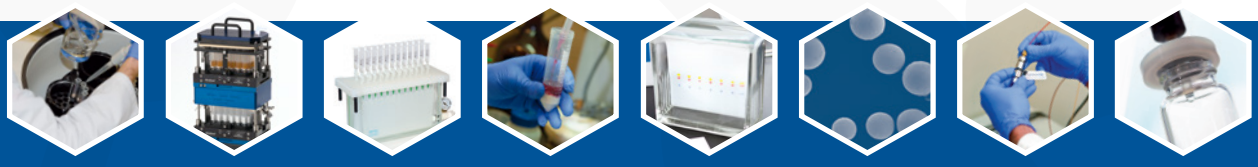
ANALYTICAL CHEMISTRY CATALOG



SILICYCLE Inc.®
UltraPure SILICA GELS

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 a wide range of markets.

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 first-rate *UltraPure* products. Our automated manufacturing processes are continuously optimized to ensure high purity and a low percentage of fine particles, thereby guaranteeing optimal performance. With our multi-ton manufacturing capacity, we are your partner of choice for all your analysis, metal removal, catalysis, synthesis, and purification requirements.

SiliCycle is also a leading service provider, offering turnkey solutