mL (*100/box*)
PS-060	SiliaPrep Phase Separator Column 60 mL (*50/box*)
PS-150	SiliaPrep Phase Separator Column 150 mL (*25/box*)

Typical Experimental Procedure

1. Select the appropriate size of SiliaPrep Phase Separator Cartridge to hold the entire sample volume (*both aqueous and chlorinated phases*).
2. Connect the SiliaPrep Phase Separator Cartridge on a vacuum manifold. Ensure the collection vessel volume is sufficient enough to recuperate entirely the organic layer.
   (*Note: Do not connect the manifold to a vacuum source.*)
3. Transfer the sample mixture to be separated on the top of the SiliaPrep Phase Separator Cartridge.
4. After a few seconds (*under gravity*), the water immiscible chlorinated solvent will start to pass through the frit and is collected in the suitable vial already placed inside the manifold.
5. The proprietary frit used in the SiliaPrep Phase Separator Cartridge allows the aqueous layer to be left on the column for at least 48 hours without passing through the frit.



SiliaPrep Phase Separator Typical Experimental Procedure

Important Advices

- **Process under gravity only - Do not apply vacuum or positive pressure**
  The SiliaPrep Phase Separator Cartridges are designed to be used under gravity only. The use of vacuum or positive pressure source can yield to a lost in the separation efficiency.
- **Biphasic or two phase system required**
  The sample to be separated needs to contain water and a water immiscible solvent with **greater** density then water to form the lower layer. Most common solvents are dichloromethane, chloroform and chlorinated solvents. Furthermore, try to minimize the presence of water miscible solvent (*i.e. methanol, ethanol or acetone*) which can cause problem to obtain a real biphasic system and consequently, the phase separator may not work effectively.

* *To obtain a most efficient compound partition between the aqueous and the organic layer, a liquid-liquid extraction can be done prior to use the phase separator column.*

SiliaPrep™ Tips Micro-SPE Cartridges

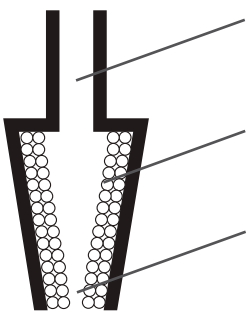
Using SiliaPrep Tips Micro-SPE Cartridges guarantees the following benefits:

- Simple, fast analyte retention & elution with a minimal loss.
- Sorbents are directly embedded on inner cartridge wall which reduces the risk of contamination.
- Exceptional binding capacity.
- No back-pressure.

SiliaPrep Tips for Micro Sample Preparation

SiliaPrep Tips Micro-SPE Cartridges are designed for micro-purification and micro-extraction of femtomole (*fmol*) to picomole (*pmol*) quantities of analytes prior to the analysis by mass spectrometric and/or chromatographic techniques. The constant improvement of these techniques of analysis has allowed scientists to decrease the limit of quantification of several applications. This lower limit has pushed SPE manufacturers to design new SPE cartridges accepting small volumes of analytes.

These Tips are specially designed to achieve extraction and purification of small molecules, peptides, phosphopeptides and proteins. SiliaPrep Tips Micro-SPE Cartridges are available in 3 different cartridge formats based on the binding capacity of each embedded sorbent. They are packed with our SiliaBond functionalized silica gels and specialty phases to cover the broadest spectrum of applications requiring small volume of analytes. The SiliaBond phases are embedded directly in the inner surface of the tip to provide consistent flow rates. Finally, no glue has been used during the packing procedure in order to prevent any contamination of the analyte.



A Flow Through Channel:
Eliminates back-pressure.

B Sorbent:
Sorbent is embedded without any glue or presence of binding polymer.

C Modified Pipette Tip
Easy to fill and release the sample.

SiliaPrep Tips General Experimental Procedure

The following lines present the general experimental procedure for the purification and enrichment of small molecules, peptides and proteins using SiliaPrep Tips Micro-SPE Cartridges.

Conditionning Step:

Attach the SiliaPrep Tips to a micropipette and aspirate/expel 5 times the elution solution and 3 times the binding solution.

A) Loading Step:

Aspirate/expel 20 to 50 times the sample to allow the compounds to adsorb to the sorbent.

B) Washing Step:

Aspirate/expel 10 times the binding solution and discard the expelled solution each time.

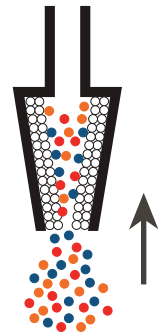
C) Elution Step:

Aspirate/expel 10 times the elution solution and collect the expelled solution in a suitable clean tube. Repeat with a fresh portion of elution solution if you want to be sure to collect all of the adsorbed compounds. (*Note : repeat 3-5 times for the carbon black sorbent.*)

Binding Solution:
0.1% formic acid or 0.05% trifluoroacetic acid (*TFA*).

Elution Solution:
0.1% formic acid or 0.05% trifluoroacetic acid (*TFA*) plus ±60% of acetonitrile, propanol or methanol depending on the compound polarities.

A) Loading Step



B) Washing Step

C) Elution Step

SiliaPrep Tips Micro-SPE Cartridges Specifications

Tip Volume (µL)	Sample Volume (µL)	Binding Capacity (µg)	Sorbent Weight (µg)
1 - 10	0.5 - 10	1	30
10 - 200	2 - 25	2.5	75
10 - 200	5 - 50	15	400

Silia*Prep* Tips Sorbent Descriptions

Bio-Pharma Pharmaceutical

The table below presents the sorbent descriptions and characteristics available for Silia*Prep* Tips Micro-SPE Cartridges.

Silia*Prep* Tips Sorbent Descriptions and Ordering Information

Silia*Prep* Tips Sorbent	Description	Tip Formats (µL/µg)	Binding Capacity (µg)	Tips/box	Product Number
C18	This phase presents the highest hydrophobic character of the Silia*Prep* Tips sorbent mainly used for small peptides or protein purification, enrichment or desalting analysis.	10 / 30	1	96	SPET-C18-T1
		200 / 75	2.5	96	SPET-C18-T2
		200 / 400	15	96	SPET-C18-T3
C8	The C8 phase is the mid-level hydrophobic sorbent of the reversed-phase family. This phase is mainly used for the sample treatment of proteins and peptides requiring a lower hydrophobic capacity then the C18 sorbent.	10 / 30	1	96	SPET-C8-T1
		200 / 75	2.5	96	SPET-C8-T2
		200 / 400	15	96	SPET-C8-T3
C4	The C4 phase presents the lowest hydrophobic character of the Silia*Prep* Tips sorbent mainly used for protein purification, enrichment or desalting analysis.	10 / 30	1	96	SPET-C4-T1
		200 / 75	2.5	96	SPET-C4-T2
		200 / 400	15	96	SPET-C4-T3
Carbon Black	The carbon black sorbent presents both a hydrophilic and hydrophobic character. This phase is mainly used for purification of oligosaccharides and other macromolecules containing sugar moities.	10 / 30	1	96	SPET-CB-T1
		200 / 75	2.5	96	SPET-CB-T2
		200 / 400	15	96	SPET-CB-T3
TiO_2	The TiO_2 sorbent is mainly used for phosphopeptide enrichment and presents high selectivity for multiple phosphylated peptides.	10 / 30	1	96	SPET-TI-T1
		200 / 75	2.5	96	SPET-TI-T2
		200 / 400	15	96	SPET-TI-T3
ZrO_2	The ZrO_2 sorbent is mainly used for phosphopeptide enrichment and presents high selectivity for mono-phosphylated peptides.	10 / 30	1	96	SPET-ZR-T1
		200 / 75	2.5	96	SPET-ZR-T2
		200 / 400	15	96	SPET-ZR-T3
TiO_2/ ZrO_2	The litterature suggests only 30% overlap in phosphopeptides isolated by TiO_2 versus ZrO_2. The ZrO_2-TiO_2 sorbent is an excellent alternative for the enrichment of a broad spectrum of phosphopeptides.	10 / 30	1	96	SPET-TIZR-T1
		200 / 75	2.5	96	SPET-TIZR-T2
		200 / 400	15	96	SPET-TIZR-T3

SiliaQuick™
QuEChERS

Greyhound Chromatography and Allied Chemicals
6 Kelvin Park, Birkenhead, Merseyside CH41 1LT United Kingdom
Tel: +44 (0)151 649 4000 Fax: +44 (0)151 649 4001
sales@greyhoundchrom.com

www.greyhoundchrom.com

SiliaQuick™ QuEChERS

Food Environment

Using Silia*Prep* QuEChERS ensures the following benefits:

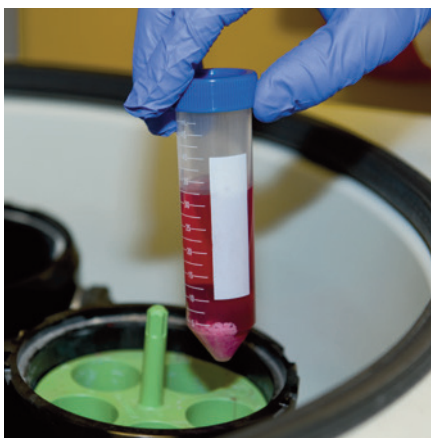
- Clean extracts from pure products.
- High recovery and lot-to-lot reproducibility.
- Great variety of QuEChERS to cover the full spectrum of food applications.
- Reduction of analysis cost.

SiliaQuick QuEChERS for Pesticide Residue Analysis

The QuEChERS technique was developed in 2003 by USDA 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. The QuEChERS method has gained in popularity to become the most valuable alternative for the determination of traces of analytes in a high throughput environment. Presently, scientists have expanded the use of this method to the analysis of a vast array of pesticides, herbicides, fungicides and other compounds present in all food and beverage matrices.

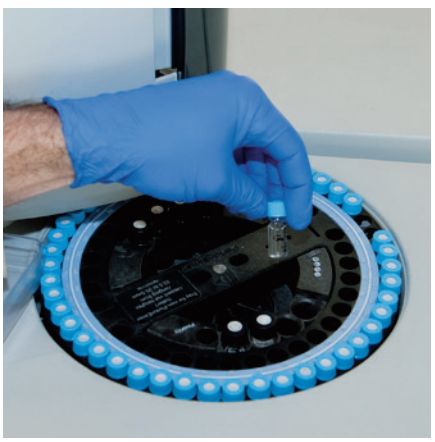
The QuEChERS technique can be summarized as a three-step methodology, starting with a liquid extraction, followed by a dispersive solid-phase extraction clean-up, and completed by a LC or GC analysis. The first step is to carry out the extraction of compounds of interest from food or beverage matrices through a solvent (*acetonitrile*). The dispersive solid-phase extraction clean-up is designed to remove specific undesired compounds such as sugars, lipids, organic acids, proteins, pigments and excess water from the final solution. The analysis step consists of a simple injection into a LC-MS/MS or GC-MS instrument to determine the analyte recovery.

Step 1
Liquid Extraction



Step 2
Dispersive SPE Clean-up

Step 3
LC or GC Analysis



SiliaQuick QuEChERS for Food Sample Treatments

SiliaQuick QuEChERS are designed to ensure the ultimate performance in pesticide analysis.

Quick: Pre-packed liquid extraction kits and dispersive solid-phase extraction clean-up kits contain the right amount of salts and/or sorbents to suit the specific food matrices, hence eliminating the sample preparation measurement step.

Cheap: No specialized equipment or glassware is required to achieve the pesticide residue analysis.

Effective: General procedure for all food and beverage matrices allowing a significant reduction of the analysis cost.

Rugged: Useful for the treatment of complex food matrices such as fish, meat or nuts without the requirement of additional treatments.

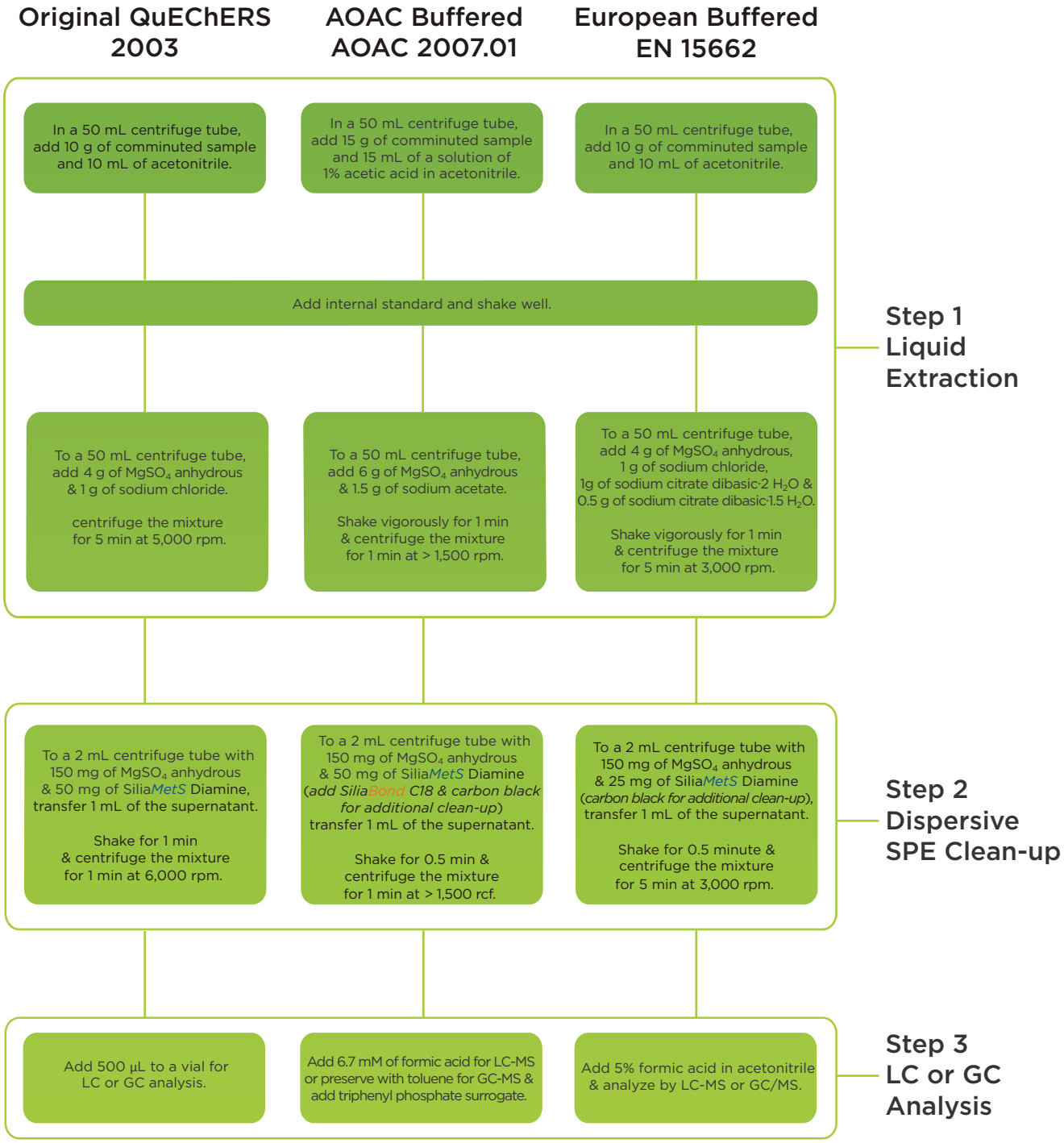
Safe: Limited time of contact with dangerous compounds and solvents.

Extraction and Dispersive Reagents

The following table presents each extraction and dispersive reagent and their specific functions in the QuEChERS technique.

Extraction and Dispersive Reagents	
Extraction Reagents	**Specific Function**
Magnesium Sulfate Anhydrous ($MgSO_4$)	Facilitates solvent partitioning.
Acetic Acid	Used for pH adjustment.
Acetonitrile	Solvent providing the best characteristics for extracting a wide variety of pesticides. Amenable for both LC and GC analysis.
Buffers	Maintain optimal pH and prevent pH degradation of sensitive analytes.
Sodium Chloride (NaCl)	Limits the amount of polar interferences.
Dispersive Reagents	**Specific Function**
SiliaMetS Diamine	Removes sugars, fatty acids, organic acids, lipids, and some pigments. Sterols and additional lipids can also be removed in combination with SiliaBond C18.
SiliaBond Amine	Removes sugars and fatty acids as well as the SiliaMetS Diamine but is less likely to catalyze degradation of base sensitive analytes.
SiliaBond C18	Removes long chain, non-polar compounds, and sterols.
Carbon Black	Removes pigments, polyphenols, and other polar compounds.
Magnesium Sulfate Anhydrous ($MgSO_4$)	Removes residual water from the organic phase.

Schematic Flow Chart of the Most Used QuEChERS Technique



How to Choose the Proper Silia*Quick* QuEChERS Kit

Step 1: For Liquid Extraction

The table below presents the Silia*Quick* QuEChERS liquid extraction kits specially pre-packed with anhydrous salts and/or sorbents to suit the QuEChERS technique of your choice.

Silia*Prep* QuEChERS Liquid Extraction Kits			
QuEChERS Method	Content	Units/box	Product Number without 50 mL Tube
Original QuEChERS	4 g magnesium sulfate anhydrous 1 g sodium chloride	100	QE-0001-50T
Buffered AOAC 2007.01	6 g magnesium sulfate anhydrous 1.5 g sodium acetate	100	QE-0002-50T
Buffered EN 15662	4 g magnesium sulfate anhydrous 1 g sodium chloride 1.5 g sodium citrate dibasic sesquihydrate 0.5 g sodium citrate tribasic dihydrate	100	QE-0003-50T

Silia*Quick* QuEChERS Troubleshooting

Poor recovery of pesticide compounds:

- Each sample has to be at the minimum 80% hydrated to perform optimal liquid extraction.
- For base sensitive compounds use buffered method.
- Always mix the sample with the solvent first to reduce the exothermic reaction between the magnesium sulfate and water.
- Add an analyte protector like toluene or sorbitol to prevent loss of thermally unstable pesticides in the GC inlet.
- Add formic acid after the dispersive SPE clean-up step to limit the degradation of base sensitive compounds prior the LC analysis.

Step 2: For Dispersive Solid-Phase Extraction Clean-Up

The following table presents the Silia*Quick* QuEChERS dispersive solid-phase extraction clean-up kits to match your food matrices. It is recommended to use the 2 mL dispersive tube for an extract volume of 1 mL and the 15 mL dispersive tube for extract volumes higher than 3 mL.

Silia*Quick* QuEChERS Dispersive Solid-Phase Extraction Kits

Matrix	Method	Tube (mL)	Units/ box	Content (mg)				Product Number
				$MgSO_4$	PSA	CB	C18	
General Fruits & Vegetables	AOAC 2007.01	2	100	150	50	-	-	QD-1000-2T
	EN 15662	2	100	150	25	-	-	QD-1001-2T
	AOAC 2007.01	15	50	1,200	400	-	-	QD-2000-15T
	EN 15662	15	50	900	150	-	-	QD-2001-15T
Pigmented Fruits & Vegetables	AOAC 2007.01	2	100	150	50	50	-	QD-1002-2T
	EN 15662	2	100	150	25	2.5	-	QD-1003-2T
	AOAC 2007.01	15	50	1,200	400	400	-	QD-2002-15T
	EN 15662	15	50	900	150	15	-	QD-2003-15T
Highly Pigmented & Fatty Fruits and Vegetables	AOAC 2007.01	2	100	150	50	50	50	QD-1004-2T
	EN 15662	2	100	150	25	7.5		QD-1005-2T
	AOAC 2007.01	15	50	1,200	400	400	400	QD-2004-15T
	EN 15662	15	50	900	150	45		QD-2005 -15T
Fatty and Waxed Fruits & Vegetables	AOAC 2007.01	2	100	150	50	-	50	QD-1006-2T
	EN 15662	2	100	150	25	-	25	QD-1007-2T
	AOAC 2007.01	15	50	1,200	400	-	400	QD-2006-15T
	EN 15662	15	50	900	150	-	150	QD-2007-15T

$MgSO_4$ = Magnesium sulfate anhydrous, PSA = Silia*MetS* Diamine, CB = Carbon Black, and C18 = Silia*Bond* C18

Choose your Silia*Quick* QuEChERS Dispersive SPE Clean-Up Kit by Food Type

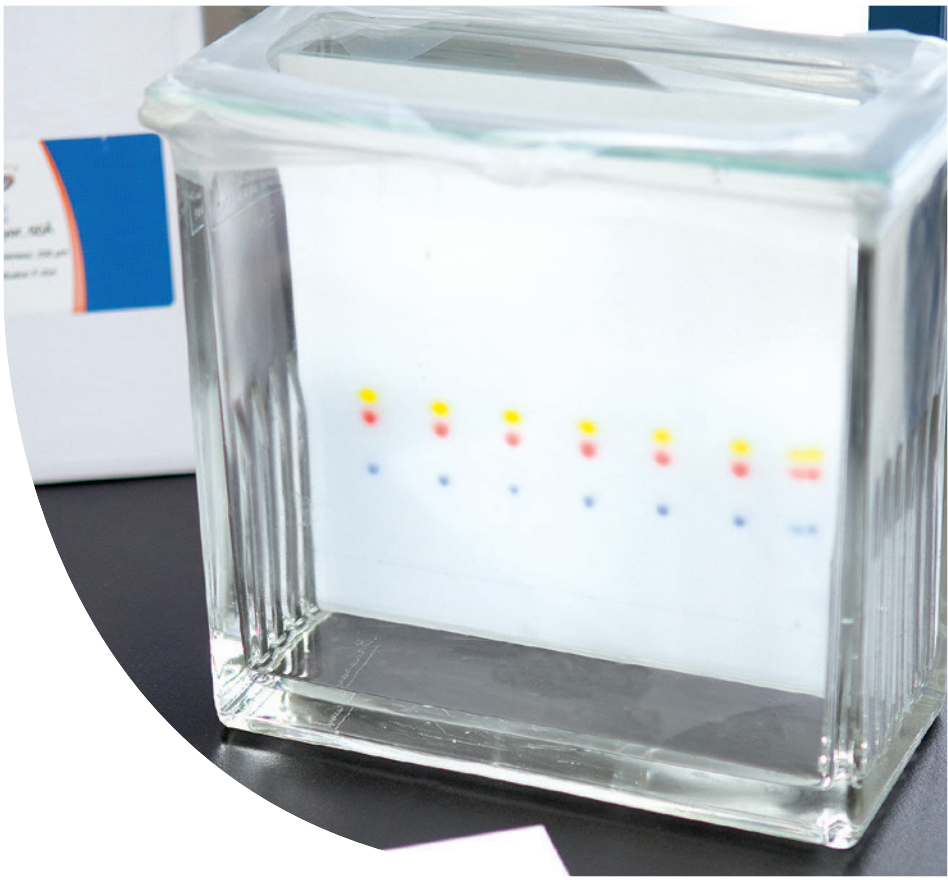
The Silia*Quick* QuEChERS dispersive solid-phase extraction clean-up kits are assembled to match food matrices to the right method.

SiliaQuick QuEChERS Dispersive Solid-Phase Extraction Kits				
Food Matrices	**General Fruits & Vegetables**	**Pigmented Fruits & Vegetables**	**Highly Pigmented and Fatty Fruits & Vegetables**	**Fatty and Waxed Fruits & Vegetables**
Root and Tuber Vegetables				
Beets	✓			
Carrot	✓			
Radish	✓			
Potato	✓			
Fruiting Vegetables				
Eggplant	✓			
Cucumber	✓			
Pepper (*green or red*)		✓		
Pumpkin		✓		
Tomato	✓			
Cabbage				
Broccoli	✓	✓		
Brussels sprouts	✓			
Cauliflower	✓			
Stem Vegetables				
Aparagus	✓			
Celery	✓			
Leek	✓			
Rhubarb	✓	✓		
Leafy Vegetables				
Lettuce		✓		
Basil		✓		
Parsley		✓		
Spinach		✓		
Leek Plants				
Garlic	✓			✓
Onion	✓			✓
Shallot	✓			

Choose your Silia*Quick* QuEChERS Dispersive SPE Clean-Up Kits by Food Types (*con't*)

SiliaQuick QuEChERS Solid-Phase Extraction Kits				
Food Matrices	General Fruits & Vegetables	Pigmented Fruits & Vegetables	Highly Pigmented and Fatty Fruits & Vegetables	Fatty and Waxed Fruits & Vegetables
Small Fruits				
Blackberry		✓		
Blueberry		✓		
Grapes (*red*)		✓		
Cranberry		✓		
Strawberry		✓		
Pome Fruits				
Apple	✓			
Pear	✓			
Quince	✓			
Citrus Fruits				
Grapefruit				✓
Lemon & Lime				✓
Orange				✓
Tangerine				✓
Stone Fruits				
Apricot	✓			
Cherry	✓			
Peach	✓			
Plum	✓			
Other Fruits				
Avocado			✓	✓
Banana	✓			✓
Mango	✓	✓		
Pineapple	✓			
Other				
Cereals (*wheat, corn, rice*)				✓
Coffee beans		✓	✓	
Tea Leaves		✓		

SiliaPlate™
TLC Plates



Greyhound Chromatography and Allied Chemicals
6 Kelvin Park, Birkenhead, Merseyside CH41 1LT United Kingdom
Tel: +44 (0)151 649 4000 Fax: +44 (0)151 649 4001
sales@greyhoundchrom.com

www.greyhoundchrom.com

Thin Layer Chromatography (TLC)

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

- Optimize your separation conditions by using the same silica gel as in your flash columns and cartridges.
- Made with an extra hard layer that ensures the plates don't loose silica on rubbing and heating.
- The consistent thickness of our Silia*Plate*™ ensures lot-to-lot reproducibility.

Introduction to Thin Layer Chromatography (TLC)

Thin layer chromatography (*TLC*) is a quick, simple and inexpensive analytical technique frequently used in various laboratories. It is used for reaction monitoring, compound purity evaluation as well as a rapid and cost-efficient selection and optimization of chromatographic conditions prior to purification by flash chromatography or HPLC.

Besides speed and low cost, TLC analysis presents other non-negligible advantages like the small quantity of compound required and high sample throughput capability (*up to 20 samples simultaneously*).

Silia*Plate* Features and Benefits

For over 18 years, SiliCycle has been offering a wide selection of TLC plates in various sizes (*plate size, thickness*) and chemistries (*10% Silver Nitrate, CN, C18, NH_2*). Silia*Plate* represents an efficient and economical alternative to other TLC plate manufacturers while demonstrating high separation power, which is due to the narrow particle size distribution silica gel used for manufacturing.

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

« Many products have been successfully purified with the silica gel. We have had problems with other companies' TLC plates not running the same as their silica gel, but everything was fixed when we switched over to all SiliCycle products.. »

William Nguyen from Stanford University, Stanford, CA, USA

Types of plates available (*TLC/HPTLC/PLC*)

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.

Differences between classical TLC, HPTLC and PLC

Properties	Classical TLC	HPTLC	Preparative PLC
Application	Quick, inexpensive, flexible and portable separations	Highly sophisticated separation problems, complex samples	Purification on a TLC plate
Analysis	Qualitative	Qualitative & Quantitative	Quantitative
Detection	UV - Stains	Instrumented analysis (*use of scanners for detection*)	UV
Price	Lower prices than HPTLC	Higher prices than TLC	-
Distribution [Mean Particle Size]	5 - 20 µm [10 - 12 µm]	4 - 8 µm [5 - 6 µm]	5 - 40 µm [25 µm]
Layer Thickness	250 µm	200 µm	0.5 mm, 1 mm, 2 mm
Typical Sample Volume	1 – 5 µL	0.1 – 0.5 µL	5 – 20 µL

TLC Backings

TLC plates are available with different backings (*also called supports*): rigid (*glass-backed*) or flexible sheets (*aluminum & plastic-backed*). Glass backed plates are the most frequently used due to the ease of handling, transparency (*spot can be seen on both sides*) as well as the chemical resistance and inertness of the support. However, glass plates also present certain disadvantages like superior fragility and higher weight over flexible backings. On the other hand, aluminum and plastic backings also offer both pros and cons as presented in the table below.

TLC Backings Comparison

Properties	Glass	Aluminum	Plastic
Approximate Thickness	1.5 mm	1.5 mm	2 mm
Total Weight	High	Low	Medium
Heating Stability	High	High	Below 175°C
Fragility	High	Low	Low
Scissors Cut	Impossible	Easily	Possible
Chemical Resistance Against			
Mineral Acids	High	Low	High
Bases (*ammoniac*)	High	Low	High

Available Sorbents

Various adsorbents can be used for TLC coating; silica, alumina, florisil, etc. However, silica gel is probably the most versatile since it covers almost all types of separation (*if the right solvent system is selected*). More than 80% of all purifications are performed using silica gel as the adsorbent.

The particle size distribution used for the silica is related to the nature of the plate. For standard TLC, silica gel with a mean particle size of 10 - 14 µm is used compared to HPTLC where a smaller particle size is required. In both cases, pore diameter is always 60 Å. Some functionalized silica gels like reversed-phase (*C18, C8, Amine, Cyano, Diol,* ...) and specialty (*Silver Nitrate*) plates can also be used as TLC adsorbent for particular needs.

The two most popular modes of separation employed in TLC are normal and reversed phases. In normal phase separation, the mobile phase is less polar than the stationary phase. Inversely, in reversed mode, the mobile phase (*usually a mixture of water and organic solvent*) is more polar than the stationary phase (*C18*).

Layer Thickness

The layer thickness is related to the nature of the analysis (*analytical or preparative*) as well as the performance of the plate (*TLC or HPLTC*). The most common layer thicknesses are 150 µm (*HPTLC plates*), 200 – 250 µm (*analytical TLC plates*) and 500 - 2,000 µm (*preparative TLC plates*).

Binder & UV Indicator

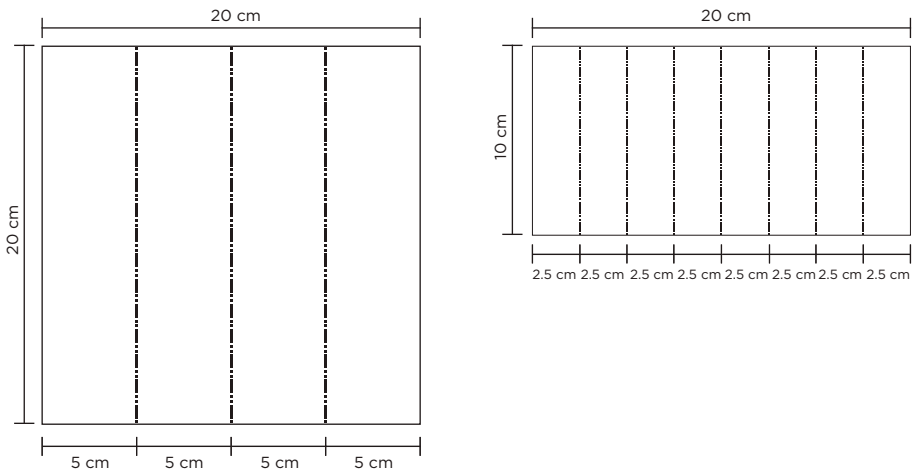
All standard Silia*Plate* products are made with a Gypsum binder and have an UV indicator (*F254*). Contact us for custom products.

Plate Size

Silia*Plate* TLC plates are available in the following standard sizes depending on the coating used: 20 x 20 cm, 10 x 20 cm, 5 x 20 cm, 5 x 10 cm & 10 x 10 cm. Also for your convenience, SiliCycle provides ready to use micro TLC plates in 2.5 x 10 cm, 2.5 x 7.5 cm & 2.5 x 5 cm formats.

An interesting compromise between standard and micro plate sizes is our Scored Silia*Plate* (*glass backing*). Two different formats are available and possible cut combinations are shown in the image below.

- 20 x 20 cm plates scored to get four 5 x 20 cm plates (*or multiple of 5 cm width*).
- 10 x 20 cm plates scored to get seven 2.5 x 10 cm plates (*or multiple of 2.5 cm width*).



SiliaPlate TLC Plates Portfolio

SiliCycle offers the possibility to analyze reactions on thin layer chromatography support and rapidly develop optimized purification conditions for efficient transfer to flash columns packed with the same SiliaFlash silica support. Maximize the benefits by using our *UltraPure* SiliaPlate TLC plates with an extra hard layer of silica. For your convenience, SiliCycle offers different sizes, choice of backings, reversed-phase & specialty plates. Contact us for more information.

Various attribute combinations are possible with SiliaPlate TLC plates and are summarized in the table below.

SiliaPlate TLC Plates Variety of Attributes

Properties	TLC		HPTLC NEW
	Analytical	Preparative	
Backing Available			
Glass	Yes	Yes	Yes
Aluminum	Yes	No	No
Plastic	Yes	No	No
Adsorbent Available			
Bare silica	Yes	Yes	Yes
Silica - functionalized	No	Yes	Yes
Silica Specifications			
Mean Particle Size	10 - 14 µm	20 - 25 µm	≤ 10 µm
Mean Pore Diameter	60 Å	60 Å	60 Å
Type of Plate Available			
Scored Plate Available	Yes	Yes	No
Channeled Plate Available	Yes	No	No
Layer Thickness	Glass: 250 µm Flexible: 200 µm	Glass: 500 µm, 1,000 µm Flexible: 1,500 µm, 2,000 µm	Glass: 150 µm
Typical Possible Plate Size*	2.5 x 5 cm; 2.5 x 7.5 cm; 2.5 x 10 cm; 5 x 10 cm; 5 x 20 cm; 10 x 20; 20 x 20 cm	20 x 20 cm	2.5 x 5 cm; 2.5 x 7.5 cm; 2.5 x 10 cm; 5 x 10 cm; 5 x 20 cm; 10 x 20; 20 x 20 cm

*For the glass-backing TLC plates.

« We had tried working with TLC plates of another brand and realized that the SiliCycle brand was the most durable and long-lasting as well as clear when visualizing with UV light so we switched back. »

Jessica Kisunzu from UC Berkeley, Berkeley, CA, USA

Silia*Plate* Ordering Information.

Silia*Plate* TLC with Glass Backing				
SiliCycle PN	Product Name	Plate Size (cm)	Thickness (µm)	#/box
Analytical Silia*Plate* Glass				
TLG-R10011B-423	Micro Silia*Plate* Glass	2.5 x 5	250	25
TLG-R10011B-124	Micro Silia*Plate* Glass	2.5 x 7.5	250	100
TLG-R10011B-2575B NEW	Micro Silia*Plate* Glass (*bulk*)	2.5 x 7.5	250	384
TLG-R10011B-624	Micro Silia*Plate* Glass	2.5 x 10	250	100
TLG-R10011B-527	Silia*Plate* Glass	5 x 10	250	200
TLG-R10011B-424	Silia*Plate* Glass	5 x 20	250	100
TLG-R10011B-723	Silia*Plate* Glass	10 x 20	250	25
TLG-R10011B-2020 NEW	Silia*Plate* Glass	20 x 20	250	20
TLG-R10011B-323	Silia*Plate* Glass	20 x 20	250	25
Scored Analytical Silia*Plate* Glass				
TLGSR10011B-723	Silia*Plate* Glass (*scored*)	10 x 20	250	25
TLGSR10011B-423	Silia*Plate* Glass (*scored*)	20 x 20	250	25
Channeled Analytical Silia*Plate* Glass (*with Preadsorbent Zone*)				
TLGCZ-R10011B-323 NEW	Channeled Silia*Plate* Glass	20 x 20	250	25
Preparative Silia*Plate* Prep (*Glass Preparative*)				
TLG-R10011B-333	Silia*Plate* Prep	20 x 20	500	25
TLG-R10011B-341	Silia*Plate* Prep	20 x 20	1,000	25
TLG-R10011B-353	Silia*Plate* Prep	20 x 20	2,000	25
Scored Silia*Plate* Prep (*Glass Preparative*)				
TLGSR10011B-333 NEW	Silia*Plate* Prep Glass (*scored*)	20 x 20	500	25
TLGSR10011B-341 NEW	Silia*Plate* Prep Glass (*scored*)	20 x 20	1,000	25
TLGSR10011B-350 NEW	Silia*Plate* Prep Glass (*scored*)	20 x 20	2,000	25
Silia*Plate* Prep C18 (*Glass Preparative*)				
TLG-R30411B-341	Silia*Plate* C18 Prep Glass	20 x 20	1,000	25

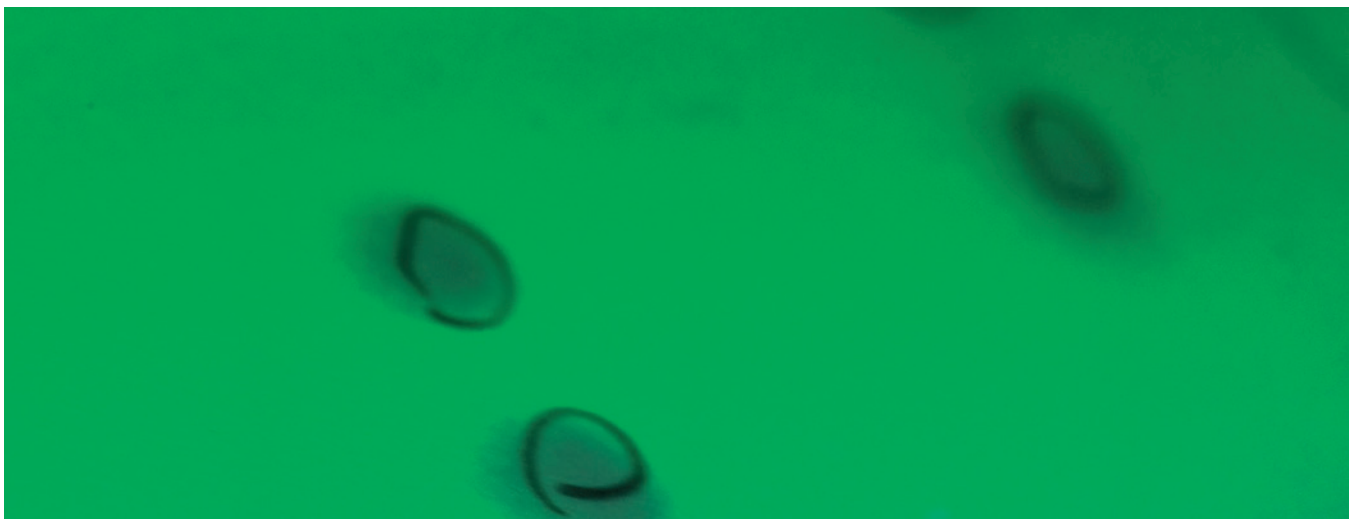
Silia*Plate* TLC with Flexible Backings				
SiliCycle PN	Product Name	Plate Size (cm)	Thickness (µm)	#/box
Silia*Plate* Al (*Aluminum*)				
TLA-R10011B-2575 NEW	Micro Silia*Plate* Aluminum	2.5 x 7.5	200	200
TLA-R10011B-323	Silia*Plate* Aluminum	20 x 20	200	25
Silia*Plate* Al C18 (*Aluminum*)				
TLA-R30411B-303	Silia*Plate* Aluminum C18	20 x 20	200	25
Silia*Plate* Pl (*Plastic*)				
TLP-R31001B-2575 NEW	Micro Silia*Plate* Plastic	2.5 x 7.5	200	200
TLP-R31001B-323	Silia*Plate* Plastic	20 x 20	200	25

NEW

SiliaPlate HPTLC Silica with Glass Backing (*Thickness: 150 microns, 25 plates/box*)			
SiliCycle PN	Plate Size (cm)	SiliCycle PN	Plate Size (cm)
SiliaPlate Silica HPTLC			
HPTLG-R10011B-1010	10 x 10	HPTLG-R10011B-2020	20 x 20
Scored SiliaPlate Silica HPTLC			
HPTLGSR10011B-1010	10 x 10 (to 5 x 5 cm)	HPTLGSR10011B-1020	10 x 20

Functionalized SiliaPlate HPTLC (*Thickness: 150 microns, 25 plates/box*)			
SiliCycle PN	Plate Size (cm)	SiliCycle PN	Plate Size (cm)
SiliaPlate C18 HPTLC			
TLG-R30411B-213	10 x 10	TLG-R30411B-303	20 x 20
SiliaPlate C8 HPTLC			
TLG-R31011B-203	10 x 10	TLG-R31011B-303	20 x 20
SiliaPlate C2 HPTLC			
TLG-R32611B-203	10 x 10	TLG-R32611B-303	20 x 20
SiliaPlate NH_2 (*Amine*) HPTLC			
TLG-R52011B-203	10 x 10	TLG-R52011B-303	20 x 20
SiliaPlate CN (*Cyano*) HPTLC			
TLG-R38011B-203	10 x 10	TLG-R38011B-303	20 x 20
SiliaPlate Diol HPTLC			
TLG-R35011B-203	10 x 10	TLG-R35011B-303	20 x 20
SiliaPlate Ag (*Silver Nitrate 10% impregnated*) HPTLC			
TLG-R23511B-423	5 x 20	TLG-R23511B-303	20 x 20

Trial Package of Functionalized SiliaPlate HPTLC: TLG-R1234511B-723
[5 plates (10 x 20 cm) of each SiliaPlate C18, C8, C2, NH_2 & CN scored to 2.5 x 10 cm]



Silia*Plate* TLC Accessories

Silia*Plate* TLC Developing Chamber

The most commonly used accessories to develop a TLC plate.

AUT-0160 Silia*Plate* Cylinder Micro TLC Developing Chamber (*1/box*)

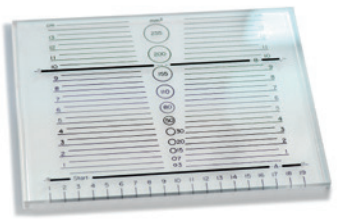
AUT-0161 Silia*Plate* Rectangular TLC Developing Chamber (*1/box*)

Other Silia*Plate* TLC Accessories

AUT-0162 Silia*Plate* TLC Cutter

AUT-0163 Silia*Plate* TLC Spotting Capillary Tubes

AUT-0164 Silia*Plate* TLC Spotting Guide



An Ideal Partnership Between SiliCycle and Society AR2i

SiliCycle has entered into an exclusive world strategic specialty distribution partnership with the Society AR2i specialized in the conception and the manufacturing of innovative devices in the field of Thin-Layer Chromatography since 1994.

Chromimage® Documentation

- Perform qualitative analysis on TLC plates in a few minutes.
- Detect and numerize your TLC plates under UV254 nm and visible mode.
- Classify and archive your TLC analysis under several storage formats (*jpg, eps, pdf, etc.*).
- Suitable for reading 10 x 10 cm, 10 x 20 cm and 20 x 20 cm plates.

PN: AUT-0165

Derivapress® System

It's simple as opening and closing a book: the Derivapress immersion derivatization system provides a cost-effective, efficient and safe alternative to perfect this essential stage of TLC and to move towards densitometric measurements like quantitative and semi-quantitative TLC.

Furthermore Derivapress complies with the GLP requirements and can be used in 21 CFR Part 11 work environments.

PN: AUT-0166

Thin Layer Chromatography Practical Guide

Select a Stationary Phase

As almost 80% of all separations can be performed using silica gel plates, it is suggested to try using this coating. However, for acid sensitive compounds, alumina is probably a better choice (*useful for amine purification*). If you are working with highly polar compounds, reversed-phase mode is more suitable.

Select a Mobile Phase (*Solvent Systems*)

The selection of the mobile phase (*also called solvent system or eluent*) is perhaps the most important parameter to achieve efficient thin layer chromatography separation. It is based on the compound's solubility with the solvent and the difference in the affinity for the mobile phase versus the stationary adsorbent (*silica*).

In normal phase chromatography, where non-polar solvents such as hexane or pentane are used, non-polar compounds will move up the plate while most polar compounds will stay on the baseline. Inversely, polar solvents will allow polar compounds to move off the origin. The most suitable solvent system is the one that moves all components off the baseline with Rf values between 0.15 and 0.85 (*ideally, close to 0.2 - 0.4*).

Remember that it is not always possible in TLC but should be possible in flash chromatography where solvent gradients can be used.

For most applications, a common solvent system to start with is 1:1 Ethylacetate (*EtOAc*) / Hexane. Varying the ratio can have a pronounced effect on the Rf. If it is not working, then try: Methanol (*MeOH*) / Dichloromethane (*DCM*) (*1:99 – 10:90*); or toluene with acetone, EtOAc, or DCM.

Remember: To increase the compound's Rf, increase the polarity of the mobile phase; increase the ratio of the polar solvent or choose another solvent. Inversely, to decrease Rf, decrease the polarity of the eluent.

Rules of Thumb

- **Standard compounds (*most popular solvent system*)**: 10 - 50% EtOAc/Hexane
- **Polar compounds**: 100% EtOAc or 5 - 10% MeOH/DCM
- **Non-polar compounds**: 5% EtOAc (*or ether*) / Hexane or 100% Hexane
- **For basic compounds**: (*amine or nitrogen containing*), it could be useful or required to add a small quantity of triethylamine (Et_3N) to the solvent mixture (*0.1 – 2.0% but typical quantity is 0.1%*) or 1 - 10% ammonia (NH_3) in MeOH/DCM.
- **For acidic compounds**: it could be useful to add acetic (*AcOH*) or formic acid (*FA*) to the solvent mixture (*0.1 - 2.0%*).

Reversed-phase mode

In reversed-phase chromatography, the typical solvent systems are:

- Mixtures of water or aqueous buffers and water miscible organic solvents such as acetonitrile *(ACN),* methanol, and tetrahydrofuran *(THF*). Other solvents can be used such as ethanol (*EtOH*) & isopropanol (*IPA*).
- If needed, to improve peak shape in flash chromatography, 0.1% of acetic, formic or trifluoroacetic acid (*TFA*) can be added to the solvent system.

« Have given your products to other folks within organisation and used it myself with great success (both the Prep SPE, HPLC columns, TLC plates, and silica gel).. »

Kerry M. Keertikar, Merck Research Labs, Kenilworth, NJ, USA

TLC Plate Preparation

Using a pencil, lightly draw a straight-line parallel to the width of the plate at about 1 cm from the base end of the plate. Sample application will be done on this line called baseline or origin.

Note: Never use a pen because ink can move with some solvents used as eluent.

Sample preparation

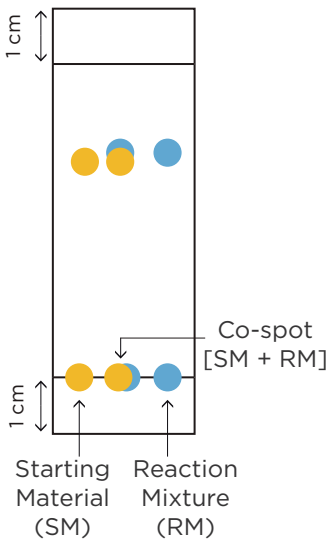
Thorough sample preparation is a prerequisite for an optimal and efficient TLC separation. Typical sample preparation processes could consist in a sample crushing, filtration, extraction or concentration of the product of interest.

Sample Application

Sample preparation will differ depending on the nature of the plate (*analytical or preparative*). For analytical plates, because thin layer chromatography is extremely sensitive, it is really important to apply a small quantity using a glass capillary (*or a micro pipette*) to get optimal resolution. For preparative plates, apply a series of small adjacent spots to form a band or a streak using a glass capillary (*or a microliter syringe*). In both cases, a spotting guide can be used to facilitate sample application.

Co-spotting

For analytical chromatography, co-spotting is frequently used for similar polarity products. This consists to apply on the same spot, the starting material and reaction mixture as shown by the image below.



TLC Plate Development

The most commonly used method to perform thin layer chromatography separation is to place vertically the TLC plate inside a sealed developing chamber to ensure solvent saturation. Place approximately 0.5 cm of the suitable solvent system inside the chamber. Slowly place the TLC inside the chamber and allow the eluent to travel up the plate until it gets to 1 cm from the top of the plate. Immediately remove the plate and draw a line along the solvent front.

Note: for optimal solvent saturation, a filter paper can be added inside the TLC chamber. This also prevents eluent evaporation. The solvent level needs to be below the baseline; otherwise the spots will be dissolved.

TLC Plate Visualization

If components of the reaction are colored, no visualization method is required (*spots can be seen directly on the silica layer*). However, most of the time it is not the case, therefore one of the methods described below should be used to reveal the spots.

Non-destructive methods

As a general visualization procedure, before treating the TLC plate with any destructive methods, UV-active compounds can be viewed under an ultraviolet lamp (*usually for polyconjugated compounds like benzophenones and anthracenes*). Furthermore, an iodine chamber can be useful for thiols, phosphines, and alkenes but it works in about 50% of cases for alkanes. It is recommended to circle the spots with a pencil on the TLC plate prior to visualization by destructive methods.

Destructive methods

For compounds that are not UV-active, there are several varieties of stains that can be used depending on the nature of the compound of interest. To use a stain, simply dip the TLC plate into the staining solution as quickly as possible, and then immediately absorb the excess stain with paper and heat carefully with a heat gun or on a hot plate at 110°C until spots are revealed. See next two pages.

Chromatogram Interpretation

Retention factor (*Rf*) definition

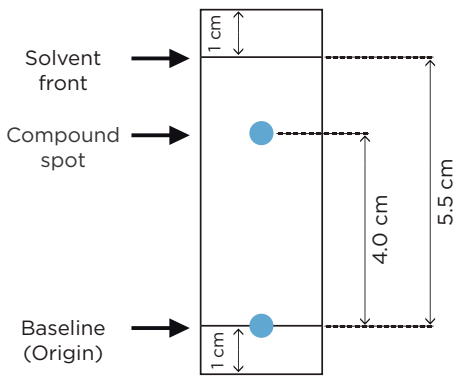
Retention factor analysis is used to evaluate if the solvent system is adequate. Rf is defined as the distance traveled by the compound divided by the distance traveled by the solvent front. This means: the larger the Rf value of a compound, the larger is the distance traveled by the compound. In other words, when comparing Rf values of various compounds under identical chromatography conditions, the compound with the larger Rf is less polar because it interacts less strongly with the polar adsorbent on the plate.

Remember, a good solvent system is one that moves all components off the baseline with Rf values between 0.15 and 0.85 (*ideal Rf is 0.2 - 0.4*). Otherwise, when possible, it is preferable to chose another solvent system.

$$\text{Retention factor (Rf)} = \frac{\text{distance traveled by the compound}}{\text{distance traveled by the solvent front}}$$

Rf calculation based on the example shown here:

Rf = 4.0 cm / 5.5 cm = 0.73



Prediction of Column Volumes (CV)

TLC data can be used to predict column elution based on the relationship between the retention factor and the column volume. CV is the number of column volumes required to elute the component from the column regardless of column dimensions [(*bed volume*) – (*volume of packing*)].

$CV = 1 / Rf$ & $\Delta CV = 1 / Rf_1 - 1 / Rf_2$

The greater the ΔCV, the greater will be the separation and resolution between the spots (easier separation). A bigger ΔCV will therefore allow more sample to be loaded onto the column.

Described below, are the most frequently used TLC visualization methods (also called stains) in alphabetical order.

Stains for Thin Layer Chromatography

Name	Visualization of...	Stain Recipe	Comments
***p*-Anisaldehyde #1**	**Universal Stain** *Good for nucleophiles and oxygenated compounds*	**Prepare stain as follows** • 2 mL of glacial acetic acid • 5 mL of *p*-anisaldehyde • 7 mL of conc. sulfuric acid • 185 mL 95% ethanol ***Tip**: Add dropwise the acid at the end and stir vigorously.*	**Visualization Colors** • Spots: Various colors • BG: Orange to pink **Appropriate Storage** • Aluminum wrapped at 0°C
N.B.: Tends to be insensitive to alkenes, alkynes and aromatic compounds unless other functional groups are present.			
***p*-Anisaldehyde #2**	**Acronycine** **Cineoles** **Terpenes**	**Prepare stain as follows [1:10:20:80]** • *p*-anisaldehyde • perchloric acid • acetone • water	**Visualization Colors** • Spots: Various colors • BG: Orange to pink **Appropriate Storage** • Aluminum wrapped at 0°C
Bromocresol Green	**Acidic groups (pK_a < 5)** **Carboxylic Acids**	**Prepare stain as follows** • 0.04 g of bromocresol green • 100 mL of 95% ethanol • 0.1 M solution of sodium hydroxide ***Tip**: Add the base slowly at the end until the solution turns pale blue.*	**Visualization Colors** • Spots: Yellow to green • BG: Blue **Appropriate Storage** • Aluminum wrapped at 0°C ***Heating NOT required***
Cerium Molybdate (CAM or Hanessian's Stain)	**Universal Stain** *Good for peptides*	**Prepare stain as follows** • 12 g of ammonium molybdate • 0.5 g of ceric ammonium molybdate • 15 mL of conc. sulfuric acid • 235 mL of water	**Visualization Colors** • Spots: Blue • BG: White **Appropriate Storage** • Aluminum wrapped
N.B.: Highly sensitive stain; very low concentration of product may appear as a significant impurity.			
Cerium Sulfate ($Ce(SO_4)_2$)	**Difficultly stainable compounds**	**Prepare stain as follows** • 15% aqueous sulphuric acid saturated with ceric sulfate	**Visualization Colors** • Spots: Black • BG: Yellow to white
Chromic Acid	**Difficultly stainable compounds**	**Prepare stain as follows** • 2.5 g of potassium chromate • 100 mL of 20% sulfuric acid in water	**Visualization Colors** • Spots: Orange to green • BG: Yellow to red
Cobalt Chloride ($CoCl_2$)	**Universal stain** *Used in conjunction with PMA when this one is not effective enough*	**Prepare stain as follows** • 2 g of cobalt chloride • 100 mL of water • 10 mL of conc. sulfuric acid ***Tip**: simply dip PMA treated plate in $CoCl_2$ solution.*	**Visualization Colors** • Spots: Various colors • BG: Pink ***Heating NOT required***
***p*-Dimethylamino-benzaldehyde** (PDAB or Ehrlich's Reagent)	**Amines** **Indoles**	**Prepare stain as follows** • 0.5 g of *p*-dimethylamin-benzaldehyde • 10 mL of conc. hydrochloric acid • 40 mL of acetone (or 95% ethanol)	**Visualization Colors** • Blue

Stains for Thin Layer Chromatography (*Con't*)

Name	Visualization of...	Stain Recipe	Comments
2,4-Dinitrophenyl-hydrazine (DNP)	**Aldehydes** **Ketones**	**Prepare stain as follows** • 12 g of 2,4-dinitrophenylhydrazine • 60 mL of conc. sulfuric acid • 80 mL of water • 200 mL of 95% ethanol	**Visualization Colors** • Spots: Yellow to red • BG: Light orange ***DO NOT HEAT dipped plate***
Dragendorff Reagent	**Nitrogenous Compounds** *Alkaloids, amines, organics bases, etc.* **Phenols**	**Prepare stain as follows** **Solution A** • 1.7 g of bismuth nitrate • 80 mL of water • 20 mL of acetic acid **Solution B** • 40 g of potassium iodide • 100 mL of water ***Tip**: mix 5 mL of each solution A and B to a solution of 20 mL of acetic acid in 70 mL of water.*	**Visualization Colors** • Spots: Orange to red • BG: Yellow **Appropriate Storage** • Aluminum wrapped **Stain Shelf-Life** • One or two weeks • Solutions A and B are long term storable ***DO NOT HEAT dipped plate***
Ferric Chloride ($FeCl_3$)	**Phenols**	**Prepare stain as follows** • 2 g of ferric chloride • 102 mL of 0.5N hydrochloric acid	**Visualization Colors** • Spots: Red • BG: Yellow
Iodine	**Unsaturated & Aromatic Compounds**	**Prepare stain as follows** • Iodine crystals in an amber bottle	**Visualization Colors** • Spots: Dark brown • BG: Light brown
N.B.: iodine stain can be removed by heating.			
Morin Hydrate (Hydroxy Flavone)	**Universal stain** *Fluorescently active*	**Prepare stain as follows** • 0.1% of morin hydrate in methanol ***Tip**: by weight.*	**Visualization Colors** • Spots: Various colors • BG: White
Ninhydrin (Indanetrione Hydrate)	**Amino Acids** **Amino Sugars** **Amines**	**Prepare stain as follows** • 1.5 g of ninhydrin • 3 mL acetic acid • 100 mL of *n*-butanol	**Visualization Colors** • Spots: Various colors • BG: White
Phosphomolybdic Acid (PMA)	**Universal stain** *Very effective against dilute sample*	**Prepare stain as follows** • 10% of PMA solution in ethanol • or 10 g of PMA in 100 mL ethanol	**Visualization Colors** • Spots: Dark green to black • BG: Light green
Potassium Permanganate ($KMnO_4$)	**Olefins** **Readily oxidized groups** *Alcohols, aldehydes, alkenes, alkynes, etc.*	**Prepare stain as follows** • 1.5 g of potassium permanganate • 10 g of potassium carbonate • 1.25 mL of 10% sodium hydroxyde • 200 mL of water	**Visualization Colors** • Spots: Yellow to light brown • BG: Purple to pink **Stain Shelf-Life** • Three months
N.B.: Can be used for detection of alcohols, amines, sulfides and mercaptans groups when gently heated.			
Vanillin	**Universal stain** *Very effective for same polarity products (Rf)*	**Prepare stain as follows** • 15 g of vanillin • 250 mL of 95% ethanol • 2.5 mL of conc. sulfuric acid	**Visualization Colors** • Spots: Various colors • BG: Light tan

(**N.B.**: Shaded lines refer to "universal stains". Occasionally, spots can be seen more clearly from glass side with glass backed TLC plate. Otherwise mentioned, stains are long-term stable when stored in a tightly-closed container to prevent solvent evaporation. "BG" stands for "background".)

Silia*Plate* TLC Troubleshooting

Problem: Streaking or elongated spot rather than a defined spot?

Possible Solutions:

- Sample was overloaded: run the TLC again using a more diluted solution of your sample.
- In presence of a base sensitive compound: try to add acetic or formic acid to the eluent (*0.1 - 2.0%*).
- In presence of an acid sensitive compound: try to add triethylamine to the eluent (*0.1 - 2.0%*) or 1 - 10% ammonia in MeOH/DCM. If it is not working use Alumina as TLC coating.
- In presence of too highly polar compounds: try using a specialized silica TLC plate like reversed-phase (*C18 for example*).

Problem: Unable to see any spots on the TLC?

Possible Solutions:

- If you have not been able to visualize any spots on your TLC using UV light, try another method; maybe your compound is not UV-active.
- Maybe your sample is too diluted. Try to apply several times your sample on the same spot (*do not forget to dry solvent between each application for optimal results*) or to concentrate your solution.
- Make sure the solvent level inside the tank is lower than the spotting line to avoid sample dissolution by the eluent.

Problem: How to monitor a reaction in presence of similar Rfs for both starting materials and product of interest?

Possible Solutions:

- Try the co-spotting method.
- Try to visualize the plate using anisaldehyde or molybdene. Spot color or brightness differ for two compounds when using these stains.
- If none of the two previous solutions work, change solvent systems (*use another class of solvent*).

Tips*: in chromatography, there are three classes of solvent systems providing significantly different results:*

1: Mixture of polar/hydrocarbon solvents (*i.e.: EtOAc/Hexane; Ether/Petroleum ether*).

2: Mixture of polar/dichloromethane solvents (*examples of polar solvent: Ether, EtOAc, MeOH*).

3: Mixture of polar/benzene (*or toluene*) solvents (*examples of polar solvent: Ether, EtOAc, MeOH*).

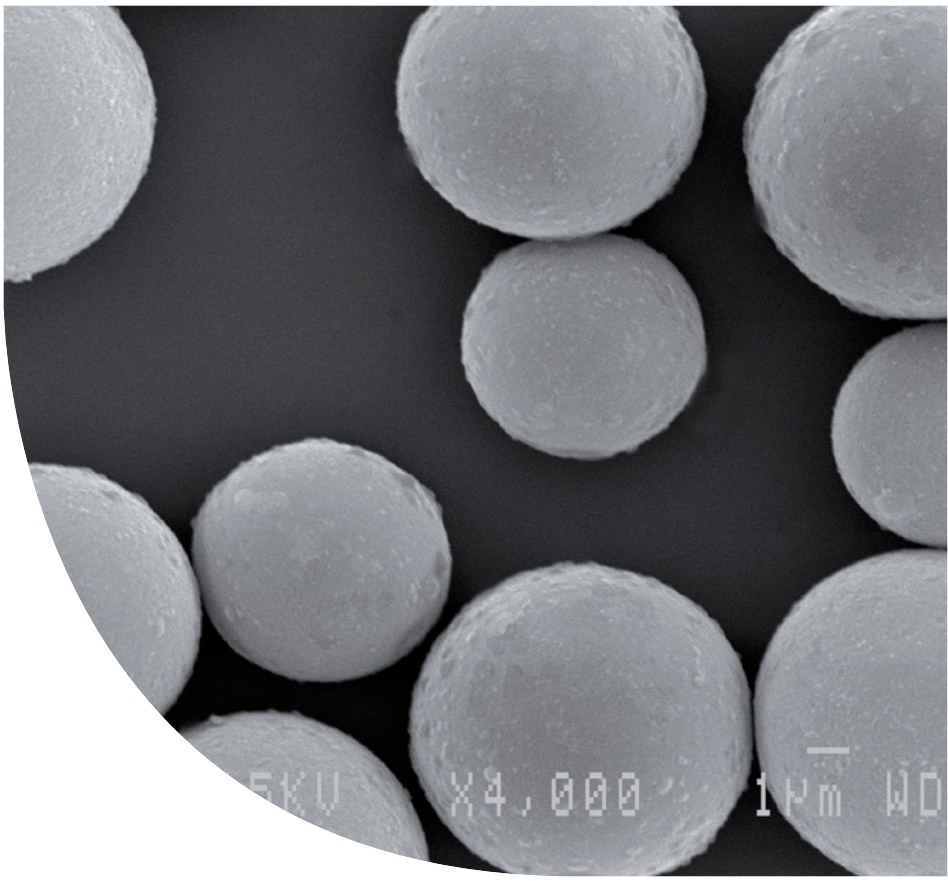
Problem: Compounds stay too close to the baseline or solvent front.

Possible Solutions:

- Too close to the baseline: your eluent is not polar enough; increase the proportion of polar solvent in the same solvent system or chose a more polar solvent.
- Too close to the solvent front: inversely, your eluent is too polar; decrease the proportion of polar solvent in the same solvent system or chose a less polar solvent.

SiliaSphere™

Spherical Silica Gels



Greyhound Chromatography and Allied Chemicals
6 Kelvin Park, Birkenhead, Merseyside CH41 1LT United Kingdom
Tel: +44 (0)151 649 4000 Fax: +44 (0)151 649 4001
sales@greyhoundchrom.com

www.greyhoundchrom.com

Silia*Sphere* Spherical Silica Gel

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

- Recognized worldwide as a leader with outstanding quality spherical silica gels for analytical and preparative chromatography.
- One of the best silica on the market with unbeatable performance.
- Broadest portfolio of chromatographic phases to suit all purification needs.
- Wide range of formats for all purification scales bulk & HPLC columns.

SiliCycle is a World Class Silica Expert

At SiliCycle, we offer two grades of spherical silica gel; Silia*Sphere* Monodispersed Spherical Silica Gel for analytical needs and Silia*Sphere* PC for preparative ones. Both grades are manufactured under the same well controlled processes to ensure constant reproducibility and easy scale-up.

With pore diameters ranging from 60 to 1,000 Å and particle sizes from 1.8 to 200 µm, we offer products to meet all your separation requirements. This is one of the most reliable portfolios of spherical silica gels for high pressure chromatography. Silia*Sphere* are ideal for both analytical and preparative chromatography, from laboratory to pilot-plant processes and production scales. Furthermore, the excellent properties of Silia*Sphere* make them the packing of choice for high performance liquid chromatography (*HPLC*), Supercritical Fluid Chromatography (*SFC*) and simulated moving bed (*SMB*) applications.

Features and Benefits of Silia*Sphere* Spherical Silica Gels

Features and Benefits of Silia*Sphere* Spherical Silica Gels

Features	Benefits
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 Silia*Sphere*	Easy scalability
Availability in bulk quantities at affordable price	On-time delivery

SiliaSphere as a Silica Matrix

For over 18 years, SiliCycle has been dedicated to silica gel manufacturing and we have achieved a strong know-how and expertise in this field. Furthermore, 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 quality of the silica.

Particle shape, pore and 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 previously mentioned parameters need to be evaluated and optimized to ensure batch-to-batch reproducibility.

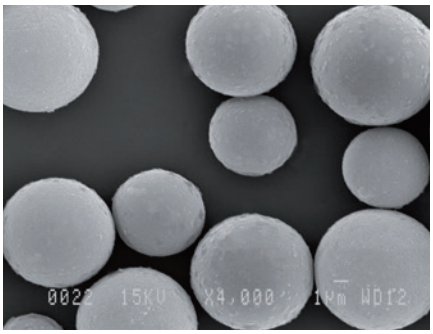
SiliaSphere is manufactured from an organic form of silicon (*alkoxydes*). This ensures very low metal content as the starting material is purified by distillation. Deionized water is used to hydrolyze the silicon alkoxydes. Careful monitoring and control of the parameters that induce precipitation afford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

SiliaSphere, the right choice for superior...

- Chromatographic performance
- Loading capacity
- Reproducibility
- Chemical & physical stability

Perfectly Spherical Particle Shape

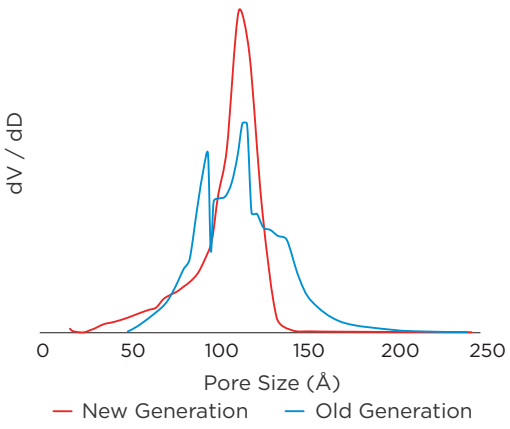
The perfectly spherical shape of SiliaSphere silicas, combined to their smooth surfaces free of any cracks, cavities and fines make them the packing of choice for chromatography. The SiliaSphere sphericity exceeds or compares favorably to well-known brands in spherical silica gel as demonstrated by the scanning electron microscope (*SEM*) picture.



SiliaSphere

Narrow Pore Size Distribution

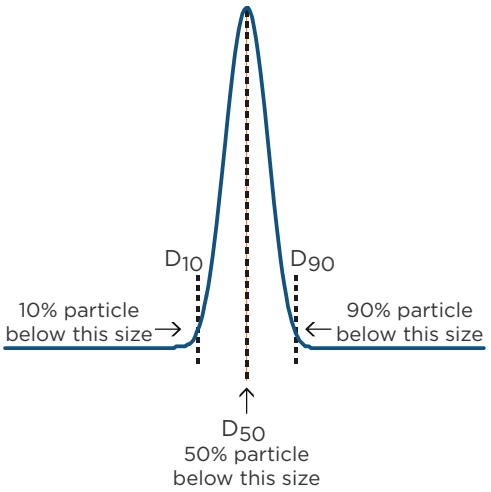
The right pore diameter to use is related to the type of molecules present in the sample to be purified. Typically, for small molecules, 100 - 120 Å pore size is recommended. However, if higher resolution is required, then 60 - 80 Å will be more suitable. For large molecules, such as peptides and proteins, 300 Å or higher is recommended.



Tight 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 when using HPLC that the particle size distribution of the spherical particles being used be very narrow. Tight particle size distribution yields greater column performance (*separation*), better peak shape, lower back-pressure as well as higher packing stability.

Silia*Sphere* offers one of the narrowest particle size distributions available on the market. To evaluate our particle size distribution, we use the D90/D10 ratio.



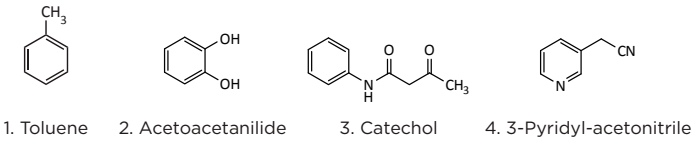
High Surface Area and Pore Volume

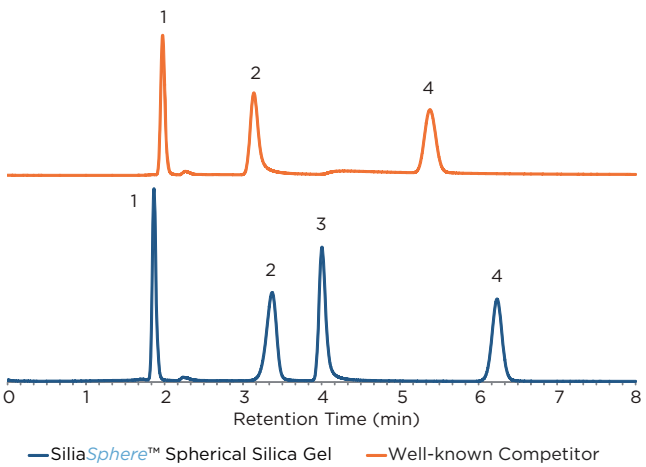
Our optimized manufacturing process ensures high specific surface area for greater loading capacity with an uniform and reproducible surface coverage.

Low Trace Metal Content & High Purity

SiliCycle's proprietary technology generates a silica gel with one of the lowest trace metal content on the market today. Our low trace metal content ensures you will get optimal performance chromatography. Tight control of trace metals in every batch also improves the reproducibility and reduces risks of interaction between metals and desired compounds. Low metal content limiting any unwanted metal ion solute interactions – providing symmetrical peaks with little or nor tailing.

To probe low metal content in Silia*Sphere* silicas, we ran the following chromatographic test and we compared our products with a well-known competitor. With Silia*Sphere*, you can be assured that peak tailing or missing peaks are not coming from our silica.





1. **Toluene**: Column Packing Efficiency => Neutral solute
2. **Acetoacetanilide**: Metal Content => Can interact with heavy metals resulting in tailing or missing peaks
3. **Catechol**: Metal Content => Can interact with heavy metals resulting in tailing or missing peaks
4. **3-Pyridyl-acetonitrile**: Silica's Acidic Character => Strongly sorbs to acidic sites

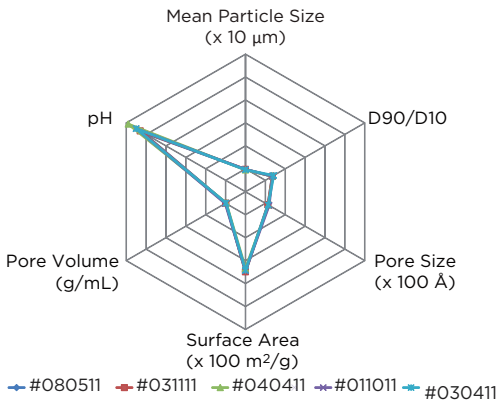
Scalability

SiliaSphere are available in bulk for a wide range of HPLC purification; from laboratory to plant scale. All SiliaSphere products are manufactured under tightly controlled manufacturing processes, and stringent quality control ensures the highest quality and reproducibility possible. Scaling-up is extremely straight-forward with SiliaSphere silicas and performance will remain the throughout the range of particle sizes.

Lot-to-lot reproducibility

SiliCycle is committed to high quality standards and always strives to provide defect-free products and lot-to-lot reproducibility. In doing so, all products are manufactured in an ISO 9001:2008 compliant facility and subjected to a stringent quality control. Every lot needs to meet the established specifications to be released. This ensures reliable & reproducible chromatographic performances.

The graph at right presents results obtained for the molecular loading based on sulfur content as well as surface coverage of the last 5 lots of SiliaSphere 10 µm, 120 Å produced which shows high product manufacturing reproducibility.



SiliaSphere Characteristics & Ordering Information

SiliaSphere Monodispersed Characteristics					
Properties / Pore Diameter	60 & 80 Å	100 Å	120 Å	300 Å	1,000 Å
Specific Surface Area (m^2/g)	≤ 450	≤ 400	≤ 300	≤ 80	≤ 20
Pore Volume (mL/g)	0.85 - 1.15	0.85 - 1.15	0.85 - 1.15	0.75 - 1.05	0.75 - 1.05
pH (5% w/w)	4 - 7	4 - 7	4 - 7	4 - 7	4 - 7
Available Particle Sizes (µm)	1.8*, 2.2*, 3, 5, 10, 15, 20	1.8, 2.2, 3, 5, 7, 10, 15, 20	1.8, 2.2, 3, 5, 7, 10, 15, 20	3, 5, 10, 15	10, 15

*Not available in 60 Å

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

Formats : 100 g, 500 g, 1 kg, 5 kg, 10 kg, 25 kg, ... up to multi-ton scale. Refer to page 75 for bonded phases information.

SiliCycle; Experts in Functionalization

Every year, various companies release new chromatographic phases to the market and claim that their phases are the most efficient. Choosing the right phase along with the right supplier is becoming a challenging task. For the past 18 years, SiliCycle has been dedicated to the development of silica-based products and has acquired extensive experience in grafting technology. This outstanding expertise, combined to tightly controlled proprietary functionalization processes, allows SiliCycle to be the supplier of choice for all chromatographic applications.

Grafting Process

Silica surface possesses active silanols (*Si-OH, free OH groups of the silica*), which permits the modification of the surface chemistry by grafting silane moieties. This property allows the control of the surface polarity useful in separation techniques. Various types of silanes can be grafted on the surface to afford monomeric or polymeric bonded phases which both have pros and cons as described below.

Main Differences Between Monomeric and Polymeric Bonded Phases

Monomeric Functionalization

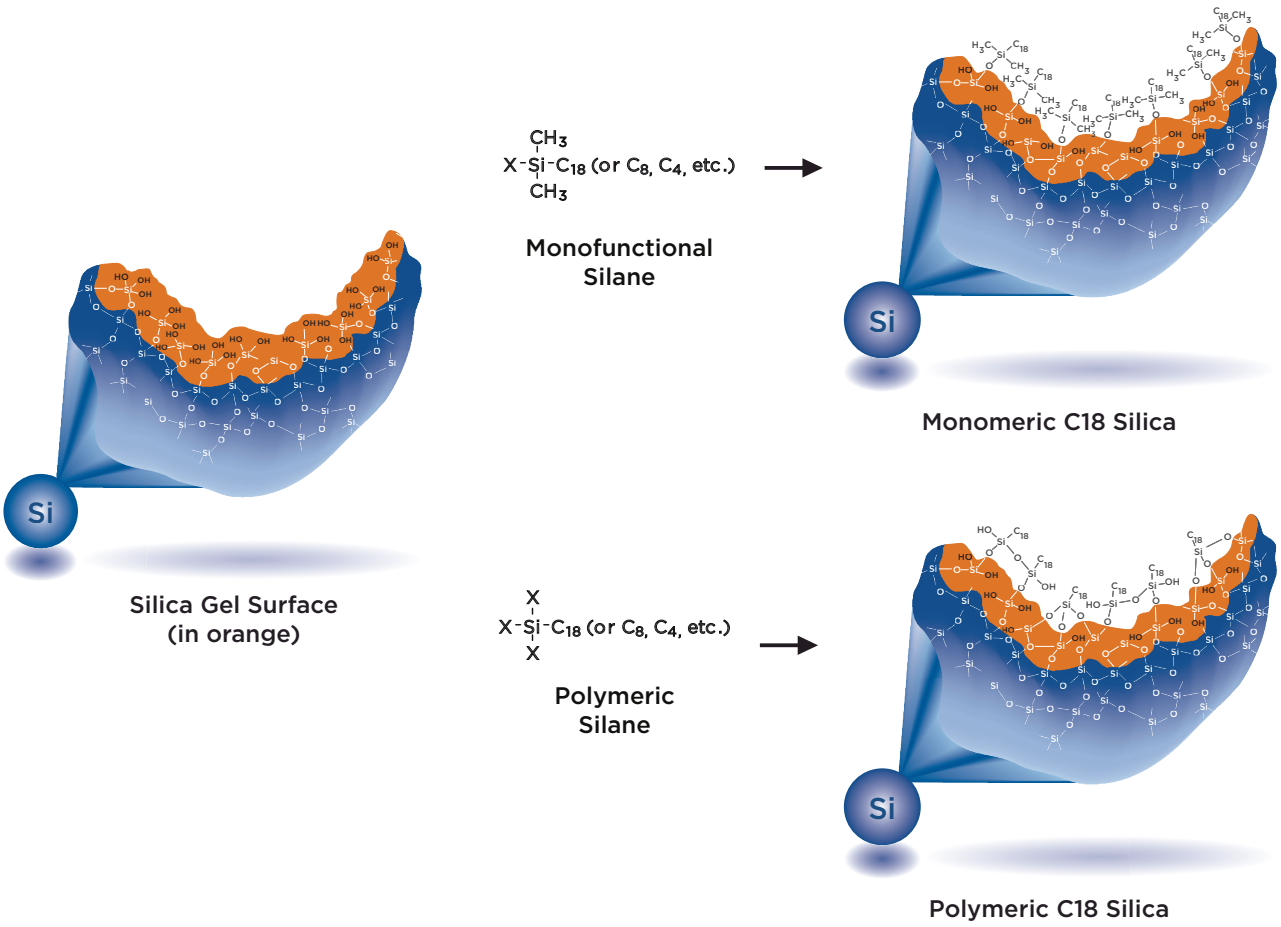
By grafting a monofunctional alkylsilane reagent, only one bond can be formed with the silica surface. This type of grafting is called monomeric. The dimethyl groups help to protect the surface by creating steric hindrance, which, at the same time, prevent from reaching the highest possible silane density. The residual silanol groups are inhibited by the grafting of a capping agent. Usually, even after the endcapping, a small portion of the initial silanols is still present due to steric hindrance.

Monomeric phases present a very high stability, batch-to-batch reproducibility and good hydrophobic properties. The fact that the silane possesses only one bond with the surface makes this phase less stable at low pH, which may lead to silane hydrolysis and consequently leaching. For low pH, the polymeric phase is preferred.

Polymeric Functionalization

Historically, trichloroalkylsilanes were the first to be employed for economic reasons. By grafting a di- or trifunctional alkylsilane reagent, it is possible to form multidimensional bondings with the surface and also between silane molecules. This grafting method is called polymeric functionalization. The silica surface is more hydrophobic, has greater stability in strong acidic condition (*pH 2-3*) and has a longer lifetime. However, polymeric phases present major disadvantages over monomeric ones: lower homogeneous surface coverage due to cross-polymerization reactions, poorer batch-to-batch reproducibility leading to variation in retention even for the same molecule. (*Note: see picture next page*).

Monomeric vs Polymeric Bonded Phases



Homogeneous Surface Coverage

SiliCycle developed a new and innovative grafting technique which is characterized by a homogeneous coverage of the alkyl chains on the surface. This proprietary process can be used with all silane types and ensures greater chemical stability as well as better performance due to the greater homogeneity of the surface coverage.

Endcapping

When functionalizing silica, it is impossible to react with every silanol group, so endcapping technology is often used to prevent peak tailing caused by non-specific interactions and thus improve separations. Furthermore, more sophisticated methods lead to strong layer protection offering very high sorbent durability in harsh conditions.

The endcapping step can be done using various methodologies. The easiest one is to treat the surface with a small silylating agent, such as trimethylchlorosilane (*TMSCl*). However, at SiliCycle, we always try to improve and control this critical step to afford highly deactivated silanol phases. For some phases, we use the conventional single endcapping step technique, for others we use our proprietary endcapping processes which can include multistep methods, use of specific silylating agents or other special treatments.

Most Popular Bonded Phases

In liquid chromatography, there are various modes of operation possible based on the interaction mechanism of the solute with the stationary phase (*sorbent*). Most known separation modes are summarized in the table below of which reversed-phase is the most popular one.

Silia*Sphere* Most Popular Bonded Phases

Mode	Normal (NP)	Reversed (RP)	Ion Exchange (IEX)
Mode Mechanism	Polar or hydrophilic	Non-polar or lipophilic	Ionic
Typical Stationary Phase	Bare silica or functionalized silica (*Amine, Cyano or Diol*)	Functionalized silica (*mostly C18, C8, C4,Cyano, Phenyl and PFP*)	Ionic functionalized silica (*SAX, SCX*) or polymer
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 (*mostly ACN, MeOH, THF*). Ion pairing agents can also be added.	Water, buffers; acid; base
Stationary Phase Polarity	Non-polar	Polar	Buffer or ionic

Typical Applications of Most Common Bonded Phases

Typical Applications of Most Common Bonded Phases

Sorbent Phase	Functional Group	Mode			Typical Applications
		NP	RP	IEX.	
Silica	- OH	X			Most polar sorbent with a slight acidic character used for purification of non-polar and non-ionic compounds.
C18	- $(CH_2)_{17}CH_3$		X		Great start for method development. Presents the maximum retention of non-polar compounds. Usually used for peptides, pesticides, PCBs, PAHs, drugs, etc.
C8	- $(CH_2)_7CH_3$		X		Presents less retention compared to C18. Usually used for highly hydrophobic pesticides, small peptides and heavy drugs.
C4	- $(CH_2)_3CH_3$		X		Presents less retention compared to C18 and C8. Widely used for molecules with large hydrophilic regions such as peptides, proteines and zwitterions (*in 300 Å*).
C1	- $(CH_3)_3$		X		Lower retention compared to other reversed-phases used for for the purification of polar and non-polar pharmaceutical products, highly hydrophobic molecules.
Cyano (CN)	- $(CH_2)_2CN$	X	X		**Normal**: less polar sorbent compared to silica used for the purification of polar organic compounds. **Reversed**: Moderate non-polar sorbent with less hydrophobicity than C18 or C8. Purification of cyclosporine and carbohydrates.
Phenyl (*PHE*)	- C_6H_5		X		Moderate non-polar sorbent with different selectivity for aromatic compounds compared to other non-polar sorbents.
Pentafluorophenyl (*PFP*)	- $(CH_2)_3C_6F_5$		X		For a new selectivity approach or the purification of conjugated compounds (isomers).
Amine (*NH_2*)	- $(CH_2)_3NH_2$	X		X	**Normal**: polar sorbent with a basic character with less retention and a different selectivity for acidic/basic compounds compared to silica. **Ion Exchange**: 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 such as sulfonic acids that may be retained irreversibly on SAX.
Diol	- $(CH_2)_3OCH_2CH(OH)CH_2OH$	X			Moderate polar sorbent with a neutral character used to extract polar compounds. Alternative to silica when acidic character is problematic.
Tosic Acid (*SCX*)	- $(CH_2)_2C_6H_4SO_3H$			X	Due to the very low pK_a (*< 1*), this silica is a strong cation exchangers. The most common use is likely for catch and release purification.
TMA Chloride (*SAX*)	- $(CH_2)_3N^+(CH_3)_3Cl^-$			X	The quaternary amine is permanently charged and commonly used for the extraction of weak cations that may not bind strongly enough to weaker anion exchangers.
TMA Acetate (*SAX-2*)	- $(CH_2)_3N^+(CH_3)_3(CO_2CH_3)^-$			X	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.

Bonded Silia*Sphere* Spherical Silica Gels Ordering Information

The table below presents the most popular Silia*Sphere* bonded phases available from SiliCycle. Please note that we can provide phases below on any of our othe silica gels and all other sorbents, contact us.

Bonded Silia*Sphere* Spherical Silica Gels Ordering Information						
Particle Size (µm)	Pore Diameter (Å)					
	60 Å	80 Å	100 Å	120 Å	300 Å	1,000 Å
C18 Silia*Sphere* Monodispersed Spherical Silica (*endcapped*)						
1.8	n/a	S03201F-A	S03201E-A	S03201G	n/a	n/a
2.2	n/a	S03202F-A	S03202E-A	S03202G	n/a	n/a
3	S03203B	S03203F-A	S03203E-A	S03203G-A	S03203M	n/a
5	S03205B	S03205F-A	S03205E-A	S03205G-A	S03205M	n/a
7	n/a	n/a	S03206E-A	S03206G-A	n/a	n/a
10	S03207B	S03207F-A	S03207E-A	S03207G-A	S03207M	S03207T
15	S03208B	S03208F-A	S03208E-A	S03208G-A	S03208M	S03208T
20	n/a	S03209F-A	S03209E-A	S03209G-A	n/a	n/a

Formats : 100 g, 500 g, 1 kg, 5 kg, 10 kg, 25 kg, ... up to multi-ton scale.

Bonded Silia*Sphere* Spherical Silica Gels Ordering Information						
Particle Size (µm)	Pore Diameter (Å)					
	60 Å	80 Å	100 Å	120 Å	300 Å	1,000 Å
C8 Silia*Sphere* Monodispersed Spherical Silica (*endcapped*)						
1.8	n/a	S30801F-A	S30801E-A	S30801G	n/a	n/a
2.2	n/a	S30802F-A	S30802E-A	S30802G	n/a	n/a
3	S30803B	S30803F-A	S30803E-A	S30803G-A	S30803M	n/a
5	S30805B	S30805F-A	S30805E-A	S30805G-A	S30805M	n/a
7	n/a	n/a	S30806E-A	S30806G-A	n/a	n/a
10	S30807B	S30807F-A	S30807E-A	S30807G-A	S30807M	S30807T
15	S30808B	S30808F-A	S30808E-A	S30808G-A	S30808M	S30808T
20	n/a	S30809F-A	S30809E-A	S30809G-A	n/a	n/a

Formats : 100 g, 500 g, 1 kg, 5 kg, 10 kg, 25 k g, ... up to multi-ton scale.

« I was able to separate two very close diastereomers that were inseparable using reverse phase HPLC.»

Jeff Warrington from Cytokenitics, South SanFrancisco, CA, USA

Bonded Silia*Sphere* Spherical Silica Gels Ordering Information

The table below presents the most popular Silia*Sphere* bonded phases available from SiliCycle. Please note that we can provide phases below on any of our othe silica gels and all other sorbents, please contact us.

Bonded Silia*Sphere* Spherical Silica Gels Ordering Information						
Particle Size (µm)	Pore Diameter (Å)					
	60 Å	80 Å	100 Å	120 Å	300 Å	1,000 Å
Amine Silia*Sphere* Monodispersed Spherical Silica (*endcapped*)						
1.8	n/a	S52001F-A	S52001E-A	S52001G	n/a	n/a
2.2	n/a	S52002F-A	S52002E-A	S52002G	n/a	n/a
3	S52003B	S52003F-A	S52003E-A	S52003G-A	S52003M	n/a
5	S52005B	S52005F-A	S52005E-A	S52005G-A	S52005M	n/a
7	n/a	n/a	S52006E-A	S52006G-A	n/a	n/a
10	S52007B	S52007F-A	S52007E-A	S52007G-A	S52007M	S52007T
15	S52008B	S52008F-A	S52008E-A	S52008G-A	S52008M	S52008T
20	n/a	S52009F-A	S52009E-A	S52009G-A	n/a	n/a

Formats : 100 g, 500 g, 1 kg, 5 kg, 10 kg, 25 kg, ... up to multi-ton scale.

Bonded Silia*Sphere* Spherical Silica Gels Ordering Information						
Particle Size (µm)	Pore Diameter (Å)					
	60 Å	80 Å	100 Å	120 Å	300 Å	1,000 Å
Cyano Silia*Sphere* Monodispersed Spherical Silica (*endcapped*)						
1.8	n/a	S38001F-A	S38001E-A	S38001G	n/a	n/a
2.2	n/a	S38002F-A	S38002E-A	S38002G	n/a	n/a
3	S38003B	S38003F-A	S38003E-A	S38003G-A	S38003M	n/a
5	S38005B	S38005F-A	S38005E-A	S38005G-A	S38005M	n/a
7	n/a	n/a	S38006E-A	S38006G-A	n/a	n/a
10	S38007B	S38007F-A	S38007E-A	S38007G-A	S38007M	S38007T
15	S38008B	S38008F-A	S38008E-A	S38008G-A	S38008M	S38008T
20	n/a	S38009F-A	S38009E-A	S38009G-A	n/a	n/a

Formats : 100 g, 500 g, 1 kg, 5 kg, 10 kg, 25 kg, ... up to multi-ton scale.

« SiliCycle provided improved peak shape for an acidic compounds improving our yield off the column. »

Sean Brown from Amgen, South San Francisco, CA, USA

SiliaChrom®
HPLC Columns

Greyhound Chromatography and Allied Chemicals
6 Kelvin Park, Birkenhead, Merseyside CH41 1LT United Kingdom
Tel: +44 (0)151 649 4000 Fax: +44 (0)151 649 4001
sales@greyhoundchrom.com

www.greyhoundchrom.com

Silia*Chrom* HPLC Columns

Using Silia*Chrom* HPLC Columns in chromatographic applications ensures the following:

- Excellent column efficiency.
- Long lifetime and column-to-column reproducibility.
- Broad pH range from 0.8 to 12.
- Compatibility with 100% aqueous and organic mobile phases.
- High surface coverage presenting no bleeding for LC-MS applications.

Presentation of the Silia*Chrom* HPLC Column Series

SiliCycle manufactures a variety of HPLC columns for reversed and normal phase applications. The Silia*Chrom* series contain more than 40 different phases, and we continue to develop additional, unique and powerful HPLC sorbents. Most of the Silia*Chrom* are silica-based products. You can be assured of the quality, from raw material synthesis through to the packing process.

We pack bonded phases in a wide range of column dimensions, including standard narrow bore and analytical columns in lengths of 20 to 250 mm, internal diameters (*ID*) of 2.0 - 4.6 mm, with particle sizes of 2.5, 3.0, 5.0, 10.0 or 20.0 µm. Also, preparative and semi-preparative HPLC columns are available, in 10, 20, 30 and 50 mm ID with lengths of 50, 100, 150 and 250 mm with particle sizes of up to 20 µm. These columns exhibit superior performances for any type of compound. The Silia*Chrom* series, with its unique sol-gel process technology, offers the total solution for HPLC end-users: broad pH range (*0.5 - 12*), compatibility with 100% aqueous and organic mobile phases, low bleeding for LC-MS, high surface coverage, and excellent column efficiency. All columns are packed using a consistent proprietary packing process to achieve uniform and stable bed for long lifetime and column-to-column reproducibility.

The Silia*Chrom* HPLC portfolio offers a broad variety of separations for various types of chromatography such as biochromatography of large molecules, size exclusion chromatography for large proteins and peptides, chiral chromatography for enantioselective separations and supercritical fluid chromatography for API separations. The following pages will highlight Silia*Chrom* phases that can be used for these applications.

SiliCycle; Experts in HPLC Column Packing

Superior HPLC columns can be produced only with excellent packing materials and excellent packing techniques. Silia*Chrom* columns are made from extremely pure silicas and are well known for their high efficiency and high resolution capacity. Based on spherical, totally porous silica, Silia*Chrom* columns provide enhanced chemical and mechanical stability as well as very high loading capacity and full end-capping.

All Silia*Chrom* columns are packed using a proprietary slurry packing process to achieve uniform and column-to-column reproducibility. Silia*Chrom* columns have good selectivity, good asymmetry and long lifetime for HPLC separation of acidic, neutral and basic organic compounds, polar or non-polar.

Standard HPLC Columns

Silia*Chrom* HPLC columns are available in Narrow Bore, Analytical, Semi-Preparative, and Preparative formats.

Silia*Chrom* HPLC Standard Column Dimensions

		Silia*Chrom* HPLC Column Length (mm)						
		20	30	50	100	150	200	250
Particle Size (µm)		2.5, 3 & 5	2.5, 3 & 5	2.5, 3, 5, 7 & 10	2.5, 3, 5, 7, 10 & 20	2.5, 3, 5, 7, 10 & 20	5 & 10	2.5, 3, 5, 7, 10 & 20
Silia*Chrom* HPLC Column Internal Diameter (mm)	2.0	S	S	S	S	S	C	C
	2.1	S	S	S	S	S	C	C
	3.0	C	S	S	S	S	C	C
	4.6	C	S	S	S	S	S	S
	10	C	C	C	S	S	S	S
	20	C	C	C	C	S	S	S
	30	C	C	C	S	S	S	S
	50	C	C	C	S	S	S	S
	100	C	C	C	C	C	C	C

S = Standard C = Custom

« SiliCycle has been able to repeatedly come through and produce high quality semi-prep HPLC columns (50+ mm ID) for several different projects that we have done. For many of these projects prices is not the driving force, the timing is.»

Jason Blanchard from Ricerca Biosciences, Concord, OH, USA

Column Packing Reproducibility

SiliCycle is recognized for its strong expertise in column packing technology. All Silia*Chrom* columns are packed using a consistent packing methodology to achieve an extremely stable and uniform column packing bed leading to high column lifetime and column-to-column reproducibility. To prove this, we packed and tested several analytical columns 4.6 x 250 mm using the same Silia*Sphere* C18 3 µm, 100 Å for reproducibility and high efficiency evaluation.

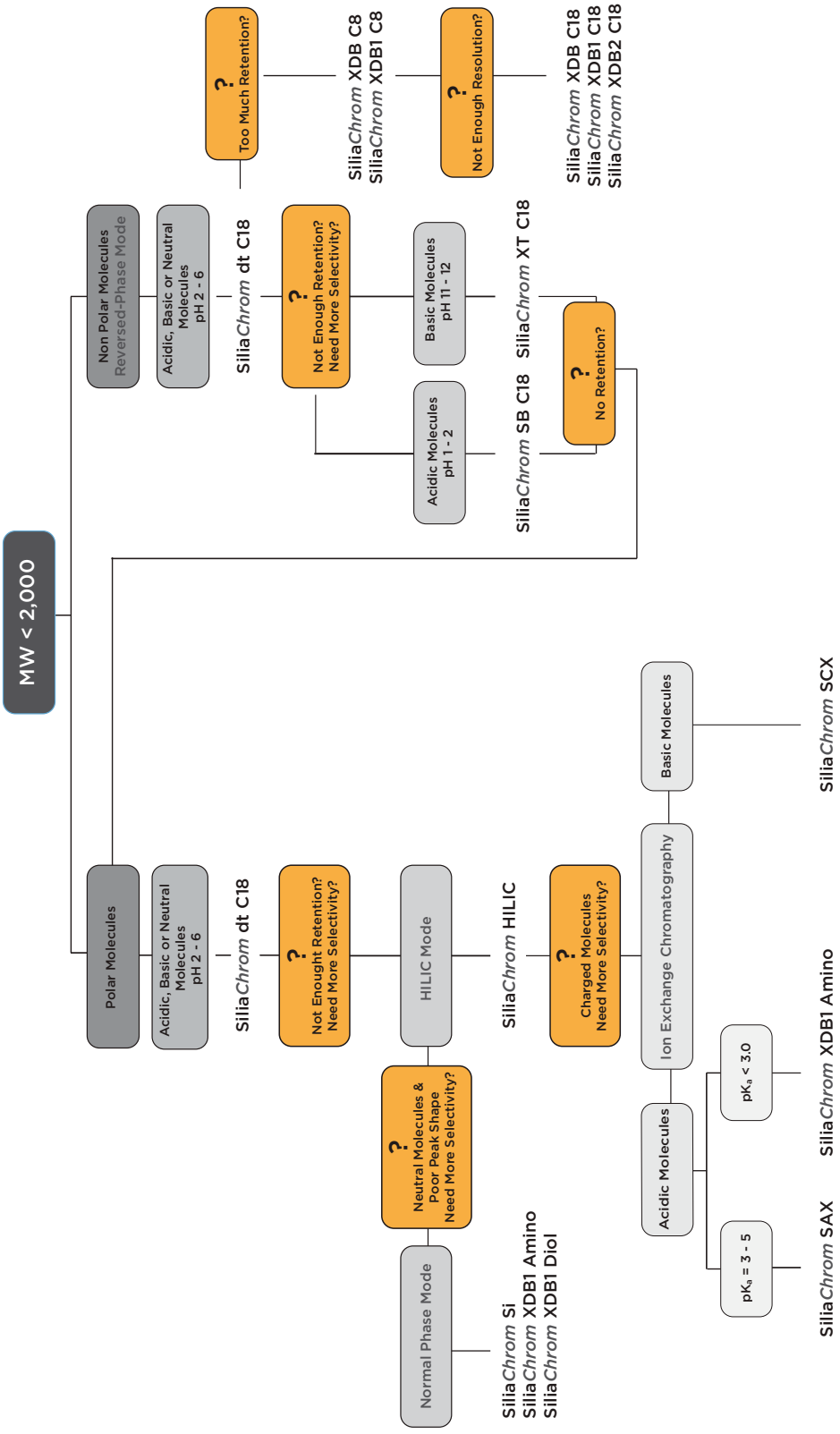
Chromatographic conditions

- **Sample mixture in mobile phase**: Uracil / Phenol / Nitrobenzene / Naphtalene
- **Injection volume**: 2 µL
- **Temperature**: 30°C
- **Flow rate**: 0.8 mL/min
- **Mobile phase**: 15% Water, 85% Methanol

Observed Column Parameters for Napthalene			
Column Number	Retention Time (min)	Theoretical Plates Number / meter	Tailing Factor
1	9.148	28,481	1.01
2	9.382	28,391	1.00
3	9.398	28,712	1.00
4	8.998	28,150	1.01
5	9.307	28,393	1.00
6	9.307	28,267	1.03
7	9.015	28,153	1.04
8	9.373	28,801	1.06
9	9.298	28,357	1.00
10	9.298	28,206	1.04
Average	9.252	28,391	1.02
Standard Deviation	0.147	222	0.02
Relative Standard Deviation	1.589	0.783	2.14

SiliaChrom Selection Guide for Small Molecules

(Molecular Weight < 2,000 Dalton)



Silia*Chrom* HPLC columns Portfolio

How to build your Part Number

Silia*Chrom* HPLC columns are available in Narrow Bore, Analytical, Semi-Preparative, and Preparative sizes.

Below is an example of a Silia*Chrom* product number that shows you the way they are structured;

The product numbers start with the **phase** code, followed by the **particle size**, the **pore size**, the **internal diameter**, and finally the **length** codes.

Note: For Guard Columns, add the letter "G" between the "H" and the phase code.

Example;

Silia*Chrom* dt C18, 3 µm, 100 Å, 4.6 mm x 150 mm = H141803E-N150

Particle Size	
µm	Code
2.5	02
3.0	03
5.0	05
7.0	06
10	07
20	09

Pore Size	
Å	Code
100	E
150	H
300	M

Internal Diameter		
Type of Columns	mm	Code
Narrow Bore	2.0	E
Narrow Bore	2.1	G
Narrow Bore	3.0	H
Analytical	4.6	N
Semi-Preparative	10	Q
Preparative	20	Y
Preparative	30	V
Preparative	50	W
Preparative	100	X

Column Length	
mm	Code
10	010
20	020
30	030
50	050
100	100
150	150
200	200
250	250

Particle Size

Pore Size

Internal Diameter

Column Length

*You may also find and buy your Silia*Chrom* online at www.silicycle.com/products/siliachrom-hplc-columns

phase code

SiliaChrom HPLC column Characteristics

SiliaChrom	Particle Size (µm)	Pore Size (Å)	Specific Surface Area (m^2/g)	Carbon Load (%)	pH Range	USP Code	T Limit* (°C)	Pressure Limit (psi)	Phase Code
SiliaChrom AQ C18	3, 5, 10	100	380	18	1.5 - 9.0	L1	60	5,000	H1518
SiliaChrom AQ C8	3, 5, 10	100	380	14	1.5 - 9.0	L7	60	5,000	H1508
SiliaChrom dt C18	2.5, 3, 5, 10	100	410 - 440	18	1.5 - 9.0	L1	60	5,000	H1418
SiliaChrom dt Si	3, 5, 10	100	410 - 440	n/a	1.0 - 8.0	L3	45	4,500	H1430
SiliaChrom XT C18	3, 5, 10	150	200	15	1.5 - 12.0	L1	60	5,000	H1718
SiliaChrom XT Fidelity C18	3, 5, 10	100	380	21	1.5 - 12.0	L1	60	5,000	HF1718
SiliaChrom SB C18	3, 5, 10	150	200	12	0.5 - 7.5	L1	60	4,500	H1018
SiliaChrom SB C18-300	5	300	80	5	0.5 - 7.5	L1	60	4,500	H1018
SiliaChrom SB C8	5	150	200	7	1.0 - 7.5	L7	60	4,500	H1008
SiliaChrom SB C8-300	5	300	80	3	1.0 - 7.5	L7	60	4,500	H1008
SiliaChrom XDB C18	5	150	200	15	1.5 - 9.0	L1	60	5,500	H1118
SiliaChrom XDB C8	5	150	200	8	1.5 - 9.0	L7	60	5,500	H1108
SiliaChrom XDB Si	5	150	200	n/a	1.0 - 8.0	L3	45	4,000	H1100
SiliaChrom XDB1 C18	3, 5	100	380 - 400	22	1.5 - 10.0	L1	60	5,500	H1218
SiliaChrom XDB1 C18-300	5, 10	300	80	8	1.5 - 9.0	L1	60	5,500	H1218
SiliaChrom XDB1 C8	5, 10	100	380 - 400	14	1.5 - 8.5	L7	60	5,500	H1208
SiliaChrom XDB1 C8-300	5	300	80	4	1.5 - 8.5	L7	60	5,500	H1208
SiliaChrom XDB1 C4	5	100	380 - 400	7	1.5 - 8.5	L26	60	5,500	H1204
SiliaChrom XDB1 C4-300	3, 5, 10	300	80	3	2.0 - 8.0	L26	60	5,500	H1204
SiliaChrom XDB1 C1	5	100	380 - 400	3	1.5 - 8.5	L13	60	5,500	H1201
SiliaChrom XDB1 C1-300	5	300	80	1	2.0 - 8.0	L13	60	5,500	H1201
SiliaChrom XDB1 CN	5, 10	100	380 - 400	5	2.0 - 8.5	L10	60	5,500	H1220
SiliaChrom XDB1 CN-300	5	300	80	3.5	2.0 - 8.0	L10	60	5,500	H1220
SiliaChrom XDB1 Amino	5, 10	100	380 - 400	7	2.0 - 8.5	L8	45	5,500	H1260
SiliaChrom XDB1 Amino-300	5	300	80	3.5	2.0 - 8.0	L8	45	5,500	H1260
SiliaChrom XDB1 Phenyl	5	100	380 - 400	12	1.5 - 9.0	L11	60	4,000	H1240
SiliaChrom XDB1 Phenyl-300	5	300	80	4.5	2.0 - 8.0	L11	60	4,000	H1240
SiliaChrom XDB1 Diol	5	100	380 - 400	5	2.0 - 8.0	L20	45	4,000	H1250
SiliaChrom XDB1 Diol-300	5	300	80	1	2.0 - 8.0	L20	45	4,000	H1250
SiliaChrom XDB1 Si	3, 5, 10	100	380 - 400	n/a	1.0 - 8.0	L3	45	4,000	H1230
SiliaChrom XDB1 Si-300	3, 5, 10	300	80	n/a	2.0 - 8.0	L3	45	4,000	H1230
SiliaChrom XDB2 C18	3, 5, 10	100	380	18	1.5 - 9.0	L1	60	5,000	H1318
SiliaChrom SCX	3, 5, 10	150	200	10	2.0 - 8.5	L9	45	5,000	H1800
SiliaChrom SCX-300	3, 5	300	80	3.5	2.0 - 8.0	L9	45	5,000	H1800
SiliaChrom SAX	3, 5, 10	100	380	6	2.0 - 8.5	L14	45	5,000	H1900
SiliaChrom SAX-300	3, 5	300	80	1	2.0 - 8.0	L14	45	5,000	H1900
SiliaChrom HILIC	3, 5, 10	100	380	8	2.0 - 8.0	-	60	5,000	H1600
SiliaChrom HILIC-300	5	300	80	2.5	2.0 - 8.0	-	60	5,000	H1600
SiliaChrom RPC	5, 7, 10, 20	n/a	750	polymer	1.0 - 14.0	L21	-	-	H920
SiliaChrom GF	5, 10	100	340	5	2.0 - 8.0	-	45	4,000	H900
SiliaChrom GF-300	5, 10	300	80	1	2.0 - 8.0	-	45	4,000	H900
SiliaChrom GF AMIDE	5, 10	100	340	5	2.0 - 8.0	-	60	4,000	H901
SiliaChrom GF AMIDE-300	5, 10	300	80	1	2.0 - 8.0	-	60	4,000	H901
SiliaChrom Cellulose T-DPC	5, 10	-	-	n/a	2.0 - 7.0	L40	40	< 700	H800
SiliaChrom Cellulose T-MB	5, 10	-	-	n/a	2.0 - 7.0	-	40	< 700	H820
SiliaChrom Amylose T-DPC	5, 10	-	-	n/a	2.0 - 7.0	L51	40	< 700	H810

SiliaChrom HPLC Selection Guide by Manufacturer

SiliaChrom HPLC Selection Guide by Manufacturer				
SiliaChrom HPLC Column	Agilent®	Eka Chemicals® (AksoNobel)	EMD Merck®	Phenomenex®
Reversed-Phases				
SiliaChrom dt C18 **SiliaChrom AQ C18**	Zorbax® SB Aq			Synergy™ Hydro RP Synergy™ Fusion RP
SiliaChrom XT C18	Zorbax® Extend C18	Kromasil® Eternity		Gemini® C18
SiliaChrom XT Fidelity C18	Zorbax® Extend C18	Kromasil® Eternity		Gemini®-NX C18
SiliaChrom SB C18	Zorbax® SB C18			
SiliaChrom SB C8	Zorbax® SB C8			
SiliaChrom XDB C18	Pursuit™ C18 Zorbax® XDB C18			
SiliaChrom XDB C8	Pursuit™ C8 Zorbax® XDB C8			
SiliaChrom XDB1 C18	Pursuit™ XRS C18	Kromasil® C18	LiChrospher® RP18e	Luna® C18
SiliaChrom XDB1 C8	Pursuit™ XRS C8	Kromasil® C8	LiChrospher® RP8	Luna® C8
SiliaChrom XDB1 Phenyl	Zorbax® SB Phenyl	Kromasil® Phenyl		
SiliaChrom XDB1 CN	Zorbax® SB CN			Luna® CN
SiliaChrom XDB2 C18	Zorbax® Eclipse Plus C18 Zorbax® Rx C18			Luna® C18(2)
Normal Phases				
SiliaChrom XDB1 Si	Zorbax® SIL Pursuit® XRS Si	Kromasil® Si	LiChrospher® Si 100	Luna® Silica
SiliaChrom XDB1 Diol		Kromasil® Diol	LiChrospher® Diol	Luna® Diol
SiliaChrom XDB1 Amino	Zorbax® SB NH_2	Kromasil® NH_2		Luna® NH_2
Ion Exchange Phases				
SiliaChrom SCX				Luna® SCX
SiliaChrom SAX	Agilent® SB-AX			Luna® SAX

SiliaChrom HPLC Chiral Selection Guide by Manufacturer				
SiliaChrom Chiral Column	Daicel	Eka Chemicals (AksoNobel)	Phenomenex	Supelco
SiliaChrom Cellulose T-DPC	ChiralCell® OD	Kromasil® CelluCoat	Lux® Cellulose-1	Astec™ Cellulose DMP
SiliaChrom Cellulose T-MB	ChiralCell® OJ		Lux® Cellulose-3	
SiliaChrom Amylose T-DPC	Chiralpak™ AD			

Supelco®	Thermo Fisher Scientific®	YMC®	Waters®	Others
	Acclaim® Polar Advantage Hypersil™ GOLD aQ C18	YMC™-PACK ODS -AQ	Atlantis® T3 Symmetry™ Shiels C18	Inertsil® ODS-3 ACE AQ C18
		YMC™ Triart C18	XTerra® C18	Nucleodur® C18 HTec
		YMC™ Triart C18	XBridge™ C18	
			X-Select™ CSH C18	
Discovery® C18 SUPELCOSIL™ LC-18-DB		YMC™-PACK ODS-A		Pinnacle™ DB C18
		YMC™-PACK C8		Pinnacle™ DB C8
Ascentis® C18		YMC™-PACK Pro RS	Sunfire™ C18 Symmetry™ C18	Ace® C18 HL Alltima™ HP C18 HiLoad
Ascentis® C8	Acclaim® C8	YMC™-PACK Pro C8	Sunfire™ C8 Symmetry™ C8	Ultra™ C8 ProntoSIL™ C8 SH
Ascentis® Phenyl	Hypersil® Phenyl	YMC™-PACK Ph		Ace® Phenyl ProntoSIL™ Phenyl
Ascentis® Cyano	Hypersil® Cyano	YMC™-PACK CN		ACE® CN
	Acclaim® 120 C18	YMC™-PACK Pro C18	SunFire™ C18	Ace® C18 Pinnacle™ II C18
Ascentis® Si		YMC™-PACK SIL	SunFire™ Si	Partasil™ Silica Nucleodur® SiOH
		YMC™-PACK Diol NP		ProntoSIL® Diol
	Acclaim® WAX	YMC™-PACK NH_2	Spherisorb® Amino	Ultra® Amino ProntoSIL® Amino E
	Hypersil® SCX		Spherisorb® SCX	Nucleosil® SCX Partisil® SCX
	Hypersil® SAX		Spherisorb® Amino	Nucleosil® SAX Partisil® SAX

« Your analytical HPLC columns are the best!
I improved my separations with several of my methods and
got an award for my efforts. Thanks for the great products!!! »

Cliff Klimas from Bristol-Myers-Squibb, Pennington, NJ, USA

Silia*Chrom* HPLC Selection Guide by USP Code

Silia*Chrom* HPLC Selection Guide by USP Code			
USP Code	Packing Type	Description	Silia*Chrom* HPLC Columns
L1	Bonding: Octadecyl (C18) Support Type: Silica Particle size: 1.5 – 10 µm	Octadecyl silane chemically bonded to porous or non-porous silica or ceramic micro-particles, 1.5 to 10 µm in diameter, or a monolithic rod	Silia*Chrom* dt C18 Silia*Chrom* AQ C18 Silia*Chrom* XT C18 Silia*Chrom* XT Fidelity C18 Silia*Chrom* SB C18 Silia*Chrom* XDB C18 Silia*Chrom* XDB1 C18 Silia*Chrom* XDB2 C18
L3	Bonding: Silica Support Type: Silica Particle size: 1.5 – 10 µm	Porous silica particles, 1.5 to 10 µm in diameter, or a monolithic silica rod.	Silia*Chrom* dt Si Silia*Chrom* XDB Si Silia*Chrom* XDB1 Si
L7	Bonding: Octyl (C8) Support Type: Silica Particle size: 1.5 – 10 µm	Octylsilane chemically bonded to totally or superficially porous silica particles, 1.5 to 10 µm in diameter, or a monolithic silica rod.	Silia*Chrom* AQ C8 Silia*Chrom* SB C8 Silia*Chrom* XDB C8 Silia*Chrom* XDB1 C8
L8	Bonding: Amine (NH2) Support Type: Silica Particle size: 1.5 – 10 µm	An essentially monomolecular layer of aminopropylsilane chemically bonded to totally porous silica gel support, 1.5 to 10 µm in diameter.	Silia*Chrom* XDB1 Amino
L9	Bonding: Strong cation exchange Support Type: Silica Particle size: 3 – 10 µm	Irregular or spherical, totally porous silica gel having a chemically bonded, strongly acidic cation-exchange coating, 3 to 10 µm in diameter.	Silia*Chrom* SCX
L10	Bonding: Nitrile (CN) Support Type: Silica Particle size: 1.5 – 10 µm	Nitrile groups chemically bonded to porous silica particles, 1.5 to 10 µm in diameter.	Silia*Chrom* XDB1 CN
L11	Bonding: Phenyl Support Type: Silica Particle size: 1.5 – 10 µm	Phenyl groups chemically bonded to porous silica particles, 1.5 to 10 µm in diameter.	Silia*Chrom* XDB1 Phenyl
L13	Bonding: TMS (C1) Support Type: Silica Particle size: 3 – 10 µm	Trimethylsilane chemically bonded to porous silica particles, 3 to 10 µm in diameter.	Silia*Chrom* XDB1 C1
L14	Bonding: Strong anion exchange Support Type: Silica Particle size: 5 – 10 µm	Silica gel having a chemicallly bonded, strongly basic quaternary ammonium anion-exchange coating, 5 to 10 µm in diameter.	Silia*Chrom* SAX
L17	Bonding: Strong cation exchange Support Type: Polymer Particle size: 6 – 12 µm	Strong cation-exchange resin consisting of sulfonated cross-linked styrene-divinylbenzene copolymer in the hydrogen form, 6 to 12 µm in diameter.	Silia*Chrom* IEC SC-H
L21	Bonding: N/A Support Type: Polymer Particle size: 3 – 30 µm	A rigid, spherical styrene-divinylbenzene copolymer, 3 to 30 µm in diameter.	Silia*Chrom* RPC
L22	Bonding: Strong cation exchange Support Type: Polymer Particle size: ~10 µm	A cation-exchange resin made of porous polystyrene gel with sulfonic acid groups, about 10 µm in size.	Silia*Chrom* IEC SC-M
L26	Bonding: Butyl (C4) Support Type: Silica Particle size: 1.5 – 10 µm	Butyl silane chemically bonded to totally porous silica particles, 1.5 to 10 µm in diameter.	Silia*Chrom* XDB1 C4
L40	Bonding: Chiral Support Type: Silica Particle size: 5 – 20 µm	Cellulose tris-3,5-dimethylphenylcarbamate coated porous silica particles, 5 to 20 µm in diameter.	Silia*Chrom* Chiral Cellulose T-DPC
L42	Bonding: Mixed-mode C18/C8 Support Type: Silica Particle size: ~5 µm	Octylsilane and octadecylsilane groups chemically bonded to porous silica particles, 5 µm in diameter.	Silia*Chrom* C18/C8
L51	Bonding: Chiral Support Type: Silica Particle size: 5 – 10 µm	Amylose tris-3,5-dimethylphenylcarbamate-coated, porous, spherical, silica particles, 5 to 10 µm in diameter.	Silia*Chrom* Chiral Amylose T-DPC

How to Choose the Right Silia*Chrom* C18 Phase

C18 reversed-phase is the most used sorbent for HPLC applications. SiliCycle has developed over the years several C18 phases for specific analytes and/or matrices. The table below presents all Silia*Chrom* C18 phases available in the SiliCycle portfolio including a short description and characteristics. This table will help you choose the right Silia*Chrom* C18 phase based on your separation needs.

Silia*Chrom* C18 Reversed-Phase Characteristics

Silia*Chrom* Phases	Description	%C	Pore Size (Å)	Surface Area (m^2/g)	pH Stability Range	Phase Description
Silia*Chrom* dt C18 **Silia*Chrom* AQ C18**	**Universal 100% aqueous compatible C18 column.** Most versatile column of the SiliCycle portfolio. Great retention for hydrophilic compounds. High sensitivity for LC-MS analysis. Same C18 functionalization but the Silia*Chrom* dt C18 is free of metal content.	18	100	410 - 440 380	1.5 - 9.0	Page 101
Silia*Chrom* SB C18	**Column designed for extremely low pH conditions** Compatibility with 100% aqueous mobile phase. Great sensitivity for LC-MS.	12	150	200	0.5 - 7.5	Page 107
Silia*Chrom* XT C18	**High stability under high pH conditions** Ideal for basic compounds.	15	150	380	1.5 - 12.0	Page 109
Silia*Chrom* XT Fidelity C18	**Excellent stability under extreme pH and temperature conditions** Ideal HPLC column for either metabolic or metabolite analysis.	21	150	380	1.5 - 12.0	Page 109
Silia*Chrom* XDB1 C18	**Highest level of hydrophobicity of the SiliCycle C18 phases** Designed for dirty samples. Oldest C18 phase technology.	22	100	380 - 400	1.5 - 10.0	Page 112
Silia*Chrom* XDB2 C18	**Mid-level hydrophobicity and most popular phase for QC analysis** Typical average value of carbon loading.	18	100	380 - 400	1.5 - 9.0	Page 114
Silia*Chrom* XDB C18	**Lowest level of hydrophobocity of the SiliCycle C18 phase** Ideal for separation of highly hydrophobic molecules such as fatty acids, barbiturates, fat-soluble vitamins & steroids.	15	150	200	1.5 - 9.0	Page 111
Silia*Chrom* XDB1 C18-300	**Highest level of hydrophobicity for a C18 with wide pore size** Designed for biochromatography applications (*peptides, proteines or nucleic acids*).	8	300	80	1.5 - 9.0	Page 112

« Needed a set of columns that work with a wide pH range. SiliaChrom XT columns did the trick. »

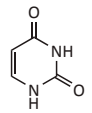
Victor Nicolaev from Sanofi, Oro Valley, AZ, USA

Silia*Chrom* Reversed-Phase HPLC Column Character Evaluation

Our Silia*Chrom* HPLC columns are evaluated by USP and NIST tests for classification purpose and based on the selectivity chart. These tests allow the characterization and the comparison of various HPLC columns in order to determine the following parameters: void volume, retention capacity of hydrophobic compound, selectivity, efficiency and silanol activity. To run this test, we use a mixture of the five organic compounds listed below. Furthermore, we used the same test for side-by-side comparison on various Silia*Chrom* C18 columns against three well-known suppliers[1].

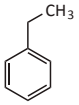
Reaction Mixture

- **Uracil (1)**: void volume marker (T_0)
- **Toluene (2)**: retention capacity of hydrophobic compounds (k'_{Tol})
- **Ethylbenzene (3)**: marker for the calculation of column efficiency for hydrophobic compounds ($k'_{Ethylbenzene}$)
- **Ratio Toluene/Ethylbenzene**: determination of selectivity ($\alpha_{Ethylbenzene/Toluene}$)
- **Amitriptyline (4)**: activity towards bases (*silianol activity evaluation*)
- **Quinizarin (5)**: activity towards chelating reagents (*metal contamination evaluation*)

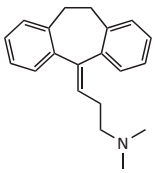


Uracil (1)

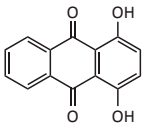
Toluene (2)



Ethylbenzene (3)



Amitriptyline (4)



Quinizarin (5)

Description of the Column Aspects Evaluated

Hydrophobicity is measured by the retention factor of the hydrophobic analyte (*ethylbenzene*) using the following equation:

$$k' = \frac{(T_R - T_0)}{T_0} = \frac{\text{Ethylbenzene retention time – Uracil retention time (}\textit{Void volume}\text{)}}{\text{Uracil retention time (}\textit{Void volume}\text{)}}$$

Selectivity (α) is measured by the retention factor ratio between two similar compounds, ethylbenzene (k_2) and toluene (k_1):

$\alpha = k_2/k_1$

Column Efficiency is usally measured by the plate count (*N*) obtained for the ethylbenzene peak.

Chelating Tailing Factor – Metal Content is measured by the quinizarin peak symmetry. A symmetric peak shape indicates low activity toward chelating agent (*absence of metals*) and an asymmetric peak shape indicates the presence of metals by peak tailing (*high activity toward chelating reagents*).

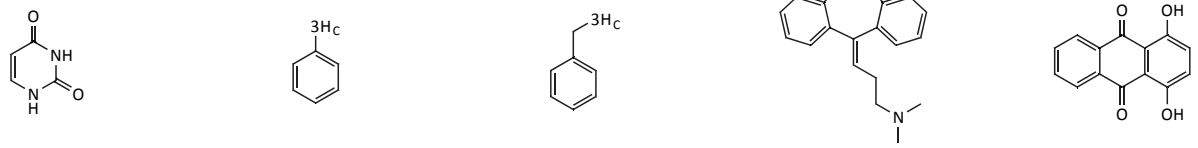
Tailing Factor of Amitriptyline (Amitr.) – Silanol Activity is measured by the peak symmetry of amitriptyline (*basic compound*). Important silanol activity is often associated with peak tailing or an asymmetric peak. In other words, a highly deactivated column will have a lower peak asymmetry.

Chromatographic conditions:

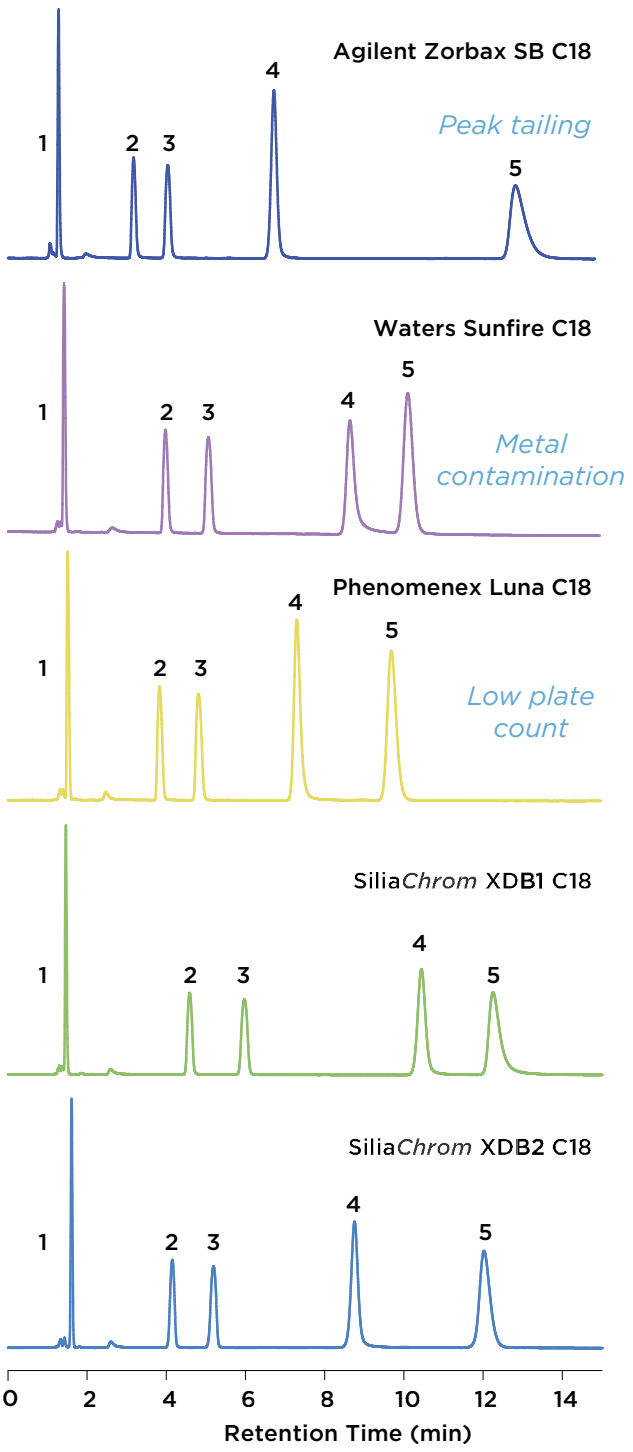
- **HPLC System**: Thermo Surveyor with PDA
- **HPLC Software**: *Xcalibur handling version 2.0*
- **Column Size**: All HPLC columns: 4.6 x 150 mm, 5 µm
- **Mobile Phase**: Methanol/buffer (*80/20, v/v*)
- **Buffer**: 20 mM of phosphate buffer adjusted at pH=7.0
- **Temperature**: 30°C
- **Flow rate**: 1.000 mL/min
- **Temperature**: UV scan (*PDA*), Total scan 200-600 nm

([1]Pharmacopeial Forum, Vol. 31(2) March-Apr. 2005, p.637)

SiliaChrom C18 HPLC Columns Versus the Competition



Uracil (1) Toluene (2) Ethylbenzene (3) Amitriptyline (4) Quinizarin (5)



C18 Column Character Evaluation Comparaison

HPLC Columns	Hydrophobicity k' Toluene	Hydrophobicity k' Ethylbenz.	Selectivity α Ethylbenz./Tol.
SiliaChrom XDB1 C18	2.14	3.09	1.44
SiliaChrom XDB2 C18	0.61	2.22	1.41
Phenomenex Luna C18	1.50	2.13	1.42
Agilent Zorbax SB C18	1.38	2.01	1.45
Waters Sunfire C18	1.72	2.45	1.43

C18 Column Character Evaluation Comparaison

HPLC Columns	Efficiency N (/ meter) Ethylbenz.	Efficiency R	Metal Content A_s Quinizarin	Silanol Activity TF Amitr.
SiliaChrom XDB1 C18	45,000	4.73	1.09	1.65
SiliaChrom XDB2 C18	28,000	3,30	1.10	1.18
Phenomenex Luna C18	22,000	2.90	1.23	1.20
Agilent Zorbax SB C18	25,000	3.20	1.10	1.55
Waters Sunfire C18	35,500	3.90	1.80	1.12

Results interpretation:

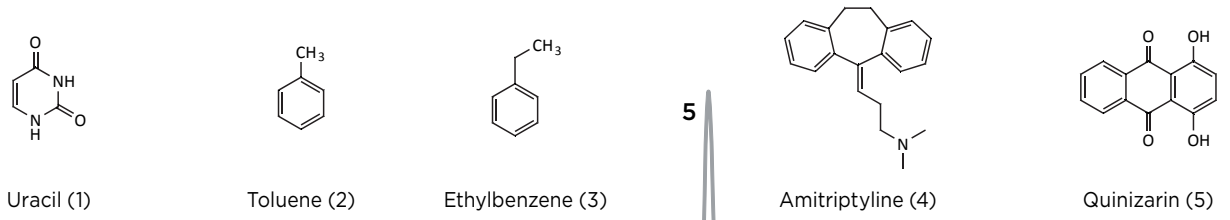
SiliaChrom columns compared advantageously over the competition; they present high column performances and with our wide portfolio, you can select the most suitable phase depending on the compound's nature. For example:

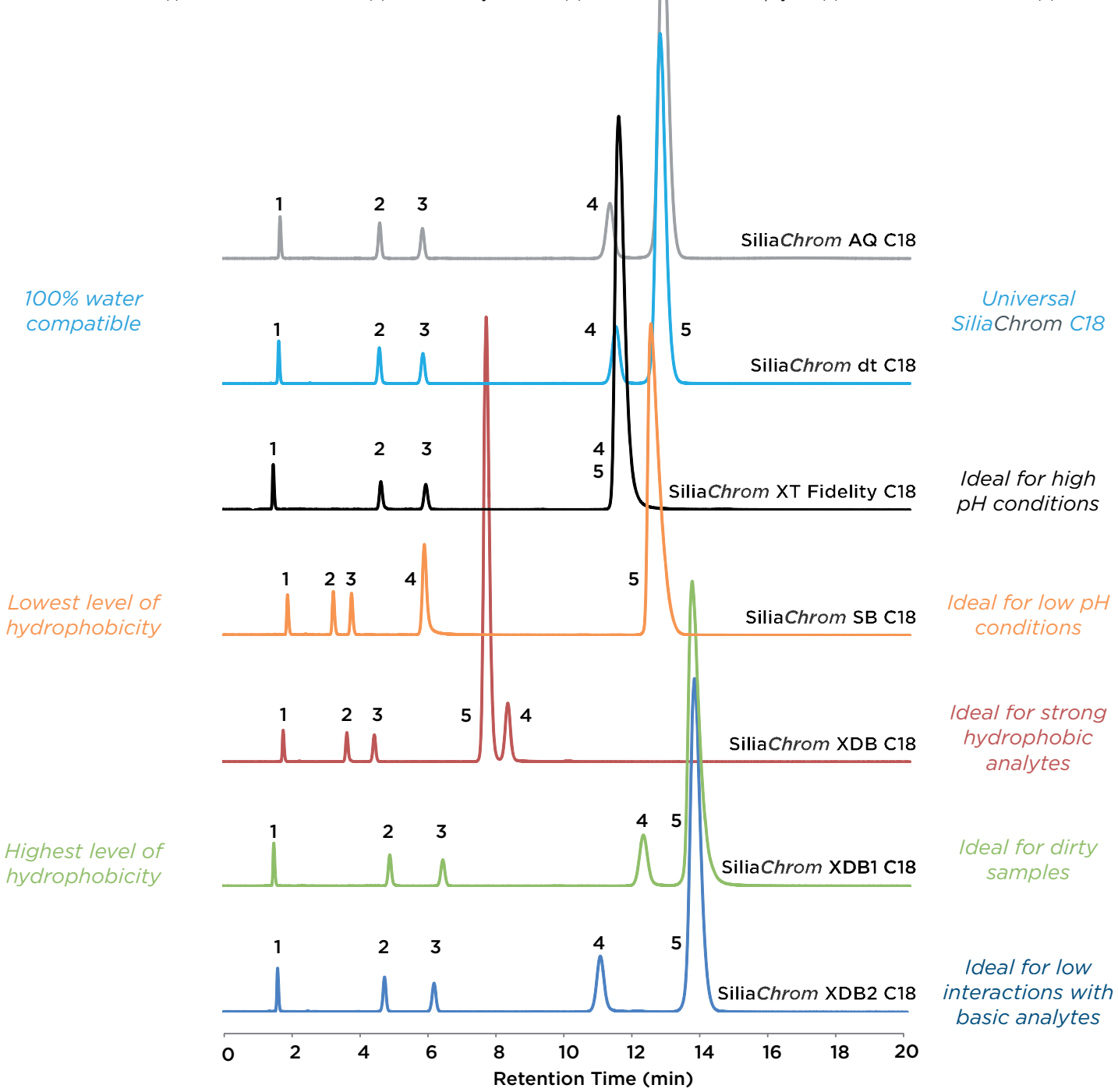
Basic analytes: SiliaChrom XDB2
Less polar analytes: SiliaChrom XDB1

The SiliaChrom columns performed very well compared to the competition. The Phenomenex Luna C18 has a lower efficiency as shown by its plate count (*N*). The Agilent Zorbax SB C18 column, shows peak tailing for amitriptyline which means that there are still some free OH presents on the surface (*activity towards bases*). Finally, the Waters Sunfire C18 seems to have high metal impurities as shown by the peak asymmetry obtained for quinizarin.

Full Range of Selectivity with Silia*Chrom* C18 HPLC Columns

Our most popular Silia*Chrom* reversed-phase C18 HPLC columns were evaluated by USP and NIST tests for classification purpose based on the selectivity chart. Select the most suitable Silia*Chrom* C18 based on your sample's properties.





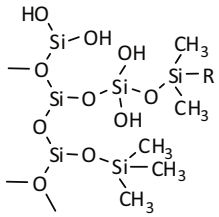
SiliaChrom dt C18
SiliaChrom AQ C8 and C18

Description

Universal 100% aqueous compatible HPLC columns **SiliaChrom dt** adsorbent presents an optimum ratio of C18 short TMS chains and some free silanol groups. This new technology shows good peak shapes for any type of molecule (*acid, neutral and base*). The silica framework is exempt of any metal permitting a high sensivity for LC-MS applications.

SiliaChrom AQ presents the same modified surface chemistry as dt but the silica framework contain low level of metal. C8 and C18 functions are available.

Structure



For C18 R = $(CH_2)_{17}CH_3$

SiliaChrom dt Purity: 99.9999% SiO_2 (*no metal content*)

SiliaChrom AQ Purity: 99.999% SiO_2

Sorbent Characteristics

- **Pore Size: 100 Å**
- **Specific Surface Area: SiliaChrom dt C18 410 - 440 m²/g**
  SiliaChrom AQ C8 & C18 380 m²/g
- **Particle Sizes Available: 2.5, 3, 5 and 10 µm**
- **USP Code: SiliaChrom dt C18 and AQ C18: L1**
  SiliaChrom AQ C8: L7
- **Typical Carbon Loading: SiliaChrom dt & AQ C18: 18%**
  SiliaChrom AQ C8 14%

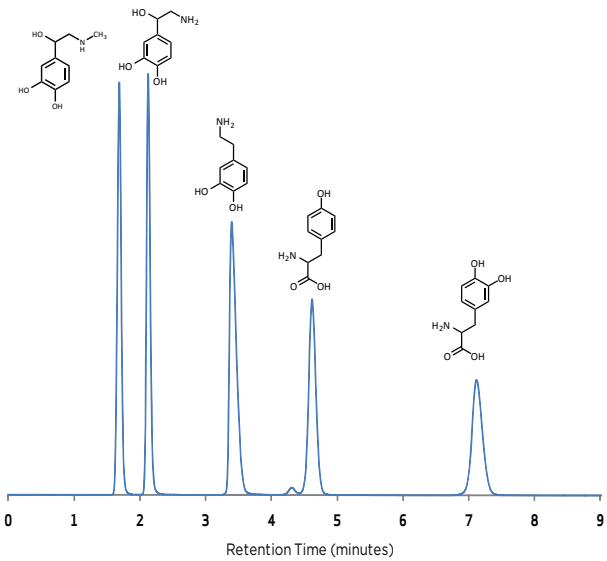
SiliaChrom dt and AQ Main Characteristics

- **Enhanced retention of hydrophilic molecules**
- **Inertness for acidic and basic analytes**
- **Compatible from 100% aqueous mobile phase to 100% organic**
- **Exceptional stability from pH 1.5 to 9.0**
- **Good tolerance to direct injection of biological matrix (*dirty samples*)**
- **Reduces the need for mobile phase modifiers**
- **Low bleeding and high sensitivity for LC-MS**
- **Partially endcapped**

Forensic

Separation of Catecholamines in Acidic Mobile Phase

Catecholamines are hydrophilic compounds with acidic functions. The mobile phase needs to be acidic to have the catecholamines under the molecular configuration and use the sorbent hydrophilic character to drive the separation.



Chromatographic conditions

- **Column**: SiliaChrom dt C18, 5 µm
- **Column size**: 4.6 x 150 mm
- **SiliCycle PN**: H141805E-N150
- **Mobile phase**: 1% Acetic Acid in water
- **Temperature**: 23°C
- **Temperature**: 23°C
- **Flow rate**: 1.000 mL/min
- **Detector**: UV at 265 nm
- **Injection volume**: 5 µL

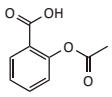
« Polar metabolites separation is very challenging. Using SiliaChrom, dt C18 in normal phase solved the problem. »

Huns Nejad from BASF, Research Triangle Park, NC, USA

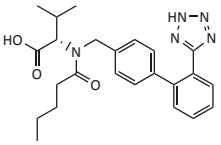
Assay for QC Testing of Blood Pressure and Cholesterol Medication

Pharmaceutical

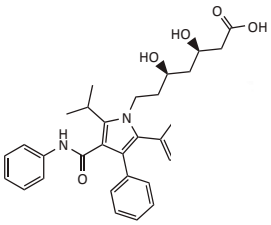
The Silia*Chrom* dt C18 presents a high lot-to-lot reproducibility, which makes it an excellent choice for quality control analysis in phamaceutical laboratories.



A: Aspirine



B: Valsartan



C: Atorvastatin

Chromatographic conditions

- **Column**: Silia*Chrom* dt C18, 5 µm
- **Column size**: 4.6 x 150 mm
- **SiliCycle PN**: H141805E-N150
- **Mobile phase**: Methanol/H_2O (70/30), 0.1% (v/v) formic acid
- **Temperature**: 30°C
- **Flow rate**: 0.800 mL/min
- **Detector**: UV at 280 nm
- **Injection volume**: 10 µL

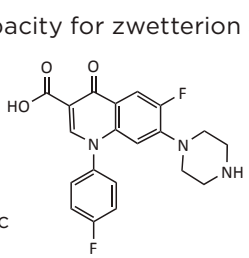
Peak Shape Evaluation for Zwetterion Fluoroquinolones

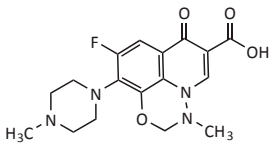
Pharmaceutical

The Silia*Chrom* dt C18 presents a high separation capacity for zwetterion analysis.

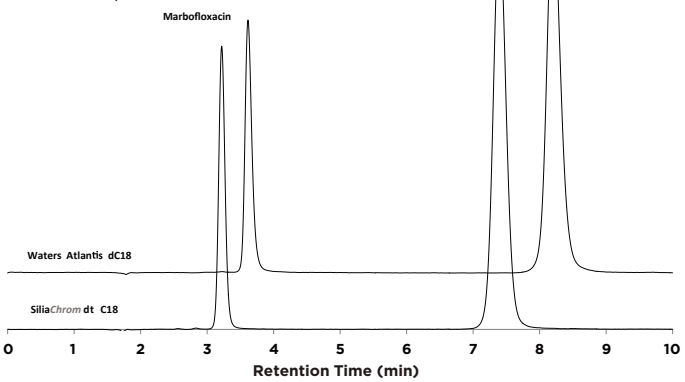
Chromatographic conditions

- **Column**: Silia*Chrom* dt C18, 5 µm
- **Column size**: 4.6 x 150 mm
- **SiliCycle PN**: H141805E-N150
- **Mobile phase**: 2.5 mM potassium phosphate monobasic (*adjust to pH 2.5 with H_3PO_4*)/ethanol (*68/32*)
- **Temperature**: 23°C
- **Flow rate**: 1.000 mL/min
- **Detector**: UV at 275 nm
- **Injection volume**: 10 µL





Sarafloxacin



Peak Shape Results		
Product	Asymmetry (USP) Silia*Chrom* dt C18	Asymmetry (USP) Atlantis dC18
Marbofloxacin	1.11	1.29
Sarafloxacin	1.08	1.14

Ropinirole and Amitriptyline Detection in Human Plasma

Pharmaceutical

SiliaChrom dt C18 presents low bleeding and is excellent for dirty samples. Partial endcapping allows for some interactions with free silanol groups. The use of SiliaPrep CleanDRUG prior to injection onto the column will insure a very clean sample which results in very low ionic suppression when using in LC-MS/MS analysis. Another big advantage is the high selectivity of SiliaChrom dt C18 for all concentration levels.

Chromatographic conditions

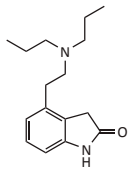
- **Column**: SiliaChrom dt C18, 2.5 µm
- **Column size**: 3.0 x 30 mm
- **SiliCycle PN**: H141802E-H030
  Sample preparation by SPE
  SiliaPrep CleanDRUG 3 mL/200 mg
  PN: SPEC-R651230B-03G
- **Mobile phase:**
  MPA: 1 mM ammonium formate in (*ACN/water, 10/90*), 0.1% formic acid (*v/v*)
  MPB: 1 mM ammonium formate in (*ACN/water, 90/10*), 0.1% formic acid (*v/v*)

Gradient		
Time (min)	MPA (%)	MPB (%)
0.00 - 0.20	85	15
0.21 - 1.20	50	50
1.21 - 1.60	0	100
1.61 - 3.50	85	15

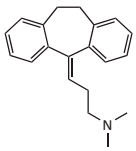
- **Temperature**: 23°C
- **Flow rate**: 1.000 mL/min
- **MS splitting flow**: 0.30 mL/min
- **Injection volume**: 5 µL

Tandem mass spectroscopy conditions

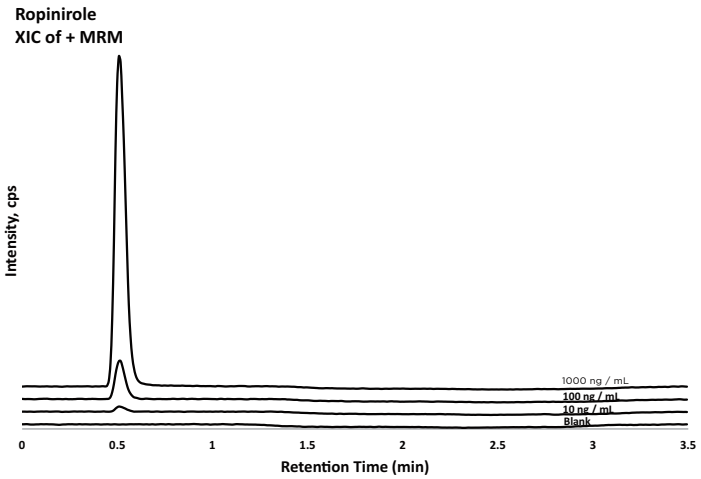
- **Detector**: Sciex API 3000, Applied Biosystem
- **Ion Source**: Positive Electrospray (*ESI+*)
- **Turbolon Ion Spray heater gas flow**: 8000 cc/min
- **Turbolon Ion Spray heater temperature**: 375°C
- **MRM Transition**: Ropinirole: m/z (*261.2 → 114.2*)
  Amitriptyline: m/z (*278.4 → 233.1*)

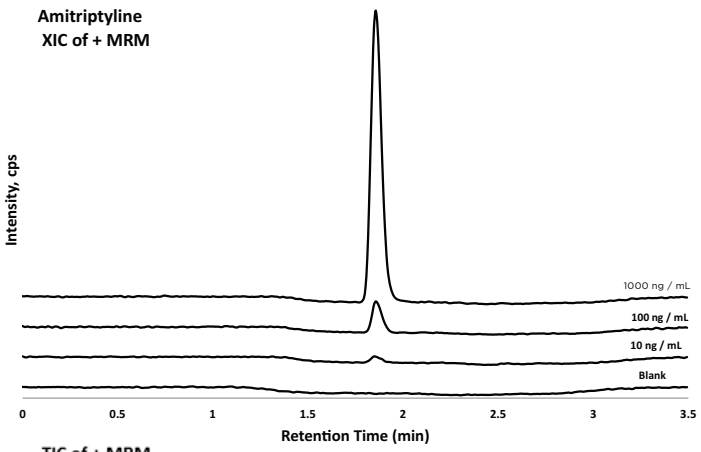


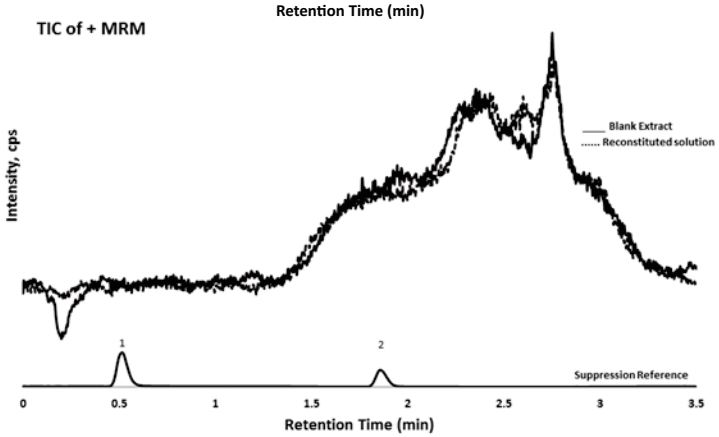
Ropinirole



Amitriptyline

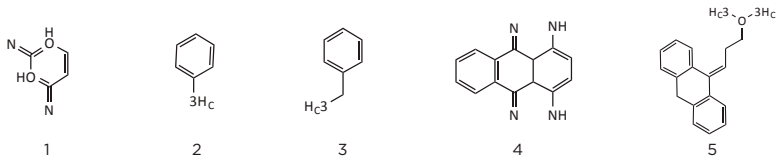






Silia*Chrom* AQ C18 is Highly Efficient for Basic Compounds

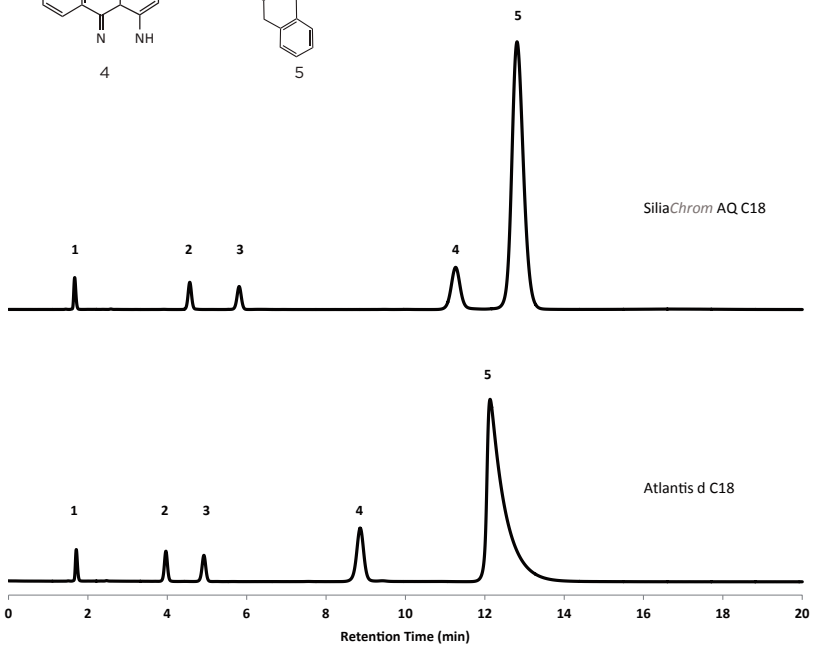
Amitriptyline, a strong basic compound, can be adsorbed on residual silanols on the surface of the packing material. With the traditional endcapping technique, this results in poor peak shapes. SiliCycle has developed a new method of silanol deactivation to eliminate the peak tailing from adsorption of compounds on residual silanol groups. This enables highly qualitative and quantitative analysis of strong basic compounds.



1 2 3 4 5

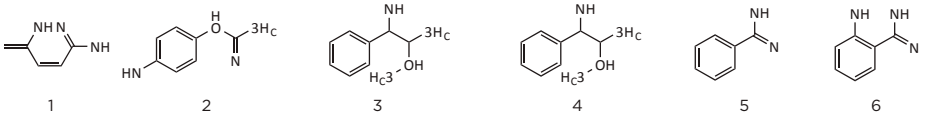
Chromatographic conditions

- **Column**: Silia*Chrom* AQ C18, 5 µm
- **Column size**: 4.6 x 150 mm
- **SiliCycle PN**: H151805E-N150
- **Mobile phase**: 80/20 methanol/ 20 mM potassium phosphate pH 7.00
- **Temperature**: 23°C
- **Flow rate**: 1.000 mL/min
- **Detector**: UV at 254 nm
- **Injection volume**: 1 µL



Evaluation of Resolution and Peak Shape

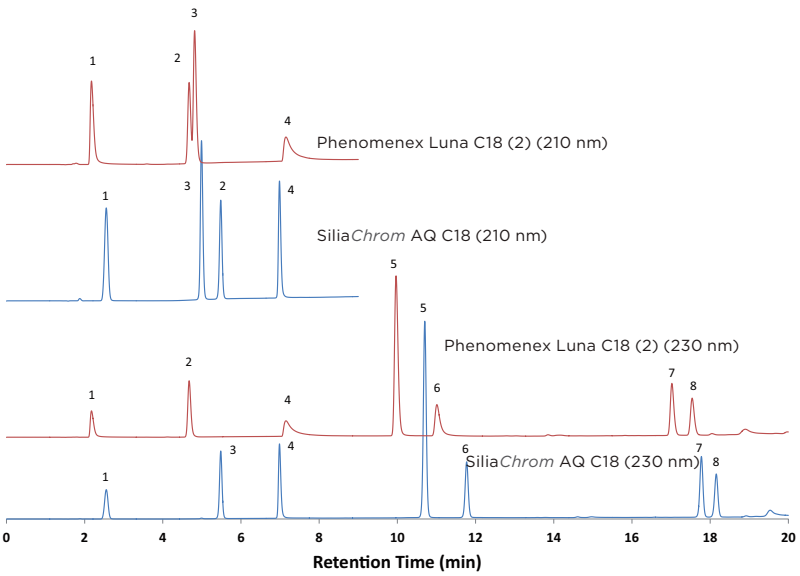
The Silia*Chrom* AQ C18 column is universal, efficient even for mixtures of basic and acidic compounds.



1 2 3 4 5 6

Chromatographic conditions

- **Column**:
  Silia*Chrom* AQ C18, 5 µm
  Phenomenex Luna, C18 (*2*) 5 µm
- **Column size**: 4.6 x 150 mm
- **SiliCycle PN**: H151805E-N150
- **Mobile phase**:
  MPA: 5 mM potassium phosphate monobasic (*adjust to pH 2.5 with H_3PO_4*)/ACN (*90/10*)
  MPB: 5 mM potassium phosphate monobasic (*adjust to pH 2.5 with H_3PO_4*)/ACN (*10/90*)
- **Temperature**: 23°C
- **Flow rate**: 1.000 mL/min
- **Detector**: UV at 254 nm
- **Injection volume**: 5 µL



Pharmaceutical

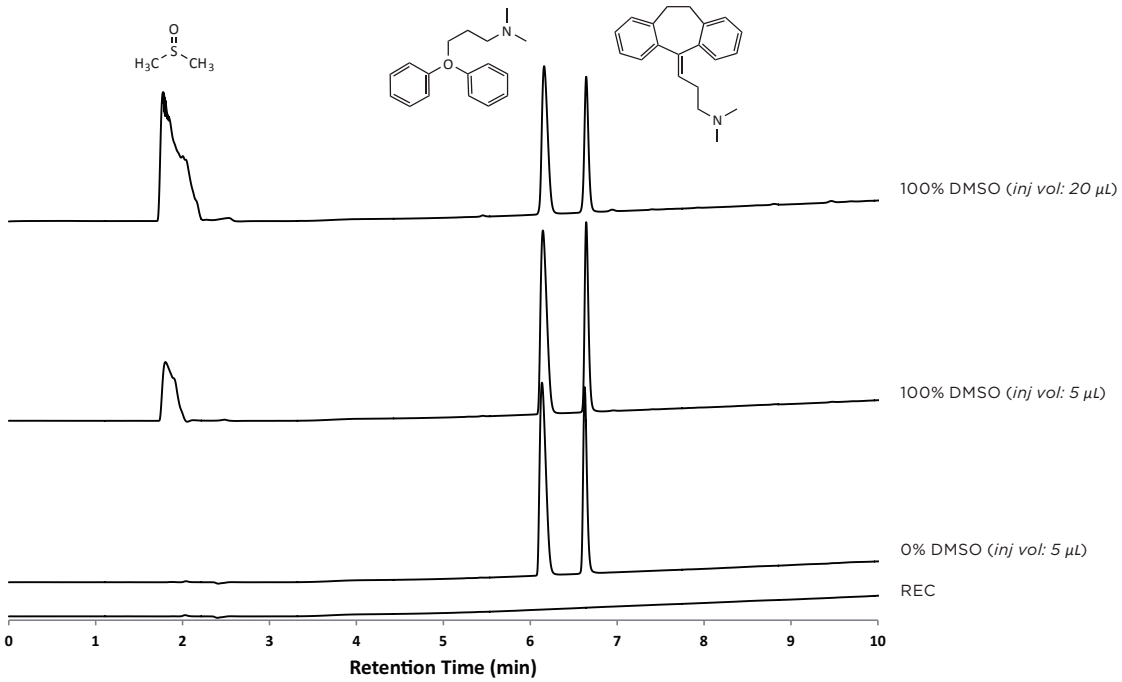
Retention Capacity of DMSO on Silia*Chrom* AQ C18

DMSO (*Dimethylsulfoxide*) is an excellent solvent to solubilize most compounds. Unfortunately, this solvent is not volatile and with some C18 columns, the DMSO can interact with the stationary phase and decrease the selectivity. In this case, the only way to inhibit this effect is to use preparative chromatography. In this study, we show that DMSO does not interact with our Silia*Chrom* AQ C18. A linear gradient has been used from a highly aqueous mobile phase to a highly organic phase.

Chromatographic conditions

- **Column**: Silia*Chrom* AQ C18, 5 µL
- **Column size**: 4.6 x 150 mm
- **SiliCycle PN**: H151805E-N150
- **Mobile phase**: MPA 0.1% formic acid in water
  MPB 0.1% formic acid in ACN
- **Temperature**: 23°C
- **Flow rate**: 1.000 mL/min
- **Detector**: UV at 254 nm
- **Reconstitution solution (*REC*)**: DMSO

Gradient		
Time (min)	% MPA	% MPB
0	90	10
9	10	90
10	10	90
11	90	10



Statistic Analysis Results						
Conditions	As $_{DMSO}$	Tr $_{DMSO}$ (min)	K'$_{DMSO}$	W$_{DMSO}$	Tr $_{diphenhydramine}$ (min)	Tr $_{amitriptyline}$ (min)
0% DMSO 5 µm	-	-	-	-	6.14	6.63
100% DMSO 5 µm	2.29	1.80	0.09	0.3	6.15	6.64
100% DMSO 20 µm	4.10	1.78	0.08	0.5	6.16	6.64

Conclusion: The study shows that DMSO does not interact with the Silia*Chrom* AQ C18. No specific retention is observed. The Silia*Chrom* AQ C18 is an excellent choice to purify components contaminated with DMSO.

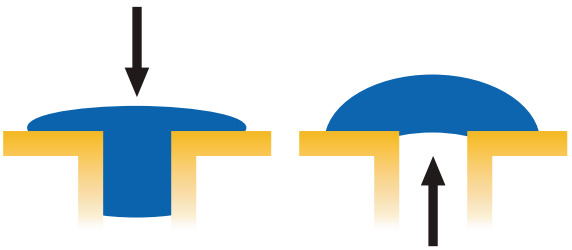
Pharmaceutical Forensic

Dewetting Phenomena

The dewetting phenomena is the formation of drops on the solid surface caused by hydrophobic repulsions of highly hydrophobic sorbents. This phenomena is illustrated by the following scheme.

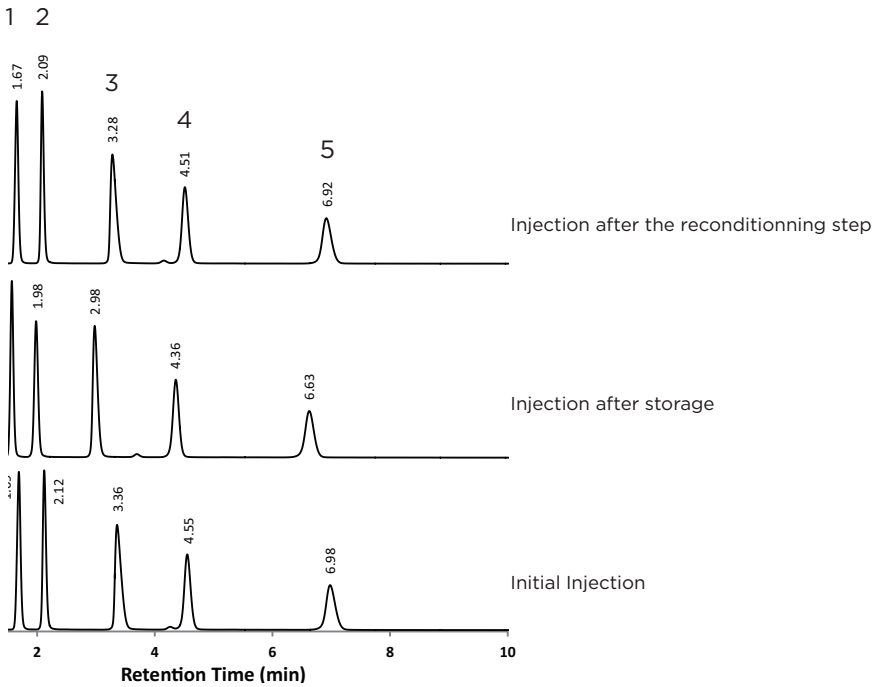
General procedure

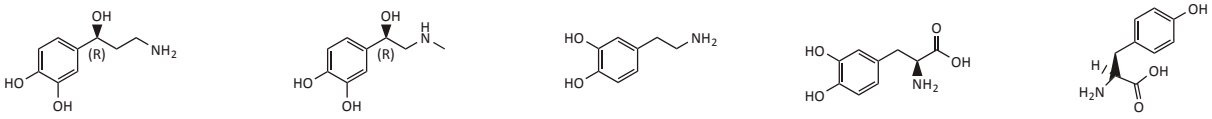
- The mixture of catecholamines is eluted on the column
- The flow is then stopped
- The column is stored in this condition during 18 h
- The mixture is then re-injected after a reconditioning step



Chromatographic conditions

- **Column**: Silia*Chrom* AQ C18, 5 µm
- **Column size**: 4.6 x 150 mm
- **SiliCycle PN**: H151805E-N150
- **Mobile phase**: 1% acetic acid in water
- **Temperature**: 23°C
- **Flow rate**: 1.000 mL/min
- **Detector**: UV at 265 nm
- **Injection volume**: 5 µL





1.Norepinephrine 2.Epinephrine 3.Dopamine 4.Levodopa 5.Tyrosine

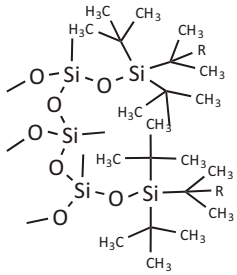
Conclusion: A small decrease in retention time is observed, but is not significant. The displacement has been resolved after the reconditioning step. The Silia*Chrom* AQ C18 does not present the dewetting phenomena.

SiliaChrom SB C18 and C8

Description

SiliaChrom SB C18 and **C8** surfaces are treated with an organic form of silicon to increase the number of silanol groups on the surface. After this step, the surface is bonded with a silane containing two functions. One function is a protecting group that shields the area and protects the surface from an acid attack from the mobile phase. The H_3O^+ ion does not have access to the surface to break the O-Si bond (*steric effect*). The other function is the linear hydrophobic chain with 18 or 8 carbons.

Structure



For C18 R = $(CH_2)_{17}CH_3$
For C8 R = $(CH_2)_7CH_3$

SiliaChrom SB C18

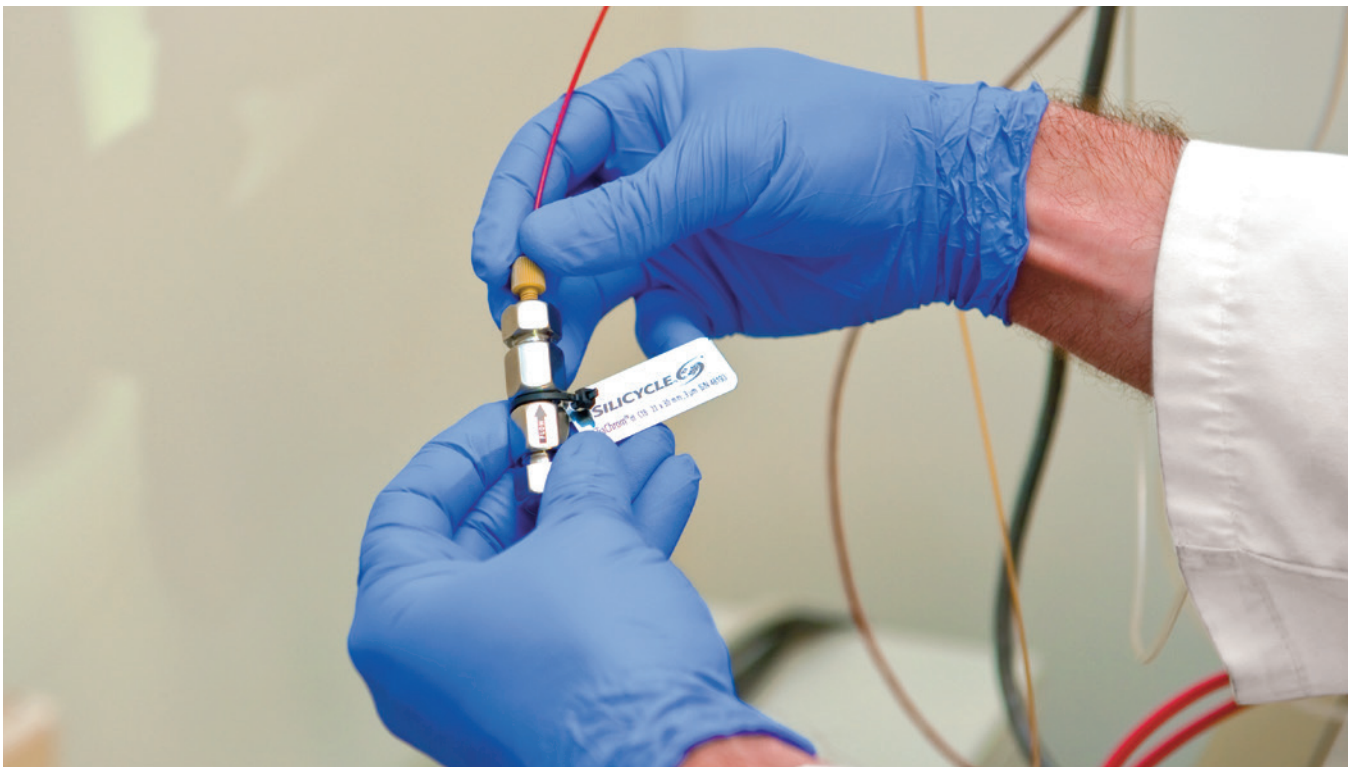
SiliaChrom SB C8

Sorbent Characteristics

- **Pore Size: 150 Å**
- **Specific Surface Area: 200 - 220 m^2/g**
- **Particle Sizes Available: 3, 5 and 10 µm**
- **USP Code: SiliaChrom SB C18: L1**
  SiliaChrom SB C8: L7
- **Typical Carbon Loading: SiliaChrom SB C18: 12%**
  SiliaChrom SB C8: 7%

SiliaChrom SB Main Characteristics

- **Extremely low pH limits (*0.5 - 7.5*)**
- **Extremely low bleeding for LC-MS applications under acidic conditions**
- **Compatible with mobile phases ranging 100% water to 100% organic**
- **Non endcapped**

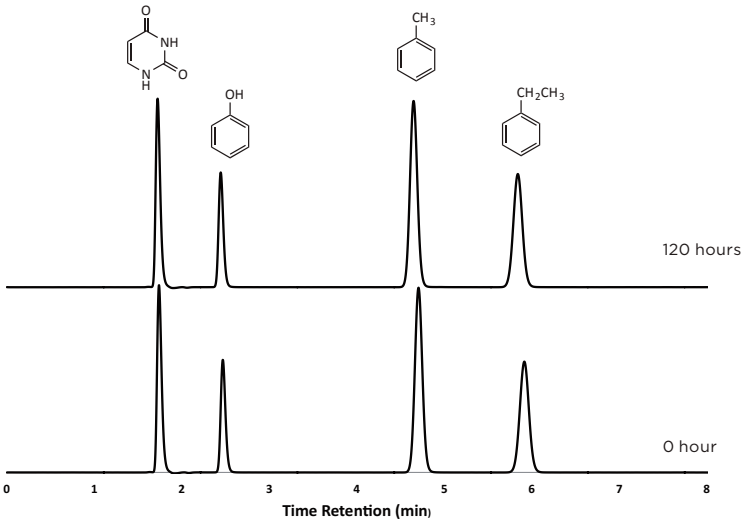


Stability of Silia*Chrom* SB C18 at Low pH Conditions

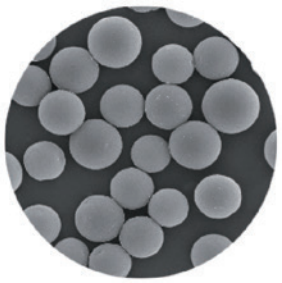
Acidic mobile phases have widespread applications in the reversed phase HPLC separation of many important pharmaceutical and environmental compounds. Analytes such as pharmaceuticals and biomolecules often show peak shape, retention and selectivity changes when the mobile phase pH is changed from neutral to acidic pH (*pH 1.0*). In fact, lowering the pH helps to suppress silanol interactions between basic compounds and the residual surface silanols, thus resulting in less tailing and better retention of acidic compounds (*pKa lower than 2*).

Chromatographic conditions

- **Column**: Silia*Chrom* SB C18, 5 µm
- **Column size**: 4.6 x 150 mm
- **SiliCycle PN**: H101805H-N150
- **Mobile phase**: 2% TFA in ACN/water (*60/40*) Solution pH: 1.00
- **Temperature**: 23°C
- **Flow rate**: 1.000 mL/min
- **Detector**: UV at 270 nm
- **Injection volume**: 10 µL

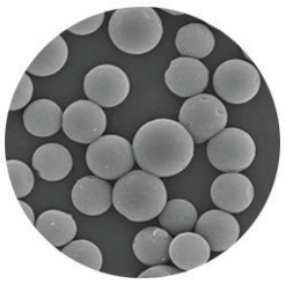


Silia*Chrom* SB C18 (*Ethylbenzene*)			
Time (hour)	RT (min)	TF (USP)	N (USP)
0	5.91	1.01	14,014
24	5.89	1.02	14,085
48	5.77	1.02	14,023
72	5.83	1.02	14,076
96	5.85	1.01	14,087
120	5.84	1.02	14,050
Mean	5.85	1.02	14,056
RSD (%)	**0.84**	**0.51**	**0.23**



Silia*Chrom* SB C18 before

No column degradation under extreme pH conditions



Silia*Chrom* SB C18 after

The HPLC column was used under extreme pH conditions and, even after 5 days of continuous injections, the number of theoretical plates (*N*), the tailing factor (*TF*) and the retention time (*RT*) are comparable. The sorbent kept its chemical and structural integrity, which we have proven with similar chromatograms and scanning electron microscope pictures (*SEM*) before and after 120 hours of use.

In conclusion, our Silia*Chrom* SB C18 and SB C8 columns are stable at low pH conditions.

Silia*Chrom* XT C18 and XT C18 Fidelity

Description

Silia*Chrom* XT C18 and **XT C18 Fidelity** are suitable with low or high pH conditions. The key is to have a hybrid surface to reduce the solubility of silica at high pH. In fact, the Silia*Chrom* XT C18 and the XT C18 Fidelity silica are coated with a monomeric methyltriethoxysilane/tetraethoxysilane prepolymer, followed by a special thermic treatment to get a rigid surface that is less soluble than untreated silica itself at high pH.

The Silia*Chrom* XT C18 column is designed for applications at very high pH (*up to 12*) at room temperature but is also suitable for low pH (*down to 1.5*).

The Silia*Chrom* XT C18 Fidelity is used at high pH conditions and offers a higher thermal stability. The only difference between Silia*Chrom* XT C18 and the XT C18 Fidelity is the carbon loading. The Silia*Chrom* XT C18 Fidelity (21% C) presents a higher hydrophibic capacity than the Silia*Chrom* XT C18 (15% C).

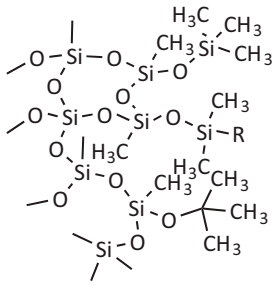
Sorbent Characteristics

- **Pore Size: Silia*Chrom* XT C18: 150 Å**
  Silia*Chrom* XT C18 Fidelity: 100 Å
- **Specific Surface Area: 380 m²/g**
- **Particle Sizes Available: 3, 5 and 10 µm**
- **USP Code: L1**
- **Typical Carbon Loading: Silia*Chrom* XT C18: 15%**
  Silia*Chrom* XT C18 Fidelity: 21%

Silia*Chrom* XT Main Characteristics

- **Excellent durability at high pH (*up to 12*)**
- **Ideal for basic compounds**
- **High thermal stability**
- **Ideal for auto-purification (*Prep. LC-MS*)**
- **Double endcapped**
- **Best HPLC columns for either metabolic or metabolite studies**

Structure



R = $(CH_2)_{17}CH_3$

Silia*Chrom* XT C18 and XT C18 Fidelity

« The high quality nature of the HPLC columns and plates from SiliCycle has allowed us to achieve a level of reproducibility with our compound libraries that would be unheard of with any other production line. »

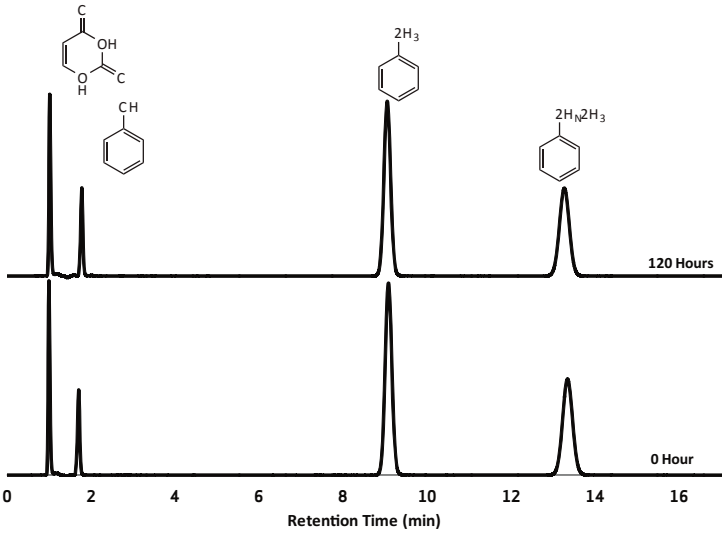
Steven Marois from Boston University CMLD, Boston, MA, USA

Stability of Silia*Chrom* XT C18 Fidelity at High pH Conditions

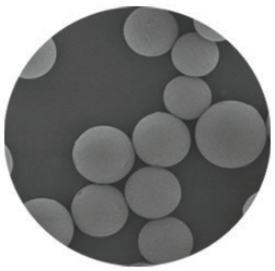
For some applications, it is necessary to work at high pH to increase the selectivity or to optimize peak shape. This is the case with basic organic compounds (pK_a > 9.0). It is the reason why it is important to have chromatographic phases stable at alkaline pH. This study demonstrates the stability of the Silia*Chrom* XT C18 Fidelity at high pH.

Chromatographic conditions

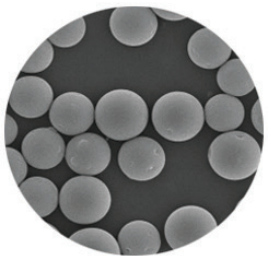
- **Column**: Silia*Chrom* XT C18 Fidelity, 5 µm
- **Column size**: 4.6 x 150 mm
- **SiliCycle PN**: HF171805H-N150
- **Mobile phase**: 0.2% TEA in ACN/water (*55/45*) (*v/v*) Solution pH: 11.5
- **Temperature**: 23°C
- **Flow rate**: 1.000 mL/min
- **Detector**: UV at 270 nm



Silia*Chrom* XT C18 Fidelity (*Ethylbenzene*)			
Time (hour)	RT (min)	TF (USP)	N (USP)
0	13.35	1.01	13,623
24	13.29	1.01	13,648
48	13.27	1.01	13,689
72	13.25	1.00	13,604
96	13.24	1.00	13,649
120	13.28	1.00	13,582
Mean	13.28	1.01	13,633
RSD (%)	**0.29**	**0.54**	**0.28**



Silia*Chrom* XT C18 Fidelity before



Silia*Chrom* XT C18 Fidelity after

The HPLC column was used under extreme pH conditions, and even after 5 days of continuous injections, the number of theoretical plates (*N*), the tailing factor (*TF*) and the retention times (*RT*) remain constant. The sorbent kept its chemical and structural integrity, which we have proven with similar chromatograms and scanning electron microscope (*SEM*) pictures before and after 120 hours of use.

In conclusion, our Silia*Chrom* XT C18 Fidelity column is stable at high pH conditions.

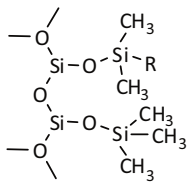
SiliaChrom XDB C18 and C8

Description

SiliaChrom XDB C18 and **C8** are made of a special silica with a larger pore size and lower surface area for the separation of large hydrophobic molecules. The relatively low surface area allows a shorter retention time for such compounds.

SiliaChrom XDB phases are ideal for separation of barbiturates, fat-soluble vitamins, fatty acids and steroids.

Structure



For C18 R = $(CH_2)_{17}CH_3$
For C8 R = $(CH_2)_7CH_3$

SiliaChrom XDB C18

SiliaChrom XDB C8

Sorbent Characteristics

- **Pore Size: 150 Å**
- **Specific Surface Area: 200 m²/g**
- **Particle Sizes Available: 3, 5 and 10 µm**
- **USP Code: SiliaChrom SB C18 L1**
  SiliaChrom SB C8 L7
- **Typical Carbon Loading: SiliaChrom XDB C18: 15%**
  SiliaChrom XDB C8: 8%

SiliaChrom XDB C18 Main Characteristics

- **Better choice for molecules > 500 Dalton**
- **High Loading capacity**
- **Wide pH range: 1.5 to 9.0**
- **Double endcapped**

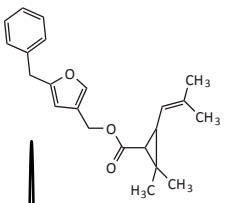
Resolution and Peak Shape of a Highly Hydrophobic Domestic Insecticide

Environment

This application illustrates the high separation efficiency of the SiliaChrom XDB C18 for very hydrophobic compounds.

Chromatographic conditions

- **Column**: SiliaChrom XDB C18, 5 µm
- **Column size**: 4.6 x 150 mm
- **SiliCycle PN**: H111805H-N150
- **Mobile phase**: ACN/water (*90/10*)
- **Temperature**: 23°C
- **Flow rate**: 1.000 mL/min
- **Detector**: UV at 235 nm
- **Injection Volume**: 1 µL



Bioresmethrin

Column Performance Results

Compounds	Retention Time (min)	Peak Asymmetry Factor (USP)	Theoretical Plates (USP)
Uracil	1.72	1.26	5,936
Bioresmethrin	4.34	1.03	14,090

Silia*Chrom* XDB1 Family

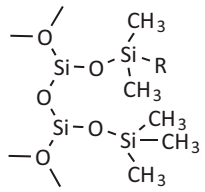
Description

Silia*Chrom* XDB1 phases have a wider range of polarity than other SiliCycle HPLC phases (*C18 to normal phase*). These phases have the maximum bonding density regardless of the compound's polarity. This allows for the least amount of interaction between the analytes and the surface OH's. These phases are not recommended for samples containing highly hydrophobic compounds.

All Silia*Chrom* XDB1 are available in 3, 5 and 10 µm except the Diol-300 which is not available in 3 µm.

The Silia*Chrom* XDB1 C18 is designed for maximum hydrophobicity and efficiency for dirty samples.

Structure



R = $(CH_2)_{17}CH_3$

Silia*Chrom* XDB1 C18

Sorbent Characteristics

See table next page.

Silia*Chrom* XDB1 Family Main Characteristics

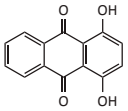
- **Better choice for molecules > 500 Dalton**
- **High loading capacity**
- **Double endcapped**

Highly Base Deactivated C18

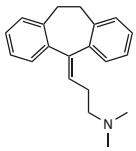
1. Uracil

2. Toluene

3. Ethylbenzene



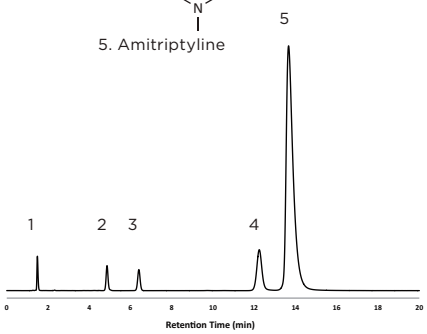
4. Quinizarin



5. Amitriptyline

Chromatographic conditions

- **Column**: Silia*Chrom* XDB1 C18, 5 µm
- **Column size**: 4.6 x 150 mm
- **SiliCycle PN**: H121805E-N150
- **Mobile phase**: MeOH/20 mM potassium phosphate monobasic pH = 7.00 (*80/20*)
- **Temperature**: 23°C
- **Flow rate**: 1.000 mL/min
- **Detector**: UV at 254 nm
- **Injection Volume**: 1 µL



Column Performance Results

Compounds	Retention Time (min)	Peak Asymmetry Factor (USP)	Theoretical Plates (USP)
Uracil	1.49	1.27	3,778
Toluene	4.86	1.09	12,144
Ethylbenzene	6.40	1.02	13,026
Quinizarin	12.24	1.07	11,525
Amitriptyline	13.66	1.76	8,190

SiliaChrom XDB1 Sorbent Characteristics

SiliaChrom XDB1 Sorbent Characteristics						
SiliaChrom Phases	Description	USP Code	%C	Pore Size (Å)	Surface Area (m^2/g)	pH Stability Range
Reversed-Phases						
SiliaChrom XDB1 C18	Designed for maximum hydrophobicity and efficiency for dirty samples.	L1	22	100	380 - 400	1.5 - 10.0
SiliaChrom XDB1 C18-300		L1	8	300	80	1.5 - 9.0
SiliaChrom XDB1 C8	Exceptionally stable with high bonding coverage and low silanol activity.	L7	14	100	380 - 400	1.5 - 8.5
SiliaChrom XDB1 C8-300		L7	4	300	80	1.5 - 8.5
SiliaChrom XDB1 C4		L26	7	100	380 - 400	1.5 - 8.5
SiliaChrom XDB1 C4-300		L26	3	300	80	2.0 - 8.0
SiliaChrom XDB1 C1		L13	3	100	380 - 400	1.5 - 8.5
SiliaChrom XDB1 C1-300		L13	1	300	80	2.0 - 8.0
SiliaChrom XDB1 CN	Maximum hydrophobicity and works in normal and reversed-phase conditions.	L10	5	100	380 - 400	2.0 - 8.5
SiliaChrom XDB1 CN-300		L10	3.5	300	80	2.0 - 8.0
SiliaChrom XDB1 Phenyl	Highly retentive phase for aromatic and unsaturated compounds.	L11	12	100	380 - 400	1.5 - 9.0
SiliaChrom XDB1 Phenyl-300		L11	4.5	300	80	2.0 - 8.0
Normal Phases						
SiliaChrom XDB1 Si	Designed for normal phase conditions, presents a high surface area and a low metal content.	L3	n/a	100	380 - 400	1.0 - 8.0
SiliaChrom XDB1 Si-300		L3	n/a	300	80	2.0 - 8.0
SiliaChrom XDB1 Diol	Excellent for normal phase applications with the highest hydrophobic activity.	n/a	5	100	380 - 400	2.0 - 8.0
SiliaChrom XDB1 Diol-300		n/a	1	300	80	2.0 - 8.0
SiliaChrom XDB1 Amino	Superior general purpose amino phase. Recommended for normal phase analysis and excellent for sugar analysis.	L8	6	100	380 - 400	2.0 - 8.5
SiliaChrom XDB1 Amino-300		L8	2.5	300	80	2.0 - 8.0

« I have successfully used regular HPLC Analytical Columns for some analytical purpose, it works perfectly and accomdate good separation. »

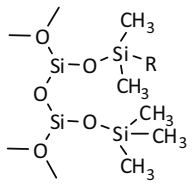
Xiaohai Li from Scripps Reshearch Institute, Jupiter, FL, USA

Silia*Chrom* XDB2 C18

Description

Silia*Chrom* XDB2 C18 is designed to be a mid-hydrophobic C18 phase with 18% of carbon loading, like most of the popular reversed-phase HPLC columns on the market. This phase demonstrates a balanced hydrophobic adsorption in order to avoid excessive retention of hydrophobic compounds.

Structure



R = $(CH_2)_{17}CH_3$

Silia*Chrom* XDB2 C18

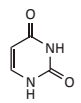
Sorbent Characteristics

- **Pore Size: 100 Å**
- **Specific Surface Area: 380 - 400 m²/g**
- **Particle Sizes Available: 3, 5 and 10 µm**
- **USP Code: L1**
- **Typical Carbon Loading: 18%**
- **pH Stability: 1.5 - 9.0**

Silia*Chrom* XDB2 C18 Main Characteristics

- **Great column-to-column and batch-to-batch reproducibility (*popular for QC/QA laboratory*)**
- **Typical average value for carbon loading (*18%*)**
- **Good peak shape for basic, acidic and neutral analytes**
- **Stronger separation power for isomers**
- **Double endcapped**

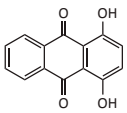
Highly Base Deactivated C18



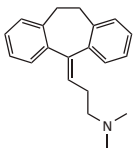
1. Uracil

2. Toluene

3. Ethylbenzene



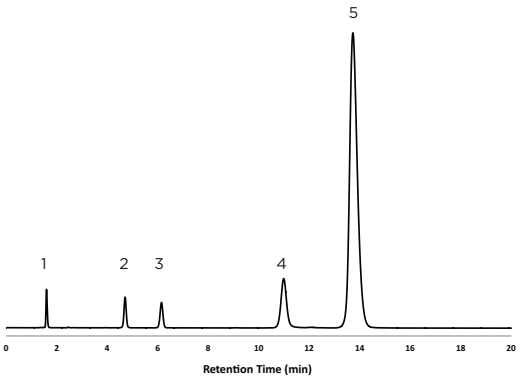
4. Quinizarin



5. Amitriptyline

Chromatographic conditions

- **Column**: Silia*Chrom* XDB2 C18, 5 µm
- **Column size**: 4.6 x 150 mm
- **SiliCycle PN**: H131805E-N150
- **Mobile phase**: MeOH/20 mM potassium phosphate monobasic pH = 7.00 (*80/20*)
- **Temperature**: 23°C
- **Flow rate**: 1.000 mL/min
- **Detector**: UV at 254 nm
- **Injection Volume**: 1 µL



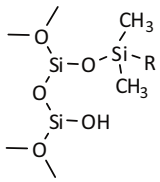
Column Performance Results			
Compounds	Retention Time (min)	Peak Asymmetry Factor (USP)	Theoretical Plates (USP)
Uracil	1.61	1.24	4 618
Toluene	4.73	1.04	12 858
Ethylbenzene	6.19	1.00	13 633
Quinizarin	11.18	1.03	12 277
Amitriptyline	13.53	1.29	9 451

SiliaChrom HILIC

Description

SiliaChrom HILIC (*hydrophilic interaction chromatography*) HPLC columns are designed to retain highly polar analytes. SiliaChrom HILIC has a selectivity that is complementary to reversed-phase columns. In fact, it has a higher retention for hydrophilic compounds in HILIC mode. HILIC sorbent is more stable and offers higher reproducibility than normal phase silica or amino columns. This phase is ideal for MedChem laboratories and is approved for SFC applications.

Structure



R = $(CH_2)_3NH\text{-}CO\text{-}NH_2$

Sorbent Characteristics

- **Pore Size: 100 Å**
- **Specific Surface Area: 380 m²/g**
- **Particle Sizes Available: 3, 5 and 10 µm**
- **Typical Carbon Loading: 8%**

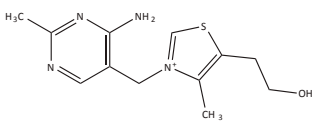
SiliaChrom HILIC Main Characteristics

- **Unique chemistry (*urea*)**
- **Accepts normal and reversed-phase applications**
- **Best replacement for amino HPLC column**
- **Provides high efficiency and rapid equilibration**
- **Enhanced sensitivity in mass spectrometry**
- **Non endcapped**

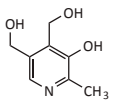
SiliaChrom HILIC

Food

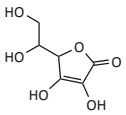
SiliaChrom HILIC: Separation of Vitamin B Complex and Vitamin C

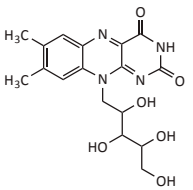


A. Thiamine (B1)



B. Pyridoxine (B6)

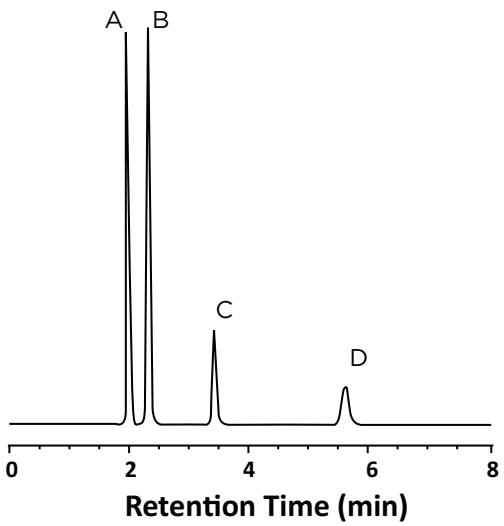




D. Riboflavine (B2)

Chromatographic conditions

- **Column**: SiliaChrom HILIC, 5 µm
- **Column size**: 4.6 x 200 mm
- **SiliCycle PN**: H131805E-N150
- **Mobile phase**: 0.1% TFA in water/0.1% in ACN (*90/10*)
- **Flow rate**: 1.000 mL/min
- **Detector**: UV at 280 nm

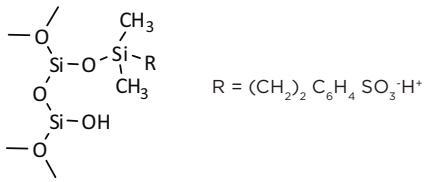


Silia*Chrom* SCX-SAX

Description

Silia*Chrom* SCX provides excellent resolution and peak shape for cationic analytes. The benzene sulfonic acid function of the Silia*Chrom* SCX is providing the cationic phase and also the π - π (*aromatic*) interaction. The Silia*Chrom* SCX is used for specific analysis of amino acids, anilines, drug salts, inorganic cations, and nucleosides.

Structure



Silia*Chrom* SCX

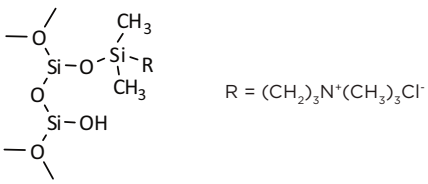
Sorbent Characteristics

- **Pore Size: Silia*Chrom* SCX: 150 Å**
  Silia*Chrom* SAX: 100 Å
- **Specific Surface Area: Silia*Chrom* SCX: 200 m²/g**
  Silia*Chrom* SAX: 380 m²/g
- **Particle Sizes Available: 3, 5 and 10 µm**
- **USP Code: Silia*Chrom* SCX L9**
  Silia*Chrom* SAX L14
- **Typical Carbon Loading: Silia*Chrom* SCX: 10%**
  Silia*Chrom* SAX: 6%

Description

Silia*Chrom* SAX provides excellent resolution and peak shape for anionic analytes. Silia*Chrom* SAX presents propyltrimethyl ammonium chloride functions allowing ion exchange interactions to acheive effective ionin chromatography. Silia*Chrom* SAX is used for specific analysis of pesticides, herbicides, inorganic anions and biological species such as nucleotides and glucosinolates

Structure



Silia*Chrom* SAX

Silia*Chrom* SCX and SAX Main Characteristics

- **Narrow peak shape**
- **Rapid equilibration**
- **Compatible with organic modifiers**
- **Provides high efficiency and rapid separations**
- **Endcapped**

Other Silia*Chrom* Products

Apart from the classic stationary phases, SiliCycle has also developped specific HPLC columns based on a silica matrix like our mixed-mode HPLC columns.

Mixed-Mode Silia*Chrom* HPLC Columns

Conjugate two surface function chemistries to optimize your separation in a single experiment. SiliCycle offers the following Silia*Chrom* Mixed-Mode HPLC columns:

- Silia*Chrom* C18/C8
- Silia*Chrom* C18/Amide
- Silia*Chrom* C18/Phenyl
- Silia*Chrom* C18/CN
- Silia*Chrom* C18/SCX
- Silia*Chrom* C18/SAX
- Silia*Chrom* C18/Nitrophenyl

SiliaChrom HPLC Columns for Biochromatography

Bio-Pharma

The rapid progress in the areas of genomics, proteomics, metabolomics and other biotechnology sectors has pushed scientists to develop innovative and efficient chromatographic methods. These methods have opened the way to better understanding of biomolecules and now offer impactful solutions effective at each level of the development of new commercial biopharmaceutical ingredients. Sorbent materials used in biochromatography and small molecule chromatography are similar but they require specific characteristics such as wide pore sizes and/or precise chemical resistance.

Separation and determination of peptides, proteins and nucleic acids can be done via different chromatography techniques. This section will highlight the SiliaChrom HPLC columns used in each following technique:

- Reversed-phase biochromatography for molecular weights (*MW*) < 5,000 Da
- Reversed-phase biochromatography for MW between 5,000 and 100,000 Da
- Ion exchange chromatography (*IEC*)
- Size exclusion chromatography (*SEC*)

SiliaChrom Reversed-Phases for Biochromatography (*MW < 5,000 Da*)

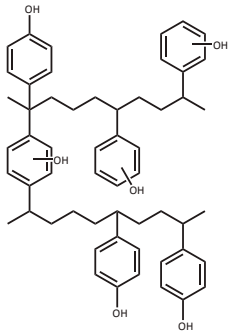
SiliaChrom Reversed-Phases for Biochromatography (*MW < 5,000 Da*)					
SiliaChrom Phases	Pore Size (Å)	%C	pH Stability Range	Characteristics	Phase Description
XT C18	150	21	1.5 - 12.0	Superior separation of basic & hydrophobic compounds Excellent peak shape in every condition. Excellent durability.	Page 109
XT C18 Fidelity	150	15	1.5 - 12.0		Page 109
dt C18	100	18	1.5 - 9.0	Superior separation of hydrophilic compounds. Mobile phase compatibility 100% aqueous to 100% organic. Inert and stable for acidic & basic analytes.	Page 101
RPC	n/a	Polymer	1.0 - 14.0	Guarantees chemical stability between pH 1.0 to 14.0 Basic compounds are well separated without peak tailling.	Page 117

Polymeric-Based SiliaChrom RPC

Description

SiliaChrom RPC phase is a hydrophobic copolymer based on polystyrene and divinylbenzene. The macroporous RPC reversed-phase resins are available in different particle sizes within a very narrow size distribution. The chemically inert polymer matrix of the SiliaChrom RPC guaranted chemical stability and allows for use with applications in the pH range from 1 to 14. The capacity factor (*K'*) values measured for aromatic and conjugated molecules on RPC columns are high due to the very pure uniform hydrophobic surface. The high efficiency and high selectivity of SiliaChrom RPC columns allow the separation of analytes in minutes. Even basic substances are separated efficiently without any peak tailing.

Structure



Phase Code: H920

Silia*Chrom* Reversed-Phases for Biochromatography (*MW 5,000 - 100,000 Da*)

Silia*Chrom* Reversed Phases for Biochromatography (*MW 5,000 - 100,000*)					
Silia*Chrom* Phases	Pore Size (Å)	%C	pH Stability Range	Characteristics	Phase Description
XDB1 C18-300	300	8	1.5 - 9.0	Silia*Chrom* C18 phase with wide pore size specialy designed for peptide & protein separation	Page 112
XDB1 C8-300	300	4.5	1.5 - 8.0	Silia*Chrom* C8 phase with wide pore diameter presenting lower hydrophobicity than C18	Page 112
XDB1 C4-300	300	3	2.0 - 8.0	Silia*Chrom* C4 phase with wide pore diameter presenting lower hydrophobicity than C8 ideal for protein separation	Page 113
XDB1 CN-300	300	3.5	2.0 - 8.0	This Cyano phase provides the maximum hydrophobicy for normal phase analysis conditions	Page 113
XDB1 Phenyl-300	300	4.5	2.0 - 8.0	Reversed-phase permitting π - π interactions Excellent for aromatic and unsaturated compounds	Page 113

Silia*Chrom* GF Phases for Size Exclusion Chromatography

Size exclusion chromatography (*SEC*) also known as gel permeation chromatography (*GPC*) or gel filtration chromatography, separates molecules according to their size (*or, more accurately, according to their hydrodynamic diameter or hydrodynamic volume*). Smaller molecules are able to enter the pores of the media and, are therefore trapped and removed from the flow of the mobile phase. The average residence time in the pores depends upon the effective size of the analyte and the pore size itself. Larger molecules are excluded with essentially no retention. Silia*Chrom* GF column series are an appropriate set of phases to be used for size exclusion chromatography with silica-based material in normal phase conditions.

Silia*Chrom* GF Phases for Size Exclusion Chromatography					
Silia*Chrom* Phases	Functional Group	Pore Size (Å)	pH Stability Range	Separation of molecules with molecular weights between:	Phase Code
GF	Diol	100	2.0 - 8.0	5,000 and 100,000 Da	H900
GF-300	Diol	300	2.0 - 8.0	50,000 and 1,000,000 Da	H900
GF AMIDE	Amide	100	2.0 - 8.0	5,000 and 100,000 Da	H901
GF AMIDE-300	Amide	300	2.0 - 8.0	50,000 and 1,000,000 Da	H901

SiliaChrom IEC Phases for Ion Exchange Chromatography

Bio-Pharma Pharmaceutical

SiliaChrom IEC series are composed of polystyrene polymer-based packing bearing different functionalities such as weak or strong cationic and anionic functions. SiliaChrom IEC phases are compatible with most mobile phases and samples with a pH range from 1 to 14. Polymer-based columns tend to have lower efficiencies for small molecules compared to silica-based columns due to their smaller surface area.

Nevertheless, SiliaChrom IEC packings are a good alternative for samples that require a mobile phase pH outside the normal operating range of standard silica-based columns. SiliaChrom IEC columns are generally used for ion exchange separations, and are also useful for non-aqueous gel permeation chromatography size exclusion analysis and ion exclusion analysis of organic acids and carbohydrates.

SiliaChrom IEC Phases for Ion Exchange Chromatography

SiliaChrom Phases	Functional Group	%C	pH Stability Range	Characteristics	Phase Code
SiliaChrom IEC SA	Dimethylammonium Chloride	8	2.0 - 8.0	Strong anion exchanger	H950
SiliaChrom IEC SC	Sulfonic Acid	4.5	2.0 - 8.0	Strong cation exchanger	H930
SiliaChrom IEC WA	Amino	3	2.0 - 8.0	Weak anion exchanger	H960
SiliaChrom IEC WC	Carboxylic Acid	4.5	2.0 - 8.0	Weak cation exchanger	H940

Each SiliaChrom IEC phases is available in particule size 5, 7, 10 and 20 µm

Silia*Chrom* Chiral Phases for Chiral Chromatography

Pharmaceutical Bio-Pharma

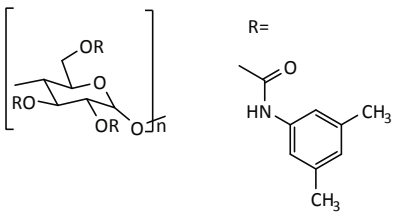
Silia*Chrom* Chiral Phases

Silia*Chrom* Chiral coated polysaccharide stationary phases are made with a spherical high quality silica support physically coated with a polymeric chiral selector such as amylose or cellulose derivatives. Due to the coated nature of these supports, solvents should be carefully selected for normal phase conditions.

Description

Silia*Chrom* Chiral Amylose T-DPC
Amylose tris-(3,5-dimethylphenylcarbamate) coated on a spherical silica support (*USP L51*). Silia*Chrom* Chiral Amylose T-DPC is used for chiral separation of alkaloids, tropines, amines, and beta blockers.

Structure

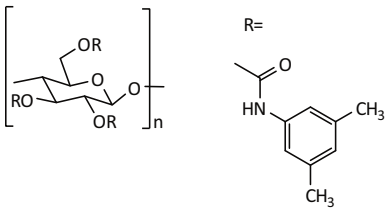


Silia*Chrom* Chiral Amylose T-DPC Phase Code: H810

Description

Silia*Chrom* Chiral Cellulose T-DPC
Cellulose tris-(3,5-dimethylphenylcarbamate) coated on a spherical silica support (*USP L40*). Silia*Chrom* Chiral Cellulose T-DPC is the most popular phase for chiral separation of alkaloids, tropines, amines, and beta blockers.

Structure

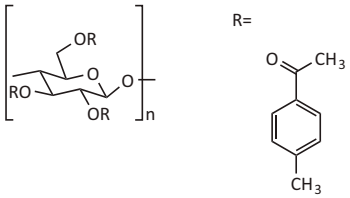


Silia*Chrom* Chiral Cellulose T-DPC Phase Code: H800

Description

Silia*Chrom* Chiral Cellulose T-MB
Cellulose tris-(4-methylbenzoate) coated on a spherical silica support. Silia*Chrom* Chiral Cellulose T-MB is used for chiral separation of aryl methyl esters and aryl methoxy esters.

Structure

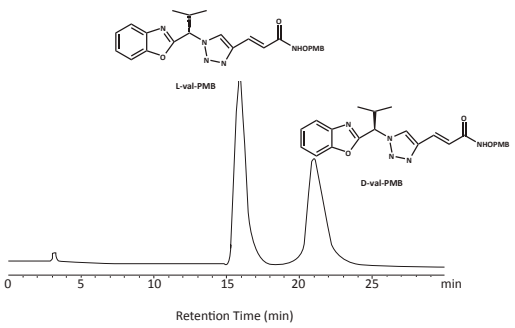


Silia*Chrom* Chiral Cellulose T-MB Phase Code: H820

Silia*Chrom* Chiral Amylose T-DPC Enantiomeric Separation of L and D-val PMB

Chromatographic conditions

- **Column**: Silia*Chrom* Chiral Amylose T-DPC, 5 µm
- **Column size**: 4.6 x 250 mm
- **SiliCycle PN**: H81005T-N250
- **Mobile phase**: Hexane/Isopropanol (*80/20*)
- **Flow rate**: 1.000 mL/min
- **Detector**: UV at 254 nm



SiliaChrom Phases for Supercritical Fluid Chromatography (SFC)

Pharmaceutical

Supercritical Fluid Chromatography (*SFC*) is a globally accepted powerful «green» chromatographic technique for separation of enantiomeric compounds and complex mixtures. For decades, it has been the preferred technique for preparative chromatography. The recent advances in preparative and analytical equipment for SFC coupled with the industry demand for reliable rapid analysis chromatography has created the need for a dependable source for SFC columns and necessary technical support. SFC is a chromatographic technique where the main component of the mobile phase is Carbone Dioxide (*CO_2*). A CO_2 based mobile phase composition is a «green» alternative to conventional HPLC mobile phases. The use of CO_2 based mobile phases enables the use of high performance preparative columns (*10 to 50 mm ID*) with a variety of particle sizes from 3 to 10 µm. Many SFC separations have successfully utilized stationary phases from normal phase HPLC such as unmodified silica, Diol, Amino and Cyano without the need for special packing techniques or hardware. The low viscosity of supercritical CO_2 allows separations to occur 3 to 5 times faster with 70 to 90% less in solvent usage than those for normal phase HPLC. Speed of the SFC separations, conservation of organic solvents and more concentrated product fractions make SFC a desirable preparative chromatographic technique for purifying chemical mixtures.

- Hydrophobicity +

SiliaChrom Phases for Supercritical Fluid Chromatography				
SiliaChrom Phases	Pore Size (Å)	Carbon Loading %	Particle Size (µm)	Phase Description
SiliaChrom XDB1 Si	100	-	3, 5, 10	Page 113
SiliaChrom XDB1 Diol	100	5	3, 5, 10	Page 113
SiliaChrom XDB1 Amino	100	6	3, 5, 10	Page 113
SiliaChrom XDB1 CN	100	5	3, 5, 10	Page 113
SiliaChrom Hilic	100	8	3, 5, 10	Page 115

Silia*Chrom* Guard Columns and Holders

Silia*Chrom* HPLC Guard Columns are designed to effectively protect both analytical and preparative HPLC columns. The usage of this shorter column is highly recommended to prolong column lifetime and does not alter the chromatography. Silia*Chrom* Guard Columns are cost effective and easy to use as a pre-filter to remove contaminants prior to injection. In liquid chromatography, contaminants introduced into the column can cause:

- Higher backpressure
- Resolution loss
- Baseline noise or drift
- Peak shape changes
- Irreversible damages (*column + system*)

Silia*Chrom* Guard Columns Packing and Dimensions

For optimal results and maximal protection, it is recommanded to always use a guard column packed with the same packing material than the HPLC column. However, only the same chemistry is really needed. Particle size can be different but it is highly recommended to match the characteristics of the HPLC column used.

Silia*Chrom* Guard Columns are available in two different lengths (*10 and 20 mm*) and four internal diameters (*ID: 2.1, 4.6, 10 and 20 mm*). In most cases, a 10 mm length would be enough but if the sample contains important quantity of impurities, the 20 mm would then be more suitable.

The Guard Column internal diameter should be the same as the HPLC column or one size smaller. Never use a guard column with a larger ID than to the HPLC column (*risk of efficiency loss*).

Silia*Chrom* Guard Columns and HPLC Column Combinations

		Silia*Chrom* Guard Cartridges Internal Diameter (mm)			
		2.1	4.6	10	20
Silia*Chrom* HPLC Column Internal Diameter (mm)	2.0	r			
	2.1	r			
	3.0	r			
	4.6		r		
	10		O	r	
	20			O	r
	30				r
	50				r

X = Preferred O = Possible

Silia*Chrom* Guard Holders

To use a Silia*Chrom* Guard Column you need to purchase the appropriate holder:

Silia*Chrom* Guard Holders					
Product Number		Silia*Chrom* Guard Cartridges Internal Diameter (mm)			
		2.1	4.6	10	20
Holders	HDW-000	r			
	HDW-001		r		
	HDW-002			r	
	HDW-003				r

Installation Procedure

1. If a new capillary tubing has been installed or if the LC system has not been operated for some time, flush the lines free of particulate before attaching the Silia*Chrom* Guard Column.
2. Insert the stainless column fitting (*B*) into the metal housing male connector (*A*) of the Silia*Chrom* Guard Holder.
3. Insert the Silia*Chrom* Guard Column (*C*) into the metal housing male connector (*A*) of the Silia*Chrom* Guard Holder. Make sure that the flat side of the stainless column fitting (*B*) is placed in front the Silia*Chrom* Guard Column frit (*C*).
4. Insert the stainless column fitting (*D*) into the metal housing female connector (*E*) of the Silia*Chrom* Guard Holder.
5. Finger tight both parts of the assembled Silia*Chrom* Guard Holder until leak free.
6. Connect the assembled Silia*Chrom* Guard Holder into the male fitting of the LC system tubing.
7. Once you have connected the Silia*Chrom* Guard Holder to the system and the LC column, connect the LC column to the detector and start pumping the working mobile phase at a low flow rate to equilibrate both the Guard Column and the LC column.
8. Gradually increase the flow rate to working condition and check for leaks. If leaking still occurs after persistent hand tightening, replace the leaking fitting.

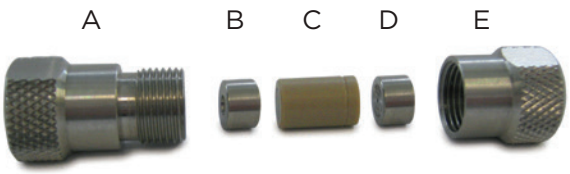
A Metal housing male connector

B Stainless column fitting

C Silia*Chrom* Guard Column

D Stainless column fitting

E Metal housing female connector



Silia*Chrom* Cleaning and Regeneration Procedures

If adequate care is taken, it is possible to maintain column efficiency and reliability over an extended period of time. This section is intended to give information on the different procedures to help extend HPLC column lifetime.

Difference between cleaning and regeneration

We usually make the assumption that, after a separation, all the material initially present in the column or cartridge has been eluted. After a run, the column is simply washed with 2-3 column volumes of the initial solvent mixture before starting a new separation. However, some impurities that are strongly retained on the column will accumulate at the intlet, if the mobile-phase composition is not strong enough to elute them during a regular run. Some non-negligible problems can arise when this happen: loss of performance, back-pressure build up, peak tailing, retention time shift or baseline drift.

To avoid this, it is highly recommended to perform regular cleaning of the column before any of these symptoms occurs. This process is simple and does not require modification of the usual chromatographic set up. When cleaning is not sufficient, a more thorough treatment, i.e. regeneration, may be necessary to avoid discarding the column.

Suggested Cleaning Procedure

The more you use a cleaning procedure, the less rigorous conditions be necessary. Cleaning should be performed after running a known “dirty” sample and prior to column storage using lower flow rate than usual (*typically from 20% to 50%*).

Column volume estimation is done using the following equation:

Column Volume (*packing’s volume included*) in mL = π * [Column Radius in cm]^2 * [Column Length in cm]

Silia*Chrom* Suggested Cleaning Procedure

Silia*Chrom* HPLC Column	Suggested Procedure
Reversed-Phase Columns (*C18, C8, C4, Amine, Cyano, Phenyl, etc.*)	- Water/ACN (*95/5*) to remove buffer - Water/ACN (*5/95*) - Mobile phase used during the separation
Normal Phase Columns (*Amine, Cyano, Diol, etc.*)	- MeOH/$CHCl_3$ (*50/50*) - Ethyl Acetate - Mobile phase used during the separation Note: Never use water.
Unbonded Silica Columns (*Silica*)	- Hexane - Isopropanol - Methylene Chloride - Mobile phase used during the separation
Ion Exchange Columns (*SCX, SAX, etc.*)	- 5 mM Phosphate Buffer pH 7.00 - Acetic Acid/Water (*10/90*) - Water - Methanol - Water

SiliaChrom Suggested Storage Conditions

When SiliaChrom HPLC Columns are not used for an extended period of time, do not allow high aqueous or high salt mobile phases to remain in the column. Remove aqueous buffers remaining in the column by washing with 20-30 column volumes of a 50% methanol or acetonitrile aqueous solution, followed by 20 column volumes of organic solvent such as methanol or acetonitrile.

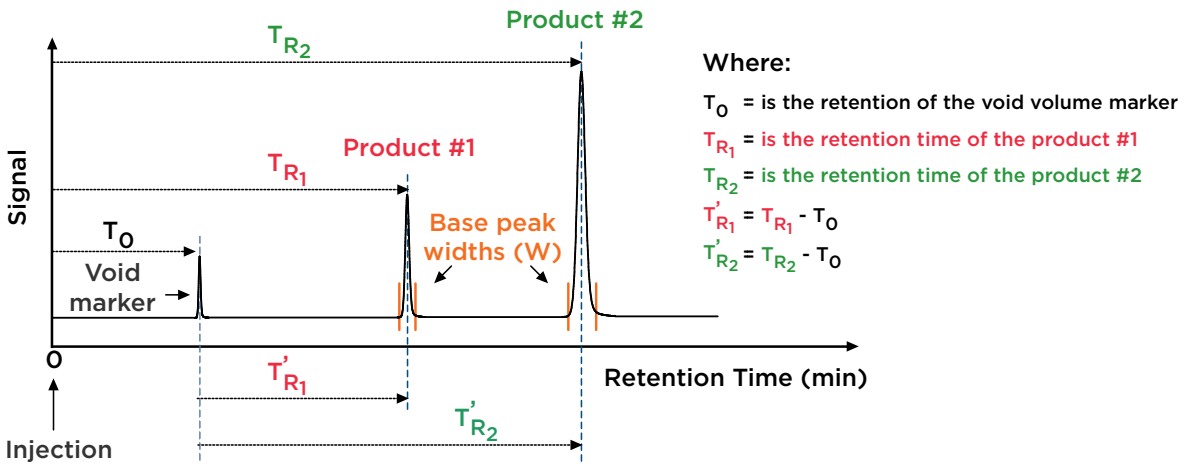
Each column is shipped with two removable column end plugs to prevent the drying of the column bed. Always put these plugs back on tightly before column storage or when column is not being used.

SiliaChrom Suggested Storage Conditions

SiliaChrom HPLC Columns		Recommended Storage Solvent
SiliaChrom AQ C18 SiliaChrom AQ C8 SiliaChrom dt C18 SiliaChrom SB C18 SiliaChrom SB C18-300 SiliaChrom SB C8 SiliaChrom SB C8-300 SiliaChrom XDB C18 SiliaChrom XDB C8 SiliaChrom XDB1 C18 SiliaChrom XDB1 C18-300 SiliaChrom XDB1 C8 SiliaChrom XDB1 C8-300 SiliaChrom XDB1 C4 SiliaChrom XDB1 C4-300 SiliaChrom XDB1 C1 SiliaChrom XDB1 C1-300 SiliaChrom XDB1 CN SiliaChrom XDB1 CN-300 SiliaChrom XDB1 Phenyl SiliaChrom XDB1 Phenyl-300 SiliaChrom XDB2 C18	SiliaChrom XT C18 SiliaChrom XT Fidelity C18 SiliaChrom C18/C8 SiliaChrom C18/Amide SiliaChrom C8/Amide SiliaChrom C18/Phenyl SiliaChrom C18/CN SiliaChrom C18/SCX SiliaChrom C18/SAX SiliaChrom C18/Nitrophenyl SiliaChrom Hilic SiliaChrom Hilic-300 SiliaChrom SCX SiliaChrom SCX-300 SiliaChrom SAX SiliaChrom SAX-300 SiliaChrom GF-300 SiliaChrom GF Amide SiliaChrom GF Amide-300	Methanol or Acetonitrile
SiliaChrom XDB1 Amino SiliaChrom XDB1 Amino-300		Butyl Chloride/Methanol
SiliaChrom Chiral Cellulose T-DPC SiliaChrom Chiral Cellulose T-MB	SiliaChrom Chiral Amylose T-DPC	Hexane/Isopropyl Alcohol (*90/10*)
SiliaChrom dt Si SiliaChrom XDB Si SiliaChrom XDB1 Si SiliaChrom XDB1 Si-300	SiliaChrom XDB1 Diol SiliaChrom XDB1 Diol-300	Isooctane/Ethanol

Important HPLC Definitions and Equations

Typical Chromatogram in liquid chromatography



Capacity Factor or Retention Factor (*k'*) is measured by the retention factor of the analyte compared to an unretained peak (*void volume marker*) using the following equation:

$$k' = \frac{(T_R - T_0)}{T_0}$$

Where:

T_R: is the retention time of the analyte

T_0: is the retention time of the unretained product

Efficiency (*N*) is usually measured by the plate count (*N or also called theoretical plate number*) using various equations. The most popular ones are:

By USP (*United States Pharmacopeia*)

$$N = 16 \times \left[\frac{t}{W}\right]^2$$

Where:

N: is the number of theoretical plates

t: is the retention time of the analyte

W: is the width at the base of the analyte

By DAB (*German Pharmacopeia*)

$$N = 5.54 \times \left[\frac{t}{W_{0.5}}\right]^2$$

Where:

N: is the number of theoretical plates

t: is the retention time of the analyte

$W_{0.5}$: is the width-at-half-height of the analyte

Selectivity (α) is measured by the retention factor ratio between two similar compounds.

$$\alpha = \frac{k'_2}{k'_1}$$

Where:

K_1': is the retention factor of product #1

K_2': is the retention factor of product #2

Separation's difficulty based on the selectivity value. If the selectivity is:

≥ 2:	Easy separation
1.5 - 2:	Possible separation*
1.2 - 1.5:	Difficult separation
≤ 1.2:	Very difficult separation**

* Method adjustment could be required

** Selectivity's optimization may be required

Important HPLC Definitions and Equations *(con't)*

Resolution (R) can be expressed using the two following equations

$$R = \frac{\sqrt{N}}{4} \times \left(\frac{\alpha - 1}{\alpha}\right) \times \left(\frac{1 + k'_2}{k'_2}\right)$$

Where:

N: is the number of theoretical plates

α: is the selectivity

K_2': is the retention factor of product #2

$$R = \frac{2(t_2 - t_1)}{W_2 + W_1}$$

Where:

T_1: is the retention time of the product #1

T_2: is the retention time of the product #2

W_1: is the width at the base of the product #1

W_2: is the width at the base of the product #2

Summary of Influencing Factors in HPLC

To choose the most suitable HPLC column, various parameters need to be taken into account: the desired selectivity and the sample load as well as the efficiency and the resolution. All these parameters are influenced by different factors in HPLC summarized in the table below.

Liquid Chromatography Influencing Factors

Properties	Typical Parameters	Affected Influencing Factors	Limitations
Chromatographic Conditions	Solvent	Retention, Efficiency	Back-pressure & phase stability
	pH	Selectivity, Resolution & Retention	Phase stability
	Flow Rate	Analysis Time, Efficiency & Resolution	Back-pressure & phase stability
Packing Characteristics	Chemistry (*SiO_2, C18, etc.*)	Selectivity, Resolution & Retention	Solvent used
	Pore Size (Å)	Sample Load & Selectivity	Size of the molecule
	Particle Size (µm)	Back-pressure, Efficiency & Resolution	Back-pressure & flow rate
HPLC Column Dimensions	Internal Diameter	Sample Load & Sensitivity	Back-pressure & flow rate
	Length	Analysis Time & Resolution	Back-pressure & analysis time too long

HPLC Method Scaling Up or Scaling Down Theory

When your experimental conditions are well optimized to get the most suitable purification, it is possible to scale up/down your method by keeping the same particle size and sorbent using these two equations:

Adjustment of the Sample Load

$$x_2 = \frac{x_1 \times r_2^2 \times C_L}{r_1^2} \quad \text{where} \quad \left[C_L = \frac{L_2}{L_1}\right]$$

Where:

x_1: is the maximum sample load in initial column

x_2: is the maximum sample load in final column

r_1: is the radius of the initial column

r_2: is the radius of the final column

L_1: is the length of the initial column

L_2: is the length of the final column

Adjustment of the Flow Rate

$$V_2 = \frac{V_1 \times r_2^2}{r_1^2}$$

Where:

V_1: is the flow rate use with the initial column

V_2: is the flow rate use with the final column

r_1: is the radius of the initial column

r_2: is the radius of the final column

How to Select the Right Silia*Chrom* HPLC Column

To select the right HPLC Column to use in your method development, read the section below to select the most appropriate Silia*Chrom* HPLC column to try first. However, before going forward in the selection, you need to have an idea of the sample quantity you need to purify as well as the liquid chromatography equipment available.

Remember: Resolution $R = \frac{\sqrt{N}}{4} \times \left(\frac{\alpha - 1}{\alpha}\right) \times \left(\frac{1 + k'_2}{k'_2}\right)$

Step 1. Find the Desired Selectivity by Selecting the Chemistry

When selecting an HPLC column, the most important factor is the selectivity in order to achieve an optimal resolution. A good knowledge of the composition of the sample mixture is crucial to select the most suitable chromatography mode to use in order to have good interactions between the sorbent and the compounds.

In liquid chromatography, there are various modes of operation possible based on the interaction mechanism of the solute with the stationary phase. Please refer you to previous sections to choose the most suitable phases to get optimal separation results.

Step 2. Select the Pore Diameter

To select the right pore diameter to use, find out the molecular weight of the solute. Typically, for small molecules, 100 - 150 Å pore size is recommended (*molecular weights below 5,000 Da*). For large molecules, such as peptides and proteins, 300 Å or higher is recommended.

Step 3. Find the Desired Efficiency & Resolution

Once you found the right selectivity, the second step is;

Be able to separate your sample with the shortest possible analysis time WITH optimal efficiency.

Two factors can influence the efficiency of a chromatography:

1. The particle size: influence on the resolution and back-pressure
2. The column dimensions (*internal diameter & length*): influence on the resolution and the sample load

Step 3.1. Select the Particle Size

For analytical applications, different particle sizes are available. The most common one being the 5 µm due to a good price/performance ratio. However, if you require a better separation and want to decrease analysis time, then 3 µm would be a better choice. Keep in mind that with a smaller particle size the backpressure will be higher.

For preparative applications, a larger particle size is usually used (*most frequently used is 10 µm*) with a larger column diameter (≤ *20 mm*).

How to Select the Right Silia*Chrom* HPLC Column *(con't)*

Step 3.2 Select the Column Dimensions (*Influence on the Resolution*)

For analytical applications, the most often recommended format for initial trial is the 4.6 x 150 mm. Then, if you need more resolution, look at: decreasing the internal diameter or increasing the column length.

3.2.1 Select the Internal Diameter (*Influence on the Sample Load*)

With smaller internal diameters, you reduce solvent consumption due to lower flow rate required but increase analysis time. Furthermore, loading capacity is decreased as the diameter decreases. The table below identifies typical applications associated with typical internal diameters used in HPLC.

Select the Internal Diameter (*ID*)

Type of columns	ID (mm)	Typical Sample Load	Typical Flow Rate	Typical Applications
Narrow Bore	2.1	0.04 - 1.5 mg	0.1 - 0.3 mL/min	Used with low sample volumes or when more sensitivity and selectivity are needed over 3 mm ID.
	3.0	0.08 - 3.0 mg	0.2 - 0.6 mL/min	Used to reduce flow rate and solvent consumption over 4.6 mm ID. It is gaining popularity.
Analytical	4.6	0.2 - 7.0 mg	0.5 - 1.5 mL/min	This is the most common ID used for traditional quantitative analysis.
Semi-Preparative	10	0.95 - 33.0 mg	2.5 - 7.0 mL/min	Used for small-scale (*mg*) preparative purifications.
Preparative	20	4.0 - 132.0 mg	9.0 - 28.0 mL/min	Used for large-scale (*hundreds of mg to gram*) purifications. The higher the diameter, the greater the loading capacity.
	30	8.5 - 297.0 mg	20.0 - 60.0 mL/min	
	50	24.0 - 800.0 mg	60.0 - 175.0 mL/min	
	100	96.0 - 3,200.0 mg	240.0 - 700.0 mL/min	

3.2.2 Select the Column Length (*Influence on the Resolution*)

The rule of thumb is that in presence of the same packing, longer columns provide better resolution and efficiency over shorter ones but with longer retention times and higher pressure. In general, it is preferable to try using the shortest column length possible. If the resolution is not good enough, increase the column length or use a smaller particle size with the same length. The table below presents the most suitable length/particle combinations.

Select the Column Length

Length (mm)	Most Suitable Particle Size (µm)	Typical Applications
30 & 50	3 µm or smaller	Used to reduce flow rate and solvent consumption over 100 & 150 mm lengths.
100 & 150	3 or 5 µm	These are the most common lengths used for traditional quantitative analysis.
200 & 250	5 µm or larger	For difficult separations or for higher resolution.

Acceptable Modifications to an HPLC Validated Method

Even if you are using an FDA validated or a USP recommanded method, some operating conditions can be adjusted if the modifications respect the acceptable specifications proposed by Pharmacopeias[1-3] and the FDA[4]. A side-by-side comparison of both the original and the adjusted method needs to be performed to demonstrate that the method's accuracy and precision is not affected by these modifications.

Acceptable Modifications to an HPLC Validated Method

Parameters	Allowable modification	Examples of possible modifications
Mobile phase pH	± 0.2 units	Validated pH: 7.0 Allowed pH range: 6.8 – 7.2
Concentration of salts in buffer	± 10%	Validated concentration: 20 mM Allowed concentration range: 18 - 22 mM
Ratio of components in mobile phase	Only the minor components can be adjusted by ± 30% or ± 2% absolute (*i.e.: in regards to the total mobile phase*), whichever is the larger but should never exceed ± 10% absolute or removed totally.	**Binary mixtures:** Validated ratio: 50/50 Allowed ratio: 40/60 to 60/40 Validated ratio: 95/5 Allowed ratio: 93.5/6.5 to 96.5/3.5 **Ternary mixtures:** Validated ratio: 60/35/5 Allowed % of the 1st component: 60% Allowed % of the 2nd component: 25 – 45% Allowed % of the 3rd component: 3.5 – 6.5% The total of the three components together need to be 100%.
Wavelength of UV detector	No modification allowed.	n/a
Column length	± 70%	Validated length: 150 mm Allowed length range: 45 - 255 mm
Column inner diameter	± 50%	Validated inner diameter: 4.6 mm Allowed inner diameter range: 2.3 – 10.6 mm
Flow rate	± 50%	Validated flow rate: 1.00 mL/min Allowed flow rate range: 0.5 – 1.5 mL/min
Injection volume	May be increased to as much as 2 times if no adverse effects on LOD and repeatability.	n/a
Particle size	No increase permitted. May be decreased by as much as 50%.	Validated particle size: 5 µm Allowed particle size range: 2.5 - 5 µm
Column temperature	± 20%	Validated temperature: 23°C Allowed length range: 18.4 – 27.6°C

1. USP. USP 32–NF 27, Chromatography <621>. Rockville, MD: USP; 2009:227.
2. USP. Second Supplement to USP 32–NF 27. Rockville, MD: USP; 2009:4147.
3. USP. USP 32–NF 27, Verification of Compendial Procedures <1226>. Rockville, MD: USP; 2009:736.
4. ORA Laboratory Procedure, Food and Drug Administration, modification criteria.

NEW

SiliaChrom HPLC Column Storage Cabinet

Protect your HPLC Column Inventory with the SiliaChrom Column Storage Cabinet

The SiliaChrom Column Storage Cabinet has been designed to safely store your HPLC column investment. Poor column storage can lead to reduced column performance and decreased product life.

The SiliaChrom Column Storage Cabinet is a bench top storage unit of solid steel construction with chrome-plated D-ring handles for added resistance. Up to 30 columns of 300 mm long (*or shorter*) can be stored in 5 separate drawers. Each drawer has a 6 position secure molded foam insert providing several storage possibilities. The foam insert can easily be customized to accommodate shorter columns, guard cartridges or HPLC tools and fittings. Each storage cabinet is stackable and supplied with rubber mounts. With the addition of a mounting bracket (*sold separately*), your SiliaChrom Column Storage Cabinet can be expanded to a multi-unit storage device.

The SiliaChrom Column Storage Cabinet is a cost-effective, expandable solution to conveniently index and store your HPLC column inventory.

Using the SiliaChrom HPLC Column Storage Cabinet ensures the following benefits

- Easy column identification.
- No more misplaced or lost columns.
- Increases column lifetime.
- Saves time and storage space.

SiliaChrom Column Storage Cabinet Characteristics	
Column Storage Cabinet PN	AUT-0167
Mounting Bracket PN	AUT-0168
Dimensions (*W x H x D*)	279 x 325 x 408 mm
Drawer Height	51 mm
Column Formats	From 20 to 300 mm lenght
Column Storage Cabinet Weight	12 Kg

SiliCycle®
Consumables

Greyhound Chromatography and Allied Chemicals
6 Kelvin Park, Birkenhead, Merseyside CH41 1LT United Kingdom
Tel: +44 (0)151 649 4000 Fax: +44 (0)151 649 4001
sales@greyhoundchrom.com

www.greyhoundchrom.com

SiliCycle® Syringe Filters

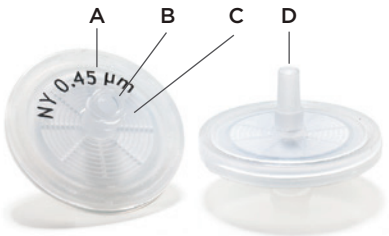
Using SiliCycle Syringe Filters guarantees the following benefits:

- Suitable for all laboratory filtrations.
- Increases column and apparatus life.
- Consistent and reproducible analysis.
- Limits system down time.

SiliCycle Syringe Filters Are Suitable for your Laboratory Filtration Needs

Syringe filters are offered by SiliCycle to help scientists with their laboratory filtration needs. They are compatible either with aqueous, organic or inorganic solutions. SiliCycle Syringe Filters are available in a wide variety of membranes (*Nylon, PTFE, PVDF, PES, and RC*) with popypropylene housing. They are the perfect choice for many applications in the fields of environmental, pharmaceutical, biotechnological, forensic and food & beverage laboratories.

SiliCycle Syringe Filters are specially designed to offer efficient and superior flow rate for any type of solution. These high quality products provide you with optimal filtration and particulate-free samples prior to injection. This extends apparatus lifetime which decreases overall analysis cost.



Nylon Syringe Filter 0.45 µm 25 mm
(*PN: SF-NYL25-45*)

A: Identification
Membrane type and pore size are clearly indentified on each syringe filter.

B: Luer-Lok™ female connector
Secures the connections to prevent «blow off».

C: Distribution ring
Generates even distribution of the flow rate during the elution.

D: Luer male connector
Can be easily connected to an automated system.

Field of Applications

Environmental
Environmental analysis of water, waste water, soil and sludge can be easily filtered using the SiliCycle Syringe Filter portfolio.

Pharmaceutical & Biotechnological
At each step of the drug discovery process, API or target compounds have to be isolated, purified and filtered prior to analysis. SiliCycle Syringe Filters achieve easy purification of complex physiological matrices.

Forensic
Elimination of particulates before injection to a sub-micron device is necessary prior to each clinical or toxicological analysis (*HPLC, GC or Mass Spectrometer*).

Food & beverage
Improving the detection limits for pesticides, herbicides, flavours and fragrances analysis requires high quality syringe filter products because of the presence of different types of particulates in the samples.

Find the Perfect Syringe Filter in 3 Simple Steps

Step 1: Selection of the Membrane by Application

Step 2: Selection of the Membrane Porosity Based on the Sample Nature

Step 3: Selection of the Membrane Diameter Based on Sample Volume

Step 1: Selection of the Membrane by Application

In the table below you can find the most popular applications where scientists are using SiliCycle Syringe Filters in their laboratories. The table below presents recommended membranes and alternative membranes for each application type. Finally, your choice of membrane can be validated by reviewing the description of each membrane in the SiliCycle portfolio.

Membrane Selection by Application

Applications	Recommended Membranes	Alternative Membranes
Sample preparation prior to HPLC & GC analysis	Nylon	PTFE, PES or RC
Protein analysis or biological solutions	PVDF or PES	Nylon or RC
High particulate loads	Nylon	RC or PTFE
Pure organic and aggressive solvents	PTFE	RC or Nylon
Environmental analysis	PTFE or Nylon	RC
Clinical or toxicological analysis	PES	RC
Food & beverage analysis	PTFE or Nylon	RC
Sample preparation prior to ionic chromatography analysis	PES	PTFE or RC
Capillary electrophoresis analysis	PES	RC
Sample preparation prior to ICP-MS or AAS analysis (*trace metals*)	PES or Nylon	RC

Membrane Descriptions

Nylon:

Hydrophilic membrane is working well for general filtrations, aqueous & mixed organic solutions, medical assays and HPLC sample preparations.

Polytetrafluoroethylene (*PTFE*):

Hydrophobic polytetrafluoroethylene membrane is an excellent media for filtration of strong acids and aggressive organic solvents. Wetting the membrane with alcohol and water gives a hydrophilic characteristic.

Polyvinylidene Fluoride (*PVDF*):

Hydrophilic polyvinylidene fluoride membrane presents low extractables and provides good filtration of aqueous solutions, organic solvents and biological solutions.

Polyethersulfone (*PES*):

Hydrophilic polyethersulfone membrane is mainly used for life-science applications (*biological & pharmaceutical*) because of the ultra-low protein binding characteristic of the membrane.

Regenerated Cellulose (*RC*):

Regenerated cellulose is a universal hydrophilic membrane used in chromatography for filtration of aqueous samples and solvents. This membrane is also used for filtration of biomolecules because of the ultra-low binding capability of the media.

Step 2: Selection of the Membrane Porosity Based on the Sample Nature

Pore Size of 0.45 µm

This porosity is recommended for filtration of viscous solutions or solutions containing high levels of particulate matter. Generally used for aqueous or mixed organic solutions prior to injection on an HPLC column packed with > 3 µm particles.

Pore Size of 0.20 µm

Generally used for aqueous or mixed organic solution prior to injection on an HPLC or UHPLC column packed with ≤ 3 µm particles. This porosity is recommended for particulate-sensitive methods.

Step 3: Selection of the Membrane Diameter Based on Sample Volume

4 mm Membrane

Use this diameter when the volume to filtrate is less than 1 mL.

13 mm Membrane

Use this diameter when the volume to filtrate is between 1 to 10 mL.

25 mm Membrane

Use this diameter when the volume to filtrate is between 10 to 100 mL.

SiliCycle Syringe Filters Chemical Compatibility Chart

SiliCycle Syringe Filters Chemical Compatibility Chart

Chemical	Nylon	PTFE	PVDF	PES	RC
Acids					
Acetic, Glacial					
Acetic, 25%					
Formic, 25%				-	
Hydrochloric, 25%					
Nitric, 25%					
Phosphoric, 25%				-	
Sulfuric, 25%					
Trichloroacetic, 10%			-	-	
Bases					
Ammonium Hydroxide, 25%					
Sodium Hydroxide, 3 N					
Alcohols					
Benzyl Alcohol					
Ethanol, 70%					
Ethanol, 98%					
Ethylene Glycol					
Glycerol					
Isopropanol					
Methanol, 98%					
Hydrocarbons					
Hexane					
Xylene					
Toluene, Benzene					
Legend					
Compatible					
Not Compatible					
Limited Compatibility (*small volumes or short contact time*)					

Chemical	Nylon	PTFE	PVDF	PES	RC
Halogenated Hydrocarbons					
Carbon Tetrachloride					
Chloroform					
Methylene Chloride					
Ketones					
Acetone					
Cyclohexanone					
Methyl Ethyl Ketone					
Methyl Isobutyl Ketone	-				
Esters					
Amyl Acetate					
Butyl Acetate					
Ethyl Acetate, Methyl Acetate					
Propyl Acetate					
Organic Oxides					
Dimethylsulfoxide	-				
Dioxane					
Tetrahydrofuran					
Ethyl Ether					
Amides & Amines					
Acetonitrile					
Aniline	-			-	
Diethylacetamide				-	
Dimethyl Formamide					
Pyridine					
Miscellaneous					
Hydrogen Peroxide, 30%					
Phenol, Aqueous, 10%					

Typical Experimental Procedure

Loading

Fill the syringe with the liquid sample and allow a small volume of air to enter the Syringe. This small volume of air is used as a purge to minimize fluid retention when expelling the liquid sample from the syringe.

Assembly

Twist the SiliCycle Syringe Filter Luer-Lok™ onto the syringe. Make sure that the Luer-Lok™ is matching with the syringe to prevent the filter from coming off during the filtration.

Filtration

Direct the SiliCycle Syringe Filter tip into the collection vessel and apply gentle pressure onto the syringe plunger. Push the liquid sample and the air volume through the SiliCycle Syringe Filter to maximize sample recovery.

SiliCycle Syringe Filters Ordering Information

SiliCycle Syringe Filter Ordering Information

Membrane Type	Quantity per box	13 mm Diameter *Sample volume: 1 - 10 mL*		25 mm Diameter *Sample volume: 10 - 100 mL*	
		0.20 µm	0.45 µm	0.20 µm	0.45 µm
Nylon	100 / box	SF-NYL13-20	SF-NYL13-45	SF-NYL25-20	SF-NYL25-45
	500 / box	SF-NYL13-20-L	SF-NYL13-45-L	SF-NYL25-20-L	SF-NYL25-45-L
	1,000 / box	SF-NYL13-20-M	SF-NYL13-45-M	SF-NYL25-20-M	SF-NYL25-45-M
Polytetrafluoroethylene (*PTFE*)	100 / box	SF-PTF13-20	SF-PTF13-45	SF-PTF25-20	SF-PTF25-45
	500 / box	SF-PTF13-20-L	SF-PTF13-45-L	SF-PTF25-20-L	SF-PTF25-45-L
	1,000 / box	SF-PTF13-20-M	SF-PTF13-45-M	SF-PTF25-20-M	SF-PTF25-45-M
Polyvinylidene Fluoride (*PVDF*)	100 / box	SF-PVD13-20	SF-PVD13-45	SF-PVD25-20	SF-PVD25-45
	500 / box	SF-PVD13-20-L	SF-PVD13-45-L	SF-PVD25-20-L	SF-PVD25-45-L
	1,000 / box	SF-PVD13-20-M	SF-PVD13-45-M	SF-PVD25-20-M	SF-PVD25-45-M
Polyethersulfone (*PES*)	100 / box	SF-PES13-20	SF-PES13-45	SF-PES25-20	SF-PES25-45
	500 / box	SF-PES13-20-L	SF-PES13-45-L	SF-PES25-20-L	SF-PES25-45-L
	1,000 / box	SF-PES13-20-M	SF-PES13-45-M	SF-PES25-20-M	SF-PES25-45-M
Regenerated Cellulose (*RC*)	100 / box	SF-RC13-20	SF-RC13-45	SF-RC25-20	SF-RC25-45
	500 / box	SF-RC13-20-L	SF-RC13-45-L	SF-RC25-20-L	SF-RC25-45-L
	1,000 / box	SF-RC13-20-M	SF-RC13-45-M	SF-RC25-20-M	SF-RC25-45-M

* Contact us for 4 mm membrane diameter, 1 mm pre-filter, and sterile syringe filters.

SiliCycle® Membrane Filters

Advantages of using SiliCycle Membrane Filters for your filtrations:

- Broad portfolio to covert all purification needs: 25 mm & 47 mm diameter available in 0.20 µm & 0.45 µm pore size.
- Many choices of membrane types to suit all fields of applications.

Fast and Cost Effective Separations with SiliCycle Membrane Filters

Membrane filters consist in a microporous films having a specific porosity which can be used to retain components (*particles and microorganisms*) with larger pore size compared to the membrane. Table below presents an overview of SiliCycle Membrane Filters specifications and typical applications.

SiliCycle Membrane Filters Overview					
Characteristics	Nylon	Polytetra-fluoroethylene (*PTFE*)	Polyvinylidene Fluoride (*PVDF*)	Polyethersulfone (*PES*)	Regenerated Cellulose (*RC*)
Membrane Specifications					
• Hydrophilic / Hydrophobic	Hydrophilic	Hydrophobic*	Hydrophobic	Hydrophilic	Hydrophilic
• Extractable level	Extremely low	Low	Low	Low	Low
Chemical & Thermal Properties					
• Chemical resistance	Very good	Higher resistance	Good	Lower resistance	Good
• pH stability range	3 - 12	1 - 14	1 - 14	1 - 14	3 - 12
• Autoclavable	Yes	Yes	Yes	Yes	Yes
• Protein binding capacity	Medium	Low	Very low	Medium	Very low
Typical Applications: Sample Preparation prior to...					
• GC analysis	Preferred	Alternative	-	Alternative	Alternative
• HPLC analysis	Preferred	-	-	-	-
• ICP-MS or AAS analysis	Preferred	-	-	Preferred	Alternative
• Ion chromatography	-	-	-	Preferred	-
Typical Applications: Solvent Filtration & Sterilization of...					
• Agressive solutions	Alternative	Preferred	-	-	Alternative
• Aqueous solutions	Preferred	-	-	-	Alternative
• Organic solutions	Preferred	-	-	-	Alternative
Typical Applications: Filtration & Sterilization for...					
• Biomolecules analysis	Alternative	-	Preferred	Preferred	Alternative
• Clinical & forensic analysis	-	-	-	Preferred	Alternative
• Environmental analysis	Preferred	Preferred	-	-	Alternative
• Food & beverage analysis	Preferred	Preferred	-	-	Alternative
Venting Applications	-	Preferred	-	-	-

* Hydrophilic character in presence of alcohol and water.

SiliCycle Membrane Filters Ordering Information

SiliCycle Membrane Filters Ordering Information (*100/box*)				
Membrane Type	25 mm Membrane Diameter		47 mm Membrane Diameter	
	0.20 µm	0.45 µm	0.20 µm	0.45 µm
Nylon	MF-NYL25-20	MF-NYL25-45	MF-NYL47-20	MF-NYL47-45
Polytetrafluoroethylene (*PTFE*)	MF-PTF25-20	MF-PTF25-45	MF-PTF47-20	MF-PTF47-45
Polyvinylidene Fluoride (*PVDF*)	MF-PVD25-20	MF-PVD25-45	MF-PVD47-20	MF-PVD47-45
Polyethersulfone (*PES*)	MF-PES25-20	MF-PES25-45	MF-PES47-20	MF-PES47-45
Regenerated Cellulose (*RC*)	MF-RC25-20	MF-RC25-45	MF-RC47-20	MF-RC47-45

* Contact us if you are looking for a membrane not listed inside this table.

25 mm
Membrane Diameter

47 mm
Membrane Diameter

SiliCycle® Vials & Caps

NEW

Using SiliCycle Vials & Caps ensures the following benefits:

- Compatible with most autosamplers.
- Tight seal each and every time.
- Affordable price and excellent quality.
- Wide range of products available.

SiliCycle Vials & Caps Are Adapted to your Sample Requirements

Vials & Caps are new consumables that SiliCycle now offers to help customers with their day-to-day sample handling needs. SiliCycle Vials & Caps are compatible with most autosampler systems. They respect general characteristics offering the right product with optimal results. These characteristics are; sample volume, volatility, stability, chemical compatibility, and the type of autosampler (*robotic specifications*).

The SiliCycle Vials & Caps portfolio also offers products that are adapted to all types of samples and for specific storage conditions. Product characteristics such as the type of glass, type of septum and type of vial closure can be easily be selected to fit your needs.

Type of Glass

Clear Glass

SiliCycle uses USP Type 1 glass which is a borosilicate presenting the lowest leaching characteristics. This glass has an expansion coefficient of 33. It is a clear glass that does not offer protection from light.

Amber Glass

SiliCycle also uses USP Type 1 glass with an expension coefficient of 51. The amber glass protects the sample from light.

Type of Closure

Snap-Top Vial

This type of vial closure is an extension of the crimp-top vial system but the plastic cap is stretched over the rim of the vial to seal the septum. This is the least reproducible sealed system. This type of vial is not recommended for volatile samples.

Crimp-Top Vial

This type of vial prevents evaporation of the sample because the seal is squeezed between the glass vial rim and the aluminum cap. A crimper is required to seal the cap on the vial.

Screw-Top Vial

This type of vial is the universal and most used vial. Users need simply to screw the cap to seal the septum between the cap and the glass rim. No tool is required.

SiliCycle Snap-Top Vials and Snap Caps

SiliCycle snap-top vials and caps are designed to rapidly seal sample prior to analysis. Because the snap sealing technology is less secure than the screw and the crimp technology, it is highly recommended to use these vials for short time storage and/or for low volatile samples. Snap-top vials are compatible with almost all autosamplers including autosamplers with robotic arms (*refer to the Autosampler Compatibility Table page 155*).

Snap-Top Vials Using 11 mm Snap Caps


2SP-C11-C


2SP-A11-C


2SP-CW11-C


2SP-AW11-C


1-5HSP-C11-C

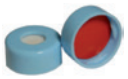

0-3SP-C11-D


0-3SP-A11-D

SiliCycle Snap-Top Vial Products

Description	Vial Size OD x Height (mm)	Capacity (mL)	Product Number 100/box	Product Number 1,000/box
Snap-Top Large Opening Clear Vial	12 x 32	2.0	2SP-C11-C	2SP-C11-M
Snap-Top Large Opening Amber Vial	12 x 32	2.0	2SP-A11-C	2SP-A11-M
Snap-Top Large Opening Clear Vial with White Patch	12 x 32	2.0	2SP-CW11-C	2SP-CW11-M
Snap-Top Large Opening Amber Vial with White Patch	12 x 32	2.0	2SP-AW11-C	2SP-AW11-M
Snap-Top High Recovery Clear Vial	12 x 32	1.5	1-5HSP-C11-C	1-5HSP-C11-M
Snap-Top Fused Insert Clear Vial (*0.3 mL*)	12 x 32	0.3	500/box, 0-3SP-C11-D	
Snap-Top Fused Insert Amber Vial (*0.3 mL*)	12 x 32	0.3	500/box, 0-3SP-A11-D	


CSP11-MI-C


BSP11-MI-C


NSP11-MI-C


RSP11-MI-C


YSP11-MI-C


CSP11-JI-C


CSP11-KSI-C


BSP11-KSI-M

SiliCycle Snap Cap Products

Description	Cap Material	Septum	Thickness (in/mm)	Product Number 100/box	Product Number 1,000/box
11 mm Clear Snap Cap	PP	Red PTFE/White Silicone	0.040/1.0	CSP11-MI-C	CSP11-MI-M
11 mm Blue Snap Cap	PP	Red PTFE/White Silicone	0.040/1.0	BSP11-MI-C	BSP11-MI-M
11 mm Black Snap Cap	PP	Red PTFE/White Silicone	0.040/1.0	NSP11-MI-C	NSP11-MI-M
11 mm Red Snap Cap	PP	Red PTFE/White Silicone	0.040/1.0	RSP11-MI-C	RSP11-MI-M
11 mm Yellow Snap Cap	PP	Red PTFE/White Silicone	0.040/1.0	YSP11-MI-C	YSP11-MI-M
11 mm Clear Snap Cap	PP	Red PTFE/White Silicone/Red PTFE	0.040/1.0	CSP11-JI-C	CSP11-JI-M
11 mm Clear Snap Cap, Slit	PP	Blue PTFE/White Silicone	0.040/1.0	CSP11-KSI-C	CSP11-KSI-M
11 mm Blue Snap Cap, Slit	PP	Blue PTFE/White Silicone	0.040/1.0	BSP11-KSI-C	BSP11-KSI-M

PP = Polypropylene

SiliCycle Crimp-Top Vials and Crimp Caps

SiliCycle crimp-top vials and caps are designed to be the safest alternative to seal sample prior to analysis or storage. When properly assembled, these vials are the best alternative for long-term storage and/or for high volatile solvents. Crimp-top vials are compatible with almost all autosamplers available on the market, including autosamplers with robotic arms (*refer to the Autosampler Compatibility Table page 155*).

Crimp-Top Vials Using 8 mm Crimp Caps

1-2CP-C8-D 1CPT-C8-D 0-8CP-C8-D 0-8CPZ-C8-D 0-7CP-A8-D 0-7CP-C8-D

SiliCycle Crimp-Top Vial Products

Description	Vial Size OD x Height (mm)	Capacity (mL)	Quantity per box	Product Number
Crimp-Top Clear Vial	8 x 40	1.2	500	1-2CP-C8-D
Crimp-Top Tapered Bottom Clear Vial	8 x 40	1.0	500	1CPT-C8-D
Crimp-Top Clear Vial	8 x 30	0.8	500	0-8CP-C8-D
Crimp-Top Clear Vial	7 x 40	0.8	500	0-8CPZ-C8-D
Crimp-Top Tapered bottom Amber Vial	7 x 40	0.7	500	0-7CP-A8-D
Crimp-Top Tapered bottom Clear Vial	7 x 40	0.7	500	0-7CP-C8-D

ALCP8-MI-C ALCP8-JI-C ALCP8-CI-C

SiliCycle Crimp Cap Products

Description	Cap Material	Septum	Thickness (in/mm)	Product Number	
				100/box	1,000/box
8 mm Crimp Cap	Al	Red PTFE/White Silicone	0.040/1.0	ALCP8-MI-C	ALCP8-MI-M
8 mm Crimp Cap	Al	Red PTFE/White Silicone/Red PTFE	0.040/1.0	ALCP8-JI-C	ALCP8-JI-M
8 mm Crimp Cap	Al	Clear FEP/Orange Silicone	0.040/1.0	ALCP8-CI-C	ALCP8-CI-M

Al = Aluminum

Crimp-Top Vials Using 11 mm Crimp Caps


1-1CPT-C11-D


1-1CPT-A11-D


0-9CPT-C11-D


0-9CPP-C11-D


0-3CP-C11-D


0-3CP-A11-D


2CP-C11-C


2CP-A11-C


2CP-CW11-C


4CP-C11-D

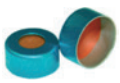

2-5CP-C11-D


2CPR-CW11-D


1-5HCP-C11-C

SiliCycle Crimp-Top Vial Products				
Description	Vial Size OD x Height (mm)	Capacity (mL)	Product Number 100/box	Product Number 1,000/box
Crimp-Top Large Opening Clear Vial	12 x 32	2.0	2CP-C11-C	2CP-C11-M
Crimp-Top Large Opening Amber Vial	12 x 32	2.0	2CP-A11-C	2CP-A11-M
Crimp-Top Large Opening Clear Vial with White Patch	12 x 32	2.0	2CP-CW11-C	2CP-CW11-M
Crimp-Top Large Opening Amber Vial with White Patch	12 x 32	2.0	2CP-AW11-C	2CP-AW11-M
Crimp-Top Clear Vial	15 x 46	4.0	500/box, 4CP-C11-D	
Crimp-Top Clear Vial	12 x 40	2.5	500/box, 2-5CP-C11-D	
Crimp-Top Round Bottom Clear Vial with White Patch	12 x 32	2.0	500/box, 2CPR-CW11-D	
Crimp-Top High Recovery Clear Vial	12 x 32	1.5	100/box, 1-5HCP-C11-C	
Crimp-Top Tapered Bottom Clear Vial	12 x 32	1.1	500/box, 1-1CPT-C11-D	
Crimp-Top Tapered Bottom Amber Vial	12 x 32	1.1	500/box, 1-1CPT-A11-D	
Crimp-Top Tapered Bottom Clear Vial	10 x 32	0.9	500/box, 0-9CPT-C11-D	
Crimp-Top Fused Insert Clear Vial	12 x 32	0.9	500/box, 0-9CP-C11-D	
Crimp-Top Fused Insert Clear Vial	12 x 32	0.3	500/box, 0-3CP-C11-D	
Crimp-Top Fused Insert Amber Vial	12 x 32	0.3	500/box, 0-3CP-A11-D	


ALCP11-CI-C


BCP11-CI-C


RCP11-CI-C


GCP11-CI-C


YCP11-CI-C


ALCP11-MI-C


ALCP11-MIM-C


ALCP11-CIM-C


ALCP11-JIM-C

SiliCycle Crimp Cap Products					
Description	Cap Material	Septum	Thickness (in/mm)	Product Number 100/box	Product Number 1,000/box
11 mm Aluminum Crimp Cap	Al	Clear FEP/Orange Silicone	0.040/1.0	ALCP11-CI-C	ALCP11-CI-M
11 mm Blue Crimp Cap	Al	Clear FEP/Orange Silicone	0.040/1.0	BCP11-CI-C	BCP11-CI-M
11 mm Red Crimp Cap	Al	Clear FEP/Orange Silicone	0.040/1.0	RCP11-CI-C	RCP11-CI-M
11 mm Green Crimp Cap	Al	Clear FEP/Orange Silicone	0.040/1.0	GCP11-CI-C	GCP11-CI-M
11 mm Yellow Crimp Cap	Al	Clear FEP/Orange Silicone	0.040/1.0	YCP11-CI-C	YCP11-CI-M
11 mm Aluminum Crimp Cap	Al	Red PTFE/White Silicone	0.040/1.0	ALCP11-MI-C	ALCP11-MI-M
11 mm Aluminum Magnetic Crimp Cap	Al	Red PTFE/White Silicone	0.040/1.0	ALCP11-MIM-C	ALCP11-MIM-M
11 mm Aluminum Magnetic Crimp Cap	Al	Clear FEP/Orange Silicone	0.040/1.0	ALCP11-CIM-C	ALCP11-CIM-M
11 mm Aluminum Magnetic Crimp Cap	Al	Red PTFE/White Silicone/Red PTFE	0.040/1.0	ALCP11-JIM-C	ALCP11-JIM-M

Al = Aluminum

Crimp-Top Vials (*Headspace*) Using 20 mm Crimp Caps

6CPTR-C20-C 10CPTR-C20-C 20CPTR-C20-C 6CPTF-C20-C 10CPTF-C20-C 20CPTF-C20-C 6CP-C20-C 10CP-C20-C 20CP-C20-C

SiliCycle Crimp-Top (*Headspace*) Vial Products

Description	Vial Size OD x Height (mm)	Capacity (mL)	Product Number	
			100/box	1,000/box
Crimp-Top Tapered Top/Radius Bottom Clear Vial	22 x 38	6.0	6CPTR-C20-C	6CPTR-C20-M
Crimp-Top Tapered Top/Radius Bottom Clear Vial	22 x 46	10.0	10CPTR-C20-C	10CPTR-C20-M
Crimp-Top Tapered Top/Radius Bottom Clear Vial	22 x 75	20.0	20CPTR-C20-C	20CPTR-C20-M
Crimp-Top Tapered Top/Flat Bottom Clear Vial	22 x 38	6.0	6CPTF-C20-C	6CPTF-C20-M
Crimp-Top Tapered Top/Flat Bottom Clear Vial	22 x 46	10.0	10CPTF-C20-C	10CPTF-C20-M
Crimp-Top Tapered Top/Flat Bottom Clear Vial	22 x 75	20.0	20CPTF-C20-C	20CPTF-C20-M
Crimp-Top Standard Top/Flat Bottom Clear Vial	22 x 38	6.0	6CP-C20-C	6CP-C20-M
Crimp-Top Standard Top/Flat Bottom Clear Vial	22 x 46	10.0	10CP-C20-C	10CP-C20-M
Crimp-Top Standard Top/Flat Bottom Clear Vial	22 x 75	20.0	20CP-C20-C	20CP-C20-M

GOCP20-5DIM-C GOCP20-8DIM-C BMCP20-DIM-C ALCP20-BI-C 0800-B0125-C 0800-N0125-C ALCP20-M-M

SiliCycle Crimp Cap and Septum Products

Description	Cap	Septum	Thickness (in/mm)	Product Number	
				100/box	1,000/box
20 mm Gold Magnetic Crimp Cap (5 mm)	Al	Natural PTFE/White Ultra Low Bleed Silicone	0.125/3.0	GOCP20-5DIM-C	GOCP20-5DIM-M
20 mm Gold Magnetic Crimp Cap (8 mm)	Al	Natural PTFE/White Ultra Low Bleed Silicone	0.125/3.0	GOCP20-8DIM-C	GOCP20-8DIM-M
20 mm Bi-Metallic Magnetic Crimp Cap	Al/Ti	Natural PTFE/White Ultra Low Bleed Silicone	0.125/3.0	BMCP20-DIM-C	BMCP20-DIM-M
20 mm Aluminum Crimp Cap	Al	Natural PTFE/White Ultra Low Bleed Silicone	0.125/3.0	ALCP20-BI-C	ALCP20-BI-M
20 mm Gold Magnetic Crimp Cap (5 mm)	Al	White PTFE/White Silicone	0.125/3.0	GOCP20-5MIM-C	GOCP20-5MIM-M
20 mm Gold Magnetic Crimp Cap (8 mm)	Al	White PTFE/White Silicone	0.125/3.0	GOCP20-8MIM-C	GOCP20-8MIM-M
20 mm Aluminum Crimp Cap	Al	White PTFE/White Ultra Low Bleed Silicone	0.125/3.0	ALCP20-NI-C	ALCP20-NI-M
20 mm Bi-Metallic Magnetic Crimp Cap	Al/Ti	White PTFE/White Ultra Low Bleed Silicone	0.125/3.0	BMCP20-NIM-C	BMCP20-NIM-M
20 mm Gold Magnetic Crimp Cap (5 mm)	Al	White PTFE/White Ultra Low Bleed Silicone	0.040/1.0	GOCP20-5NIM-C	GOCP20-5NIM-M
20 mm Gold Magnetic Crimp Cap (8 mm)	Al	White PTFE/White Ultra Low Bleed Silicone	0.040/1.0	GOCP20-8NIM-C	GOCP20-8NIM-M
0.800" Septum	-	Natural PTFE/White Ultra Low Bleed Silicone	0.040/1.0	0800-B0125-C	0800-B0125-M
0.800" Septum	-	White PTFE/White Ultra Low Bleed Silicone	0.040/1.0	0800-N0125-C	0800-N0125-M
20 mm Gold Magnetic Crimp Cap (5 mm)	Al	-	-	-	GOCP20-5M-M
20 mm Gold Magnetic Crimp Cap (8 mm)	Al	-	-	-	GOCP20-8M-M
20 mm Aluminum Crimp Cap	Al	-	-	-	ALCP20-M-M

Al = Aluminum, Al/Ti = Aluminum/Tin Plate

SiliCycle Screw-Top Vials and Screw Caps

SiliCycle screw-top vials and caps are developed to be easily reusable. No tools are required to securely seal the sample comparatively to crimp-top vials and caps. Screw-top technology provides low evaporation and rapid alternative for volatile sample storage and/or analysis. Screw-top vials are compatible with almost all autosamplers available on the market (*refer to the Autosampler Compatibility Table page 155*).

Screw-Top Vials (*Standard Opening*) Using 8 mm Screw Caps


2SW-C8-C


2SW-A8-C


2SW-CW8-C


2SW-AW8-C

SiliCycle Screw-Top (*Standard Opening*) Vial Products

Description	Vial Size OD x Height (mm)	Capacity (mL)	Product Number	
			100/box	1,000/box
Screw-Top Standard Opening Clear Vial	12 x 32	2.0	2SW-C8-C	2SW-C8-M
Screw-Top Standard Opening Amber Vial	12 x 32	2.0	2SW-A8-C	2SW-A8-M
Screw-Top Standard Opening Clear Vial with White Patch	12 x 32	2.0	2SW-CW8-C	2SW-CW8-M
Screw-Top Standard Opening Amber Vial with White Patch	12 x 32	2.0	2SW-AW8-C	2SW-AW8-M


NSW8-HI-C


NSW8-HSI-C


NSW8-KI-C


NSW8-KSI-C


NSW8-JI-C


NSW8-C

SiliCycle Screw Cap and Septum Products

Description	Cap Material	Septum	Thickness (in/mm)	Product Number	
				100/box	1,000/box
8 mm Black Screw Cap	PP	Red PTFE/White Silicone	0.060/1.5	NSW8-HI-C	NSW8-HI-M
8 mm Black Screw Cap, Slit	PP	Red PTFE/White Silicone	0.060/1.5	NSW8-HSI-C	NSW8-HSI-M
8 mm Black Screw Cap	PP	Blue PTFE/White Silicone	0.060/1.5	NSW8-KI-C	NSW8-KI-M
8 mm Black Screw Cap, Slit	PP	Blue PTFE/White Silicone	0.060/1.5	NSW8-KSI-C	NSW8-KSI-M
8 mm Black Screw Cap	PP	Red PTFE/White Silicone/Red PTFE	0.060/1.5	NSW8-JI-C	NSW8-JI-M
0.321'' Septum	-	Red PTFE/White Silicone	0.060/1.5	0321-H0060-C	0321-H0060-M
0.321'' Slit Septum	-	Red PTFE/White Silicone	0.060/1.5	0321-HS0060-C	0321-HS0060-M
0.321'' Septum	-	Blue PTFE/White Silicone	0.060/1.5	0321-K0060-C	0321-K0060-M
0.321'' Slit Septum	-	Blue PTFE/White Silicone	0.060/1.5	0321-KS0060-C	0321-KS0060-M
0.321'' Septum	-	Red PTFE/White Silicone/Red PTFE	0.040/1.0	0321-J0040-C	0321-J0040-M
0.321'' Septum	-	Red PTFE/White Silicone/Red PTFE	0.060/1.5	0321-J0060-C	0321-J0060-M
8 mm Black Screw Cap	PP	-	-	NSW8-C	NSW8-M

PP= Polypropylene

Screw-Top Vials (*Large Opening*) Using 9 mm Screw Caps


2SW-C9-C


2SW-A9-C


2SW-CW9-C


2SW-AW9-C


4SW-C9-D


1-5HSW-C9-D


0-3SW-C9-D


0-3SW-A9-D

SiliCycle Screw-Top (*Large Opening*) Vial Products

Description	Vial Size OD x Height (mm)	Capacity (mL)	Product Number	
			100/box	1,000/box
Screw-Top Large Opening Clear Vial	12 x 32	2.0	2SW-C9-C	2SW-C9-M
Screw-Top Large Opening Amber Vial	12 x 32	2.0	2SW-A9-C	2SW-A9-M
Screw-Top Large Opening Clear Vial with White Patch	12 x 32	2.0	2SW-CW9-C	2SW-CW9-M
Screw-Top Large Opening Amber Vial with White Patch	12 x 32	2.0	2SW-AW9-C	2SW-AW9-M
Screw-Top Fused Insert Polypropylene Vial	12 x 32	0.25	0-25SW-PP9-C	0-25SW-PP9-M
Screw-Top Fused Insert Polypropylene Vial	12 x 32	0.7	0-7SW-PP9-C	0-7SW-PP9-M
Screw-Top Large Opening Clear Vial	16 x 46	4.0	500/box, 4SW-C9-D	
Screw-Top High Recovery Clear Vial	12 x 32	1.5	500/box, 1-5HSW-C9-D	
Screw-Top High Recovery Amber Vial	12 x 32	1.5	500/box, 1-5HSW-A9-D	
Screw-Top Fused Insert Clear Vial	12 x 32	0.9	500/box, 0-9SW-C9-D	
Screw-Top Fused Insert Clear Vial	12 x 32	0.3	500/box, 0-3SW-C9-D	
Screw-Top Fused Insert Amber Vial	12 x 32	0.3	500/box, 0-3SW-A9-D	


BSW9-C


NSW9-C


RSW9-C


GSW9-C


YSW9-C


0346-H0040-C


0346-P0040-C


0346-PS0040-C


0346-K0040-C


0346-J0040-C

SiliCycle Screw Cap and Septum Products

Description	Cap Material	Septum	Thickness (in/mm)	Product Number	
				100/box	1,000/box
9 mm Blue Open-Top Screw Cap	PP	-	-	BSW9-C	BSW9-M
9 mm Black Open-Top Screw Cap	PP	-	-	NSW9-C	NSW9-M
9 mm Red Open-Top Screw Cap	PP	-	-	RSW9-C	RSW9-M
9 mm Green Open-Top Screw Cap	PP	-	-	GSW9-C	GSW9-M
9 mm Yellow Open-Top Screw Cap	PP	-	-	YSW9-C	YSW9-M
0.346" Septum	-	Red PTFE/White Silicone	0.040/1.0	0346-H0040-C	0346-H0040-M
0.346" Septum	-	White PTFE/Red Silicone	0.040/1.0	0346-P0040-C	0346-P0040-M
0.346" Septum, Slit	-	White PTFE/Red Silicone	0.040/1.0	0346-PS0040-C	0346-PS0040-M
0.346" Septum	-	Blue PTFE/White Silicone	0.040/1.0	0346-K0040-C	0346-K0040-M
0.346" Septum	-	Red PTFE/White Silicone/Red PTFE	0.040/1.0	0346-J0040-C	0346-J0040-M

PP = Polypropylene

Screw-Top Vials (*Large Opening*) Using 9 mm Screw Caps (*con't*)


BSW9-HI-C


BSW9-HSI-C


BSW9-HB-C


NSW9-HI-C


RSW9-HI-C


GSW9-HI-C


YSW9-HI-C


BSW9-OB-C


BSW9-BI-C


BSW9-PI-C


NSW9-PI-C


NSW9-PSI-C


BSW9-KI-C


BSW9-KSI-C


BSW9-KSB-C


NSW9-KI-C


NSW9-KSI-C


BSW9-JI-C


BSW9-EI-C


NSW9-EI-C


NSW9-ESI-C

SiliCycle Screw-Top (*Large Opening*) Cap Products

Description	Cap Material	Septum	Thickness (in/mm)	Product Number	
				100/box	1,000/box
9 mm Blue Screw Cap	PP	Red PTFE/White Silicone	0.040/1.0	BSW9-HI-C	BSW9-HI-M
9 mm Blue Screw Cap, Slit	PP	Red PTFE/White Silicone	0.040/1.0	BSW9-HSI-C	BSW9-HSI-M
9 mm Blue Screw Cap, Bonded	PP	Red PTFE/White Silicone	0.040/1.0	BSW9-HB-C	BSW9-HB-M
9 mm Black Screw Cap	PP	Red PTFE/White Silicone	0.040/1.0	NSW9-HI-C	NSW9-HI-M
9 mm Red Screw Cap	PP	Red PTFE/White Silicone	0.040/1.0	RSW9-HI-C	RSW9-HI-M
9 mm Green Screw Cap	PP	Red PTFE/White Silicone	0.040/1.0	GSW9-HI-C	GSW9-HI-M
9 mm Yellow Screw Cap	PP	Red PTFE/White Silicone	0.040/1.0	YSW9-HI-C	YSW9-HI-M
9 mm Blue Screw Cap, Bonded	PP	White PTFE/Orange Silicone	0.040/1.0	BSW9-OB-C	BSW9-OB-M
9 mm Blue Screw Cap	PP	Clear PTFE/Orange Silicone	0.040/1.0	BSW9-BI-C	BSW9-BI-M
9 mm Blue Screw Cap	PP	White PTFE/Red Silicone	0.040/1.0	BSW9-PI-C	BSW9-PI-M
9 mm Blue Screw Cap, Slit	PP	White PTFE/Red Silicone	0.040/1.0	BSW9-PSI-C	BSW9-PSI-M
9 mm Back Screw Cap	PP	White PTFE/Red Silicone	0.040/1.0	NSW9-PI-C	NSW9-PI-M
9 mm Black Screw Cap, Slit	PP	White PTFE/Red Silicone	0.040/1.0	NSW9-PSI-C	NSW9-PSI-M
9 mm Blue Screw Cap	PP	Blue PTFE/White Silicone	0.040/1.0	BSW9-KI-C	BSW9-KI-M
9 mm Blue Screw Cap, Slit	PP	Blue PTFE/White Silicone	0.040/1.0	BSW9-KSI-C	BSW9-KSI-M
9 mm Blue Screw Cap, Slit, Bonded	PP	Blue PTFE/White Silicone	0.040/1.0	BSW9-KSB-C	BSW9-KSB-M
9 mm Black Screw Cap	PP	Blue PTFE/White Silicone	0.040/1.0	NSW9-KI-C	NSW9-KI-M
9 mm Black Screw Cap, Slit	PP	Blue PTFE/White Silicone	0.040/1.0	NSW9-KSI-C	NSW9-KSI-M
9 mm Blue Screw Cap	PP	Red PTFE/White Silicone/Red PTFE	0.040/1.0	BSW9-JI-C	BSW9-JI-M
9 mm Blue Screw Cap	PP	Natural PTFE/White Silicone	0.040/1.0	BSW9-EI-C	BSW9-EI-M
9 mm Black Screw Cap	PP	Natural PTFE/White Silicone	0.040/1.0	NSW9-EI-C	NSW9-EI-M
9 mm Black Screw Cap, Slit	PP	Natural PTFE/White Silicone	0.040/1.0	NSW9-ESI-C	NSW9-ESI-M

PP = Polypropylene

Screw-Top Vials (*Large Opening*) Using 10 mm Screw Caps


2SW-C10-C


2SW-A10-C


2SW-CW10-C


2SW-AW10-C

SiliCycle Screw-Top (*Large Opening*) Vial Products

Description	Vial Size OD x Height (mm)	Capacity (mL)	Product Number	
			100/box	1,000/box
Screw-Top Large Opening Clear Vial	12 x 32	2.0	2SW-C10-C	2SW-C10-M
Screw-Top Large Opening Amber Vial	12 x 32	2.0	2SW-A10-C	2SW-A10-M
Screw-Top Large Opening Clear Vial with White Patch	12 x 32	2.0	2SW-CW10-C	2SW-CW10-M
Screw-Top Large Opening Amber Vial with White Patch	12 x 32	2.0	2SW-AW10-C	2SW-AW10-M


NSW10-HI-C


NSW10-HSI-C


WSW10-HI-C


0374-H0060-C


0374-HS0060-C


NSW10-C


WSW10-C

SiliCycle Screw Cap and Septum Products

Description	Cap Material	Septum	Thickness (in/mm)	Product Number	
				100/box	1,000/box
10 mm Black Screw Cap	PP	Red PTFE/White Silicone	0.060/1.5	NSW10-HI-C	NSW10-HI-M
10 mm Black Screw Cap, Slit	PP	Red PTFE/White Silicone	0.060/1.5	NSW10-HSI-C	NSW10-HSI-M
10 mm White Screw Cap	PP	Red PTFE/White Silicone	0.060/1.5	WSW10-HI-C	WSW10-HI-M
0.374" Septum	-	Red PTFE/White Silicone	0.060/1.5	0374-H0060-C	0374-H0060-M
0.374" Septum, Slit	-	Red PTFE/White Silicone	0.040/1.0	0374-HS0060-C	0374-HS0060-M
10 mm Black Screw Cap	PP	-	-	NSW10-C	NSW10-M
10 mm White Screw Cap	PP	-	-	WSW10-C	WSW10-M

PP= Polypropylene

Screw-Top Vials (*Large Opening*) Using 13 mm Screw Caps


4SW-C13-C


4SW-A13-C


4SW-CW13-C


4SW-AW13-C


3-5HSW-C13-E

SiliCycle Screw-Top (*Large Opening*) Vial Products				
Description	Vial Size OD x Height (mm)	Capacity (mL)	Product Number	
			100/box	1,000/box
Screw-Top Large Opening Clear Vial	15 x 45	4.0	4SW-C13-C	4SW-C13-M
Screw-Top Large Opening Amber Vial	15 x 45	4.0	4SW-A13-C	4SW-A13-M
Screw-Top Large Opening Clear Vial with White Patch	15 x 45	4.0	4SW-CW13-C	4SW-CW13-M
Screw-Top Large Opening Amber Vial with White Patch	15 x 45	4.0	4SW-AW13-C	4SW-CW13-M
Screw-Top High Recovery Clear Vial	15 x 45	3.5	250/box, 3-5HSW-C13-E	


NSW13-HI-C


NSW13-HSI-C


NSW13-HB-C


NSW13-HSB-C


NSW13-ZHI-C


NSW13-ZHSI-C


NSW13-C


0479-H0060-C


0479-HS0060-C


0479-H0075-C


0479-HS0075-C

SiliCycle Screw Cap and Septum Products					
Description	Cap Material	Septum	Thickness (in/mm)	Product Number	
				100/box	1,000/box
13 mm Black Screw Cap	PP	Red PTFE/White Silicone	0.060/1.5	NSW13-HI-C	NSW13-HI-M
13 mm Black Screw Cap, Slit	PP	Red PTFE/White Silicone	0.060/1.5	NSW13-HSI-C	NSW13-HSI-M
13 mm Black Screw Cap, Bonded	PP	Red PTFE/White Silicone	0.060/1.5	NSW13-HB-C	NSW13-HB-M
13 mm Black Screw Cap, Slit, Bonded	PP	Red PTFE/White Silicone	0.060/1.5	NSW13-HSB-C	NSW13-HSB-M
13 mm Black Screw Cap	PP	Red PTFE/White Silicone	0.075/1.9	NSW13-ZHI-C	NSW13-ZHI-M
13 mm Black Screw Cap, Slit	PP	Red PTFE/White Silicone	0.075/1.9	NSW13-ZHSI-C	NSW13-ZHSI-M
13 mm Black Screw Cap	PP	-	-	NSW13-C	WSW13-M
0.479'' Septum	-	Red PTFE/White Silicone	0.060/1.5	0479-H0060-C	0479-H0060-M
0.479'' Septum, Slit	-	Red PTFE/White Silicone	0.060/1.5	0479-HS0060-C	0479-HS0060-M
0.479'' Septum	-	Red PTFE/White Silicone	0.075/1.9	0479-H0075-C	0479-H0075-M
0.479'' Septum, Slit	-	Red PTFE/White Silicone	0.075/1.9	0479-HS0075-C	0479-HS0075-M

PP= Polypropylene

Screw-Top Vials (*Headspace*) Using 18 mm Screw Caps


10SW-C18-C


10SW-A18-C


20SW-C18-C


20SW-A18-C

SiliCycle Screw-Top (*Headspace*) Vial Products				
Description	Vial Size OD x Height (mm)	Capacity (mL)	Product Number 100/box	Product Number 1,000/box
Screw-Top Standard Opening Clear Vial	22 x 46	10.0	10SW-C18-C	10SW-C18-M
Screw-Top Standard Opening Amber Vial	22 x 46	10.0	10SW-A18-C	10SW-A18-M
Screw-Top Standard Opening Clear Vial	22 x 76	20.0	20SW-C18-C	20SW-C18-M
Screw-Top Standard Opening Amber Vial	22 x 76	20.0	20SW-A18-C	20SW-A18-M


ALSW18-LIM-C


ALSW18-IIM-C


ALSW18-ZQIM-C


ALSW18-QIM-C


0680-I0050-C


0680-L0060-C


0680-Q0125-C


0680-Q0050-C

SiliCycle Screw Cap (*Headspace*) and Septum Products					
Description	Cap	Septum	Thickness (in/mm)	Product Number 100/box	Product Number 1,000/box
18 mm Magnetic Aluminum Screw Cap	Al	Blue PTFE/White Ultra Low Bleed Silicone	0.060/1.5	ALSW18-LIM-C	ALSW18-LIM-M
18 mm Magnetic Aluminum Screw Cap	Al	Red PTFE/White Ultra Low Bleed Silicone	0.050/1.3	ALSW18-IIM-C	ALSW18-IIM-M
18 mm Magnetic Aluminum Screw Cap	Al	White PTFE/Translucent Blue Ultra Low Bleed Silicone	0.125/3.0	ALSW18-ZQIM-C	ALSW18-ZQIM-M
18 mm Magnetic Aluminum Screw Cap	Al	White PTFE/Translucent Blue Ultra Low Bleed Silicone	0.050/1.3	ALSW18-QIM-C	ALSW18-QIM-M
0.680" Septum	-	Blue PTFE/White Ultra Low Bleed Silicone	0.060/1.5	0680-L0060-C	0680-L0060-M
0.680" Septum	-	Red PTFE/White Ultra Low Bleed Silicone	0.050/1.3	0680-I0050-C	0680-I0050-M
0.680" Septum	-	White PTFE/Translucent Blue Ultra Low Bleed Silicone	0.125/3.0	0680-Q0125-C	0680-Q0125-M
0.680" Septum	-	White PTFE/Translucent Blue Ultra Low Bleed Silicone	0.050/1.3	0680-Q0050-C	0680-Q0050-M

Al = Aluminum

Insert Vials for Microsampling


0-3IF-C9-M


0-2IT-C8-D


0-2IT-C9-M


0-2IF-C8-M

SiliCycle Insert Vial Products					
Description	Insert Vial	Vial Size OD x Height (mm)	Capacity (mL)	Quantity per box	Product Number
Flat Bottom Clear Vial Insert	9 mm Screw-Top 11 mm Snap-Top 11 mm Crimp-Top	6 x 31	0.3	1,000	0-3IF-C9-M
Tapered Bottom Clear Vial Insert	8 mm Screw-Top	5 x 30	0.2	500	0-2IT-C8-D
Flat Bottom Clear Vial Insert	9 mm Screw-Top 11 mm Snap-Top 11 mm Crimp-Top	6 x 30	0.2	1,000	0-2IT-C9-M
Tapered Bottom Clear Vial Insert	8 mm Screw-Top	5 x 31	0.2	1,000	0-2IF-C8-M

Shell (*Neckless*) Vials and Caps


1SLF-C8-D


2SLF-C12-D

SiliCycle Shell (*Neckless*) Vial Products				
Description	Vial Size OD x Height (mm)	Capacity (mL)	Quantity per box	Product Number
Shell Flat Bottom Clear Vial	8 x 40	1.0	500	1SLF-C8-D
Shell Flat Bottom Clear Vial	12 x 32	2.0	500	2SLF-C12-D


CSL8-M


CSL12-M

SiliCycle Cap Products for Shell Vials		
Description	Cap Material	Product Number 1,000/box
8 mm Clear Cap for Shell Vial	PE	CSL8-M
12 mm Clear Cap for Shell Vial	PE	CSL12-M

PE= Polyethylene

EPA Type Screw-Top Vials and Screw Caps

SiliCycle EPA screw-top vials and caps are developed to meet USP and EPA standard for water samples and/or environmental testing. Neutral borosilicate type 1 glass clear and amber are used coupled to an ultra low or an extreme low bleed septa liner ensure tight sealed samples prior analysis.

EPA Screw-Top Vials Using 24 mm Screw Caps


20SW-C24-C


20SW-A24-C


30SW-C24-C


30SW-A24-C


40SW-C24-C


40SW-A24-C

SiliCycle EPA Type Screw-Top Vial Products

Description	Vial Size OD x Height (mm)	Capacity (mL)	Product Number	
			100/box	1,000/box
EPA Screw-Top Clear Vial	28 x 57	20.0	20SW-C24-C	20SW-C24-M
EPA Screw-Top Amber Vial	28 x 57	20.0	20SW-A24-C	20SW-A24-M
EPA Screw-Top Clear Vial	28 x 70	30.0	30SW-C24-C	30SW-C24-M
EPA Screw-Top Amber Vial	28 x 70	30.0	30SW-A24-C	30SW-A24-M
EPA Screw-Top Clear Vial	28 x 95	40.0	40SW-C24-C	40SW-C24-M
EPA Screw-Top Amber Vial	28 x 95	40.0	40SW-A24-C	40SW-A24-M


NSW24-RI-C


WSW24-RI-C


WSW24-GI-C


WSW24-RB-C


NSW24-RB-C

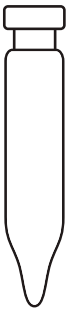

WSW24-GB-C

SiliCycle EPA Type Screw Cap and Septum Products

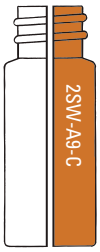
Description	Cap	Septum	Thickness (in/mm)	Product Number	
				100/box	500/box
24 mm EPA Type Black Screw Cap	PP	Natural PTFE/Clear Extreme Low Bleed Silicone	0.125/3.0	NSW24-RI-C	NSW24-RI-D
24 mm EPA Type White Screw Cap	PP	Natural PTFE/Clear Extreme Low Bleed Silicone	0.125/3.0	WSW24-RI-C	WSW24-RI-D
24 mm EPA Type White Screw Cap	PP	Natural PTFE/Clear Ultra Low Bleed Silicone	0.125/3.0	WSW24-GI-C	WSW24-GI-D
24 mm EPA Type White Screw Cap, Bonded	PP	Natural PTFE/Clear Extreme Low Bleed Silicone	0.060/1.5	WSW24-RB-C	WSW24-RB-D
24 mm EPA Type Black Screw Cap, Bonded	PP	Natural PTFE/Clear Extreme Low Bleed Silicone	0.125/3.0	NSW24-RB-C	NSW24-RB-D
24 mm EPA Type White Screw Cap, Bonded	PP	Natural PTFE/Clear Extreme Low Bleed Silicone	0.125/3.0	WSW24-GB-C	WSW24-GB-D
0.880'' Septum	-	Natural PTFE/Clear Extreme Low Bleed Silicone	0.060/1.5	0880-R0060-C	0880-R0060-D
0.880'' Septum	-	Natural PTFE/Clear Extreme Low Bleed Silicone	0.125/3.0	0880-R0125-C	0880-R0125-D
0.880'' Septum	-	Natural PTFE/Clear Ultra Low Bleed Silicone	0.125/3.0	0880-G0125-C	0880-G0125-D

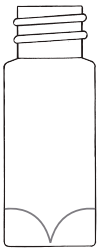
PP= Polypropylene

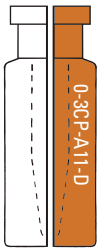
SiliCycle Vials Comparison Chart (Actual Size)



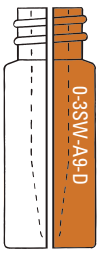
Product No. Dimensions	**8-CPZ-C8-D** 7 x 40 mm	**0-8CP-C8-D** 8 x 30 mm	**0-7CP-C8-D** 7 x 40 mm	**1-2CP-C8-D** 8 x 40 mm	**1CPT-C8-D** 8 x 40 mm

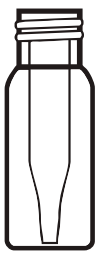


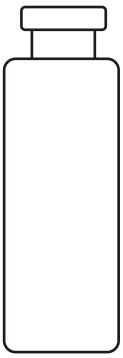




Part No. Dimensions	**2SW-C8-C** 12 x 32 mm	**2SW-C9-C** 12 x 32 mm	**4SW-C9-D** 15 x 45 mm	**1-5HSW-C9-D** 12 x 32 mm	**0-3CP-C11-D** 12 x 32 mm

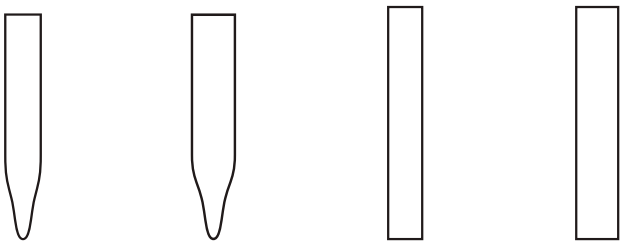




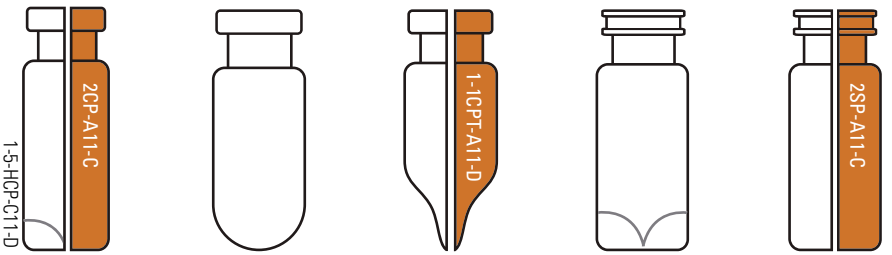


Part No. Dimensions	**0-3SW-C9-D** 12 x 32 mm	**0-9SW-C9-D** 12 x 32 mm	**2-5CP-C11-D** 12 x 40 mm	**4CP-C11-D** 15 x 46 mm

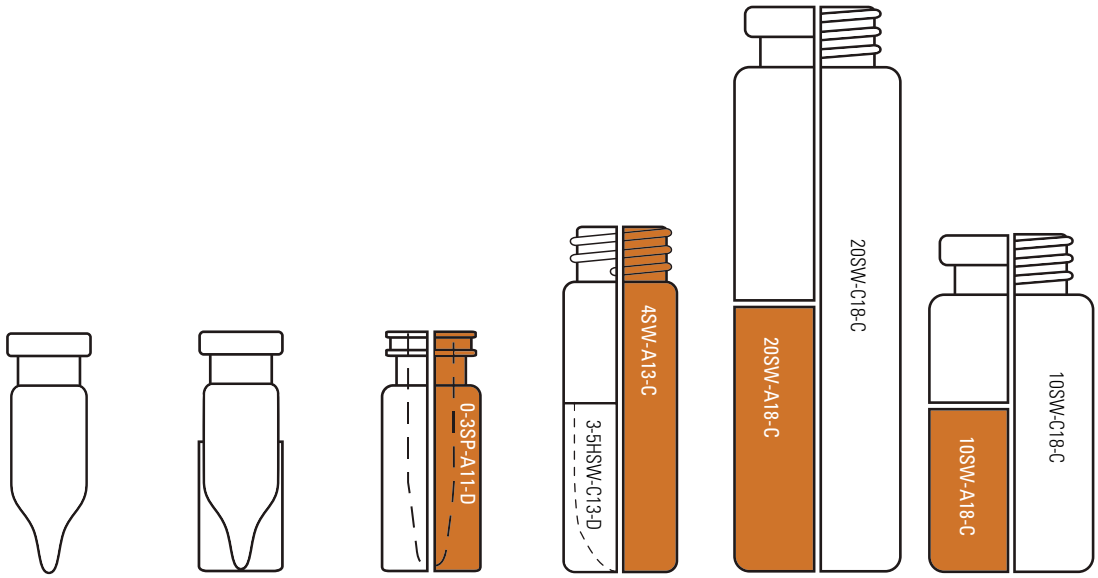
SiliCycle Vials Comparison Chart *(con't)*



Part No. Dimensions	0-2IT-C8-D 5 x 30 mm	0-2IT-C9-M 6 x 30 mm	0-2IF-C8-M 5 x 31 mm	0-3IF-C9-M 6 x 31 mm



Part No. Dimensions	2CP-C11-C 12 x 32 mm	2CPR-CW11-D 12 x 32 mm	1-1CPT-C11-D 12 x 32 mm	1-5HSP-C11-C 12 x 32 mm	2SP-C11-C 12 x 32 mm



Part No. Dimensions	0-9CPT-C11-D 10 x 32 mm	0-9CP-C11-D 12 x 32 mm	0-3SP-C11-D 12 x 32 mm	4SW-C13-C 15 x 45 mm	20CP-C20-C 22 x 75 mm	10CP-C20-C 22 x 46 mm

Instrument and Vial Compatibility Chart

The table bellow indicates the categories of vials that are compatible with various models of autosamplers.

*Certain autosamplers require the purchase of optional vial trays and, in few cases, programming upgrades to use all of the vials listed.

Autosampler Compatibility Table

Manufacturer	Model	8 mm Crimp	11 mm Crimp and Snap	8 mm Screw	9 mm Screw	10 mm Screw	13 mm Screw	18 mm Screw (*Headspace*)	Shell Vials (*Neckless*)	Plate (*page 49*)
Agilent	1050, 1090		•		•					
	1050 (34 Pos. Tray), 1090 (34 Pos. Tray)	•								
	1100/1200		•		•					
	G1888A							•		
	7673A/7683A	•	•		•					
	7693A		•	•	•		•		•	
	HS7694						•	•		
	7697A							•		
	79855(A)		•		•					
	5880/5890		•		•					
	6850 (27 Pos. Tray)		•		•					
	6850 (22 Pos. Tray)						•			
	6890		•		•					
	CTC HTS+HTC PAL+CTC GC PAL	•	•		•					•
	CTC Combi PAL							•		
	1100 Well-Plate/1100 Nanoflow		•	•	•					•
	1200 Well-plate/1200 SL plus		•	•	•					•
AI	42 vial tray		•	•	•					
	60 vial tray	•	•	•	•					
	CTC A200S	•	•	•	•					
	Headspace							•		
AIM	CPS-100+CPS-200		•	•	•					
Alcott	708 AL, 728								•	
	738, 719 D/ D-PCS		•	•	•	•				
	719 AL		•	•	•	•	•	•		
Alpha M.O.S.	Prometheus/Fox/Kronos							•		
Antec Leyden	AS 100, 736 Unisampler, 738		•	•	•	•				
	Alexys		•	•	•					
ATAS GL	Focus		•	•	•			•		
Beckman	501, 502/502e, 507/507e	•	•	•	•	•				
	504	•								
	508 (System Gold)				•			•		
	Marathon, Promis		•	•	•					
	Triathlon,Standard Tray		•	•	•			•		
	Triathlon, LSV Tray	•					•			
	Triathlon, Super-LSV Tray							•		
	Triathlon, Micro-Tray	•								
Bruker	LC51						•			
	Mapi1									•
Cambridge Scientific Instruments	205 Series, 300 Series		•	•	•	•	•			

- indicates that a cap having an outer flange is required for the vial to operate properly with the autosampler.
- indicates that the vials from this category are compatible with the autosampler in most configurations.
- indicates that a magnetic seal is required for use with the autosampler.

Autosampler Compatibility Table (con't)

Manufacturer	Model	8 mm Crimp	11 mm Crimp and Snap	8 mm Screw	9 mm Screw	10 mm Screw	13 mm Screw	18 mm Screw (*Headspace*)	Shell Vials (*Neckless*)	Plate (*page 49*)
Carlo Erba	AS100, A200LC, AS300	•	•	•	•				•	
	AS200, AS200S	•	•	•	•					
	AS800, 42 vial tray		•	•	•					
	AS800, 60 vial tray	•	•	•	•					
	HS250, 500, 800, 850							•		
Cecil Instruments	CE4800		•	•	•	•				
	AutoQuest		•	•	•	•				
CTC	A200S	•	•	•	•	•				
	A200 LC	•	•	•	•	•		•		
	HS 500							•		
CTC (LEAP)	LC PAL (216 Pos.)		•	•	•	•		•		
	HTX PAL, HTC PAL, HTS PAL (200 Pos. Tray), Combi PAL (200 Pos. Tray), GC PAL (200 Pos. Tray)	•								
	HTX PAL, HTC PAL, HTS PAL (54/98 Pos. Tray)	•	•	•	•	•		•		
	HTX PAL, HTC PAL, HTS PAL (32 Pos. Tray), Combi PAL (32 Pos. Tray), GC PAL (32 Pos. Tray), Combi PAL SPME Mode (32 Pos. Tray)							•		
	Combi PAL (98 Pos. Tray), GC PAL (98 Pos. Tray)	•	•		•					
	Combi PAL SPME Mode (98 Pos. Tray)		•		•					
DANI	ALS 39.80, ALS 86.80, ALS 1000		•		•					
	HS39.50, HS86.50							•		
	Master AS		•		•			•		
	Master DHS							•		
Dionex	Gina 50	•	•		•		•			
	AS 50	•	•	•	•	•				
	Summit ASI 100, Micro-Tray (192 Pos.)	•								
	Summit ASI 100, Analytical-Tray (117 Pos.)		•	•	•					
	Summit ASI 100, Semiprep.-Tray (63 Pos.)						•			
	Famos (LC Packings/Dionex)		•	•	•	•		•		
	UltiMate Analytical, cylindrical, WPS-3000 SL, 120 Pos. Rack (2ml)		•	•	•	•		•		
	UltiMate Analytical, conical, WPS-3000 SL, 120 (3x40) Pos. Rack (1.1ml=2ml w. Inserts)		•					•		
	UltiMate Micro, conical, WPS-3000 SL, 120 (3x40) Pos. Rack (250µl), UltiMate Nano/Cap/Micro, WPS-3000 SL, 216 (3x72) Pos. Rack (1.2ml)	•						•		
	UltiMate Semipreparative, WPS-3000 SL, 66 (3x22) Pos. Rack (4ml)						•	•		
	AS 40						•		•	
	AS-HV			•						
D-Star	DAS 10		•	•						
Dynatech	42 vial tray		•	•	•					
	60 vial tray	•	•	•	•					
	LC2000	•								
	GC111, GC311	•	•	•						
	LC-241	•	•	•						
Eksigent	NanoLC-AS1		•	•						
ESA	540-MT/540		•	•	•					•
EST	LC-241plus		•	•						
EST Analytical	Cobra L/S GC Autosampler; 120 vial tray		•	•	•	•				
	Cobra L/S GC Autosampler; 60 vial tray, Markelov HS9000							•		
Finnigan	A200S	•	•	•	•					

Autosampler Compatibility Table (con't)

Manufacturer	Model	8 mm Crimp	11 mm Crimp and Snap	8 mm Screw	9 mm Screw	10 mm Screw	13 mm Screw	18 mm Screw (Headspace)	Shell Vials (Neckless)	Plate (page 49)
Fisons	AS100, A200LC, AS300	•	•	•	•				•	
	AS200	•	•	•	•					
	AS200S	•	•	•	•					
	AS800, 42 vial tray		•	•	•					
	AS800, 60 vial tray	•	•	•	•					
	HS250, HS500, HS800, HS 850							•		
GBC	Avanta Ultra Z		•		•				•	
	LC 1650		•	•						
GE Healthcare	Ettan A-905		•		•	•				
GE Instruments	Sievers 900							•		
Gerstel	MPS	•	•	•	•		•	•		•
Gilson	201/202, 221/222, 231/401/232/402, Aspec, Aspec Xli, Aspec XL4			•	•				•	
	221XL/222XL, 223, 231XL/232XL/233XL	•								
	Nano Injektor			•	•					
	235/235P/SP 235/SP 235P	•		•	•					
Gynkotek	Gina 50	•	•		•		•			
HTA	HT200H							•		
	HT250D, HT280T, HT300L		•	•	•	•		•		
	HT300A, HT310A		•	•	•	•				
ICI	LC1600	•	•							
IMT GmbH	PTA3000							•		
Jasco	AS 2055/AS 2055 (i), AS 2057/AS 2057 (i), AS 2059	•	•	•	•	•				
	851/AS-950/AS-1550/AS-1555			•						
	AS-2059/AS-2059Plus			•						•
	AS-2059-SF/X-LC	•		•						•
Knauer	K-3800 (Basic Marathon), Smartline K-3950, PLATINblue AS-1		•	•	•			•		
Konik -Tech	Robokrom Static HS							•		
	Robokrom HRGC	•	•							
	Robokrom HPLC		•	•	•	•				
Kontron	MSI 660			•			•			
	360, 460	•	•	•	•					
	360/460/560/565	•	•	•	•					
LDC	713-60	•								
	Marathon, Promis		•	•	•					
Metrohm	Triathlon		•	•						
PerkinElmer	Series 200, 25 vial tray, ISS-225, 25 vial tray							•		
	Series 200, 85 vial tray, ISS-100, 85 vial tray, ISS-200, 85 vial tray, ISS-225, 85 vial tray		•			•		•		
	Series 200, 81/100 vial tray, Integral 4000, ISS-100, 100 vial tray, ISS-200, 100 vial tray		•			•				
	Series 200, 205 vial tray	•	•			•				
	Series 200, 225 vial tray	•								
	AI-1	•	•							
	AS-100/AS-100B	•	•							
	AS2000/AS2000B	•	•			•				
	AS-300, AS8300, Autosystem	•	•							
	HS 6, HS40/HS100/101							•		
	TurboMatrix HS16/HS40/HS40 XL/ HS40 Trap/HS110/ HS110 Trap							•		
	ISS-200, 145 vial tray	•								
	ISS-225, 205 vial tray	•	•			•				
	ISS-225, 100 vial tray + 80 vial tray		•			•				
	LC 600, 42 vial tray	•								
	LC 600, 60 vial tray		•			•				
	Clarus 400, 500, 600		•							

Autosampler Compatibility Table (con't)

Manufacturer	Model	8 mm Crimp	11 mm Crimp and Snap	8 mm Screw	9 mm Screw	10 mm Screw	13 mm Screw	18 mm Screw (*Headspace*)	Shell Vials (*Neckless*)	Plate (*page 49*)
Pharmacia	LKB 2157-010		•	•	•					
	LKB 2157-020	•	•							
	Akta A-900		•	•						
Polymer Laboratories	PL-AS RT		•	•	•	•	•			
	GPC 110/210		•	•						
Quma Elektronik	QHSS-40							•		
Sedere	–		•		•					
Selerity	3100		•	•						
Sepiatech	Sepmatix									•
SGE	LS-3200	•								
Shimadzu	AOC-5000	•	•		•			•◦		
	AOC-14/1400, AOC-17, AOC-20/20i/20s 150 Pos. Tray		•	•	•	•	•			
	AOC-20/20i/20s 96 Pos. Tray						•			
	LC-20A		•	•	•	•	•			
	SIL-2AS, SIL-6A, SIL-10A/SIL-10AF/SIL-10AP/SIL-10Ai/SIL-10AxL/Rack S 100 Pos.	•	•	••	•	•	•		•	
	SIL-6B/SIL-7A/SIL-8A/SIL-9A		•	•	•	•	•		•	
	SIL-10A/SIL-10AF/SIL-10AP/SIL-10Ai/SIL-10AxL/Rack L 80 Pos.						•		•	
	SIL-10A/SIL-10AF/SIL-10AP/SIL-10Ai/SIL-10AxL/Rack MTP2 192 Pos., SIL-10HTA/SIL-10HTC 350 pos. Tray								•	
	SIL-10HTA/SIL-10HTC 140 Pos. Tray		•	•	•	•			•	
	SIL-10HTA/SIL-10HTC 100 Pos. Tray						•		•	
	SIL-10ADvp		•	•	•	•	•		•	
	HTA 200 H							•		
	SIL-20A (Prominence) 105 vial tray/SIL-20AC (Prominence) 70 vial tray	•	•	•	•	•				
	SIL-20A/Sil-20AC (Prominence) 175 vial tray								•	
	SIL-20A/Sil-20AC (Prominence) 50 vial tray, LC2010C + LC2010A 100 Pos. Tray						•		•	
	LC2010C + LC2010A 350 Pos. Tray								•	
	LC2010C + LC2010A 140 Pos. Tray		•	•	•	•			•	
	HSS-2B							•		
Spark	Marathon Basic, Standard 96 Pos. Tray, Midas, Large Capacity 96 Pos. Tray, Promis, SPH 125		•	•	•					
	Marathon Basic Prep King Size 48 Pos. Tray, Midas, Large Volume 24 Pos. Tray							•		
	Midas, Standard 84 Pos. Tray, Alias		•	•	•			•		
	Triathlon,Standard 96 Tray		•	•	•				•	
	Triathlon, LSV 72 Pos. Tray						•			
	Triathlon, Super-LSV 32 Pos. Tray							•		
	Triathlon, Micro 160 Pos. Tray	•								
	Endurance 48 Pos. Tray, Reliance 48 Pos. Tray		•	•	•					
	Integrity		•	•	•					•
	Prospekt 2		•	•						
	Reliance/Symbiosis Pharma		•	•						•
	Symbiosis Pico									•
Spectra-Physics	8875, 8880		•	•	•					
	SpectraSYSTEM AS1000, AS3000, AS3500	•	•	•	•				•	
Sykam	S 5200		•		•					
Talbot	ASI		•		•					
Teledyne Tekmar	7000/7000HT/7050							•		
	HT3A							•		

• indicates that a cap having an outer flange is required for the vial to operate properly with the autosampler.
• indicates that the vials from this category are compatible with the autosampler in most configurations.
• indicates that a magnetic seal is required for use with the autosampler.

Autosampler Compatibility Table (con't)

Manufacturer	Model	8 mm Crimp	11 mm Crimp and Snap	8 mm Screw	9 mm Screw	10 mm Screw	13 mm Screw	18 mm Screw (*Headspace*)	Shell Vials (*Neckless*)	Plate (*page 49*)
Thermo Scientific	AS1000 (Trace GC), AS200, AS2000 90 vial tray (Trace GC)	•	•	•	•					
	AS300	•	•	•	•				•	
	AS2000 30 vial tray							•		
	AI3000 (II)/AS3000 (II) AS3500 (Trace GC + Focus GC)	•	•		•			•		
	A200LC, AS 100	•	•	•	•				•	
	SpectraSYSTEM AS 1000, AS 3000, AS 3500	•	•	•	•				•	
	A200S	•	•	•	•					
	AS800, 42 vial tray		•	•	•					
	AS800, 60 vial tray	•	•	•	•					
	HS250, HS500, HS800, HS 850, HS2000							•		
	TriPlus (=GC PAL) (AS+ Duo)	•	•	•	•			•		
	TriPlus HS, TriPlus SPME							•		
	Surveyor (Surveyor Plus)	•	•	•	•			•	•	
	Accela High Speed LC Autosampler (200 Pos.)	•	•	•	•					
	Accela Open Autosampler (342 Pos)	•	•	•	•					•
Tosoh	AS 8010		•		•					
	TSK-6080		•		•		•			
Tracor	770/771/772		•	•	•					
Unicam	4247, 4710		•	•	•					
	4700 (GC)	•								
	4700 (LC)	•		•	•					
	LC-XP		•	•	•		•			
	S4/S8	•								
Varian	ProStar 400, Standard 96 Pos. Tray, ProStar 410, Large Capacity 96 Pos. Tray		•	•	•	•				
	ProStar 400, King Size 48 Pos. Tray, ProStar 410, Large Volume 24 Pos. Tray							•		
	ProStar 410, Standard 84 Pos. Tray		•	•	•	•		•		
	ProStar 420, Standard 96 Pos. Tray		•	•	•	•			•	
	ProStar 420, LSV 72 Pos. Tray	•					•			
	ProStar 420, Super-LSV 32 Pos. Tray							•		
	ProStar 420, Micro 160 Pos. Tray	•								
	ProStar 430, 48 Pos. Tray		•	•	•					
	8035			•	•					
	8000, 8100		•	•	•					
	8200		•	•	•	•				
	8400 (100 Pos.), 8410-Autoinjector (10 x 2ml; 6 x 5ml; 5 x 10ml)		•	•	•			•		
	CP-910, 911, 912		•	•	•					
	CP-940, 941		•							
	LC 9100/LC 9095/LC 9090		•		•					
	COMBI PAL (200 Pos. Tray) GC PAL (200 pos. Tray)	•						•		
	COMBI PAL (98 Pos. Tray) GC PAL (98 Pos. Tray)	•	•		•			•		
	COMBI PAL SPME mode (98 Pos. Tray)		•		•			•		
	COMBI PAL (32 Pos. Tray) GC PAL (32 Pos. Tray), COMBI PAL SPME mode (32 Pos. Tray)							•		
	Genesis							•		
	Marathon Basic, Standard 96 Pos. Tray		•	•	•					
	Marathon Basic, Prep, King Size 48 Pos. Tray							•		
	Vista			•	•					
	CP-9020/CP-9025, CP-9060							•		
	CP-9010		•	•	•					
	CP-8410/8034/8035/8100/8200/9095/9100		•	•						
	920-LC/940-LC		•	•						

Autosampler Compatibility Table (con't)

Manufacturer	Model	8 mm Crimp	11 mm Crimp and Snap	8 mm Screw	9 mm Screw	10 mm Screw	13 mm Screw	18 mm Screw (*Headspace*)	Shell Vials (*Neckless*)	Plate (*page 49*)
Viscotek	GPC Autosampler			•	•	•				
VWR(Merck)/ Hitachi	L2200 (LaChrom Elite)/L2200-U (LaChrom Ultra) (200 Pos. Tray), L7200 (LaChrom) (80 Pos. Tray)/L7250(LaChrom) (Pos. Tray)		•	•	•					
	L2200 (LaChrom Elite) (128 Pos. Tray)						•			
	L7250 (LaChrom) (Rack Holder for combination Racks)	•	•	•	•		•			
	655-A40 (108 Pos. Tray), L-9100, AS 2000 (50 Pos. Tray), AS 4000 (150 Pos. Tray)		•	•	•					
	AS 4000 (198 Pos. Tray)	•								
	AS 6000	•	•	•	•					
Waters	Acquity Sample Organizer		•		•					•
	Acquity/CapLC/Waters/Nano Acquity		•		•					•
	Alliance HTS									•
	Model 2767		•	•						•
	Model 2707		•	•						•
	Model 2777		•	•						•
	ACQUITY™ UPLC Systems				•		•			
	Wisp 48 position						•		•	
	Wisp 96 position, 717, 96 Position Carousel								•	
	717, 48 Position Carousel						•		•	
	Alliance®, Alliance HT Syst.		•		•	•				
	Alliance® GPC 2000						•	•		
	Alliance® 2790/2795, Alliance 2690/2695		•		•	•				

• indicates that a cap having an outer flange is required for the vial to operate properly with the autosampler.
• indicates that the vials from this category are compatible with the autosampler in most configurations.
• indicates that a magnetic seal is required for use with the autosampler.

Terms and Conditions

General

Unless otherwise stated, all transactions are expressly subject to these Terms and Conditions. Modifications or additions will be recognized only if accepted in writing by an officer of SiliCycle Inc. (*hereinafter named SiliCycle*), or an officially designated representative. Provisions of Buyer's Purchase Order or other documents that add to or differ from these Terms and Conditions are expressly rejected. No waiver of these Terms and Conditions or acceptance of others shall be construed as failure of the Company to raise objections.

Privacy Policy

Because your clientele is our most vital asset, we take privacy very seriously and won't share your personal information with anyone. Your information is used only to personalize your profile and to facilitate the transaction. You can change or update your information at any time.

Quotation and Published Prices

Quotations automatically expire 30 calendar days from the date issued unless otherwise stated. Quotes are subject to withdrawal with notice within that period. Prices shown on the published price lists and other published literature issued by SiliCycle are not unconditional offers to sell, and are subject to change without notice.

Warranty

SiliCycle guarantees to the original Buyer that the products sold conform to the composition and purity described therein at the time of their shipment. The Buyer's sole remedy in the event that SiliCycle fails to meet said warranty shall be the replacement of the unused portion of the product(*s*), or if approved by SiliCycle, a refund (*at the purchase price*) provided that the Buyer returns the alleged non-conforming product(*s*) within 30 days after reception of product(*s*). SiliCycle makes no other guarantee of suitability for a particular purpose or of the merchantability in the use or handling of the product, and does not accept any liability for consequential, special, indirect or incidental damages resulting therefrom.

Changes

The Buyer may, with the express written consent of SiliCycle, make changes in the specifications for products or work covered by the contract. In such an event, the contract price and delivery dates shall be equitably adjusted. SiliCycle shall be entitled to payment for reasonable profit plus costs and expenses incurred by work and materials rendered unnecessary as a result of such changes and for work and materials required to effect said changes.

If the Buyer has made a mistake on his/her purchase order, and the material has already been shipped and received, SiliCycle may approve the exchange of said material (*if price is identical*); however the Buyer will be responsible for all shipping costs. See return authorization policy section on the next page to obtain a return merchandize authorization form prior to returning goods.

Cancellation

Undelivered parts of any order may be cancelled by the Buyer only with the written approval of SiliCycle. If the Buyer makes an assignment for the benefit of creditors, or in the event that SiliCycle, for any reason feels insecure about Buyer's willingness or ability to perform, SiliCycle shall have the unconditional right to cancel the sales transaction or demand full or partial payment.

In the event of any cancellation of this order by either party, the Buyer shall pay SiliCycle for reasonable costs and expenses incurred by the SiliCycle prior to receipt of the cancellation notice, plus SiliCycle's usual rate of profit for similar work.

Taxes

The Company's prices do not include any applicable sales, goods and services, use, excise or similar taxes and the amount of any such tax SiliCycle may be required to pay or collect will be added to each invoice and paid by the Buyer.

Terms of Payment

All merchandise purchased remains the property of SiliCycle until such time as all invoices for the merchandise have been paid in full. Except for purchases paid online, or unless explicitly stated elsewhere in writing, terms are cash net 30 days from date of invoice. Additional fees of 2% per month (*26.8% per year*) will accrue on all accounts past due. If any payment is in default, and it becomes necessary to hire a recovery agency or lawyer, the client accepts to pay, in addition to the outstanding balance, recovery fees equal to 20% of the balance in capital and interests. By reason of the financial condition of Buyer or otherwise, SiliCycle may require full or partial payment in advance.

Certain orders may require a deposit or progressive payments as referenced in the quote. Such deposits may be increased upon receipt of purchase order based upon the Buyer's most current credit rating. Subject to the warranties stated in this policy, all sales are final without right of return.

Return Policy

Our Customer Service Department is available to assist you at any time should a problem arise with your order. Please make sure to inspect your packages immediately upon receipt and notify us within the next two (*2*) business days of any damage and/or discrepancies. Should a product be sent to you incorrectly, as the result of an error on our part, we will take quick and appropriate action to correct the problem at no charge to you.

In order to maintain the quality of our products and continue to provide competitive prices, some products may not be returned for credit. SiliCycle will not grant credit for:

(i) Shelf-worn, used or defaced products;

(ii) Scavengers, reagents, catalysts, or any other bounded silica whose containers have been opened;

(iii) Products that are personalized or customized;

(iv) Refrigerated or temperature-controlled products;

(v) Products that have been discontinued;

(vi) Products not directly purchased from SiliCycle

Products sold in distribution by SiliCycle will be subject to the Terms and Conditions Policy of the respective manufacturer.

Prior to any return, an authorization and a return material authorization (*RMA*) number must be obtained from our Customer Service Department. Shipping instructions will also be provided at this point. The RMA will ensure the safe and proper handling of material; it should therefore be referenced on all shipping labels.

The Buyer has 30 days from the issuance of the RMA to return the goods. Returns made without an authorization number will not be accepted and will be returned to the Buyer.

Returns are subject to a 40% restocking and/or disposal fee.

Shipping Policy

SiliCycle uses a two-day or five-day delivery (*or equivalent*) depending on weight and availability of product. Standard overnight delivery can also be arranged. Freight charges are prepaid and added to the invoice unless special instructions are requested by the customer. These conditions apply to all North American shipments. International delivery delays will vary according to orders and destination countries.

Delivery

Delivery dates indicated in the contract documents are approximate and based on prompt receipt of all necessary information regarding the product covered by the contract. SiliCycle will use reasonable efforts to meet the indicated delivery dates, but cannot be held responsible for its failure to do so.

In the event of any delivery delay caused by the Buyer, SiliCycle will store and handle all items ordered at Buyer's risk and will invoice Buyer for the unpaid portion of the contract price, plus storage, insurance, and handling charges on or after the date on which the product is ready for delivery. The invoice will be payable in full within 30 days from the invoice date, unless otherwise expressly agreed to in writing by SiliCycle.

SiliCycle will not hold orders unless specifically approved. SiliCycle has the right to make partial shipments and bill for those shipments; the buyer will make payment in accordance with the terms mentioned in this policy.

Shipping and Handling Charges

Shipping charges plus the applicable company handling charges will be prepaid and billed as a separate item on the product invoice. Title to the product and risk of loss shall pass to Buyer upon delivery to a carrier.

Application

All products are sold for laboratory or manufacturing uses. Only professional laboratory staff should handle the chemicals.

Product Numbers Index

Product Numbers Index (con't)

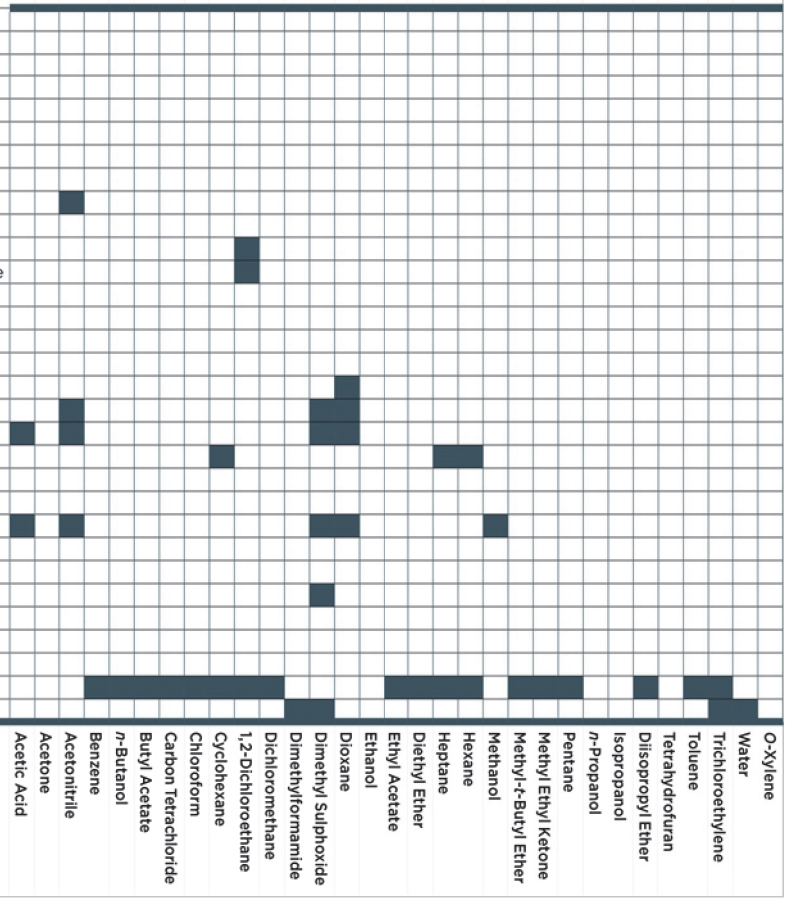
Applications Index

Solvent Properties and Miscibility Chart

Solvent Properties and Miscibility Chart

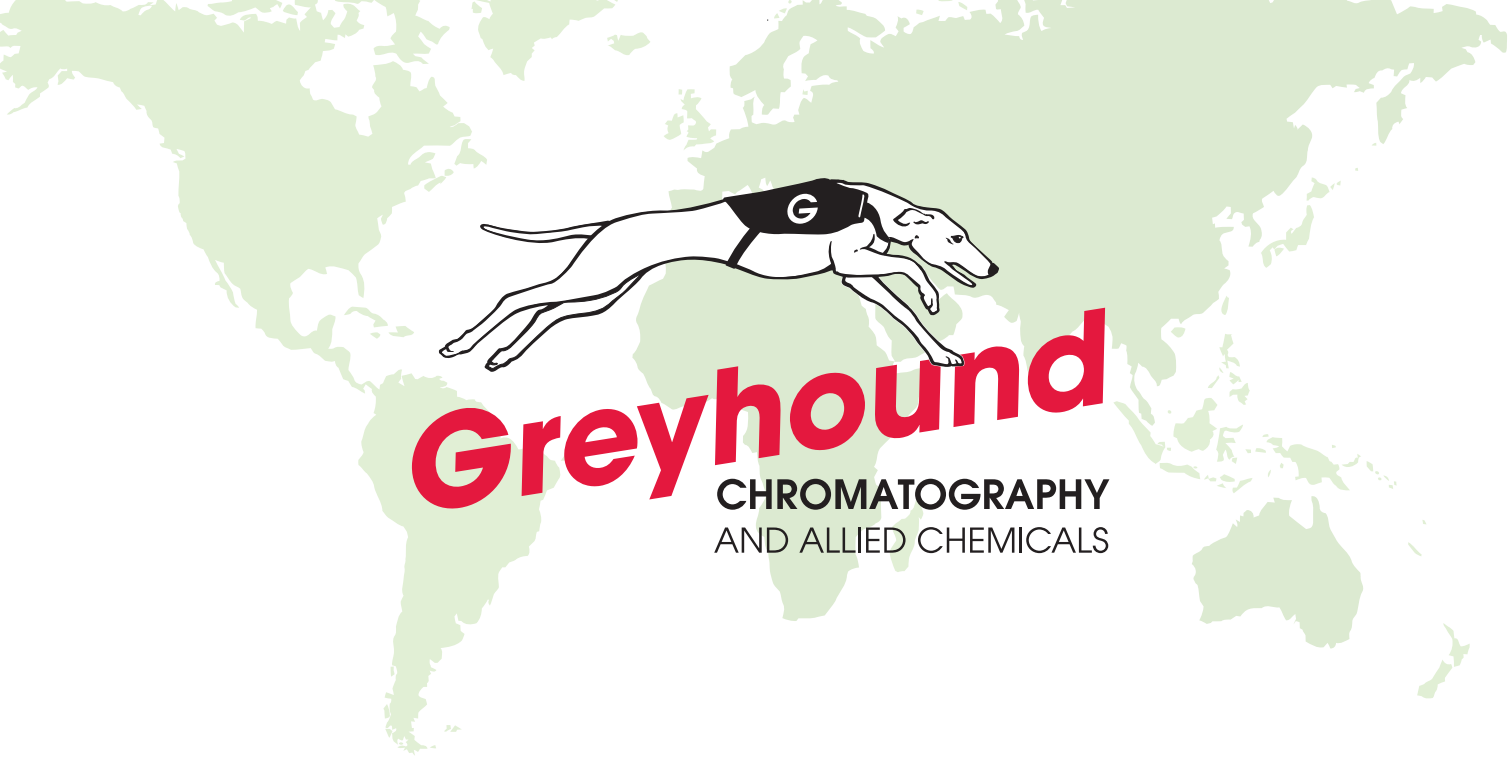
Solvent Strength	Polarity Index	UV Cutoff (nm)	Refractive Index	Viscosity (cP, 20°C)	Boiling Point (°C)	Water Solubility (w/w%)	Solvent
0.01	1.0	200	1.391	0.50	99	0.0002	Isooctane
0.04	0.0	200	1.410	0.92	174	0.01	*n*-Decane
0.05	0.1	200	1.407	0.44	49	0.01	Cycloheptane
0.1	1.0	220	1.402	0.45	78	0.11	1-Cyclobutane
0.21	2.1	220	1.397	0.64	142	0.19	*n*-Butyl Ether
0.28	2.4	220	1.368	0.37	68	0.62	Isopropyl Ether
0.42	3.1	233	1.424	0.44	40	1.6	Methylene Chloride
0.43	4.2	334	1.396	0.51	117	-	Methyl Butyl Ketone
0.47	4.7	320	1.451	2.00	156	-	Cyclohexanone
0.55	5.5	210	1.402	1.72	125	Miscible	Methoxyethanol
0.6	4.5	260	1.362	0.37	57	-	Methyl Acetate
0.64	6.0	380	1.344	0.67	101	2.1	Nitromethane
0.65	6.5	268	1.438	0.84	166	Miscible	*N,N'*-Dimethylacetamide
0.69	6.0	265	1.447	1.65	182	-	*N*-Methylformamide
1.11	6.9	210	1.432	19.9	198	Miscible	Ethylene Glycol
2	6.0	260	1.372	1.26	118	Miscible	Acetic Acid
0.56	5.1	330	1.359	0.36	56	Miscible	Acetone
0.65	5.8	190	1.344	0.38	82	Miscible	Acetonitrile
-	2.7	238	1.501	0.65	80	0.18	Benzene
0.39	3.9	215	1.399	2.98	117	7.8	n-Butanol
-	4.0	254	1.394	0.73	126	0.43	Butyl Acetate
-	1.6	265	1.460	0.97	77	0.08	Carbon Tetrachloride
0.4	4.1	245	1.446	0.57	61	0.815	Chloroform
0.04	0.2	200	1.427	1.00	81	0.01	Cyclohexane
-	3.5	228	1.445	0.79	83	0.81	1,2-Dichloroethane
-	3.1	235	1.424	0.44	40	1.3	Dichloromethane
0.64	6.4	268	1.431	0.92	153	Miscible	*N,N'*-Dimethylformamide
0.62	7.2	270	1.478	2.24	189	Miscible	Dimethyl Sulphoxide
0.56	4.8	220	1.422	1.37	101	Miscible	Dioxane
0.88	4.3	210	1.361	1.20	79	Miscible	Ethanol
0.58	4.4	260	1.372	0.45	77	8.7	Ethyl Acetate
-	2.8	218	1.352	0.23	35	6.89	Diethyl Acetate
0.01	0.1	200	1.388	0.40	98	0.0004	*n*-Heptane
0.01	0.1	200	1.375	0.31	69	0.0012	*n*-Hexane
0.95	5.1	205	1.329	0.55	65	Miscible	Methanol
0.35	2.5	220	1.369	0.27	55	4.8	Methyl-*t*-Butyl Ether
0.51	4.7	329	1.379	0.43	80	24	Methyl Ethyl Ketone
-	0.0	190	1.358	0.23	36	0.004	Pentane
0.82	4.0	210	1.385	2.30	97	Miscible	*n*-Pentanol
0.82	3.9	205	1.378	2.40	82	Miscible	Isopropanol
-	2.2	220	1.368	0.37	68	-	Diisopropyl Ether
0.45	4.0	212	1.407	0.55	66	Miscible	Tetrahydrofuran
0.29	2.4	285	1.496	0.59	111	0.05	Toluene
-	1.0	273	1.477	0.57	87	0.11	Trichloroethylene
2	10.2	190	1.000	1.00	100	-	Water
0.26	2.5	288	1.506	0.81	144	0.018	*O*-Xylene

Immiscible (*2 phases are produced when both solvents are mixed*)



References: CRC Handbook of Chemistry and Physics, 73rd Edition
The HPLC Solvent Guide, 2nd Edition, Paul C Sadek
HPLC Columns, Theory, Technology & Practice, Uwe D Neue
High-Performance Liquid Chromatography, 5th Edition, Veronica R Meyer
The Merck Index, 12th Edition

Tel: +44 (0)151 649 4000 Fax: +44 (0)151 649 4001 Email: sales@greyhoundchrom.com www.greyhoundchrom.com



SILICYCLE APPROVED DISTRIBUTION PARTNER

Greyhound Chromatography and Allied Chemicals

6 Kelvin Park, Birkenhead, Merseyside, CH41 1LT
United Kingdom

Tel: +44 (0)151 649 4000
Fax: +44 (0)151 649 4001
Email: sales@greyhoundchrom.com

www.greyhoundchrom.com

s and proteins.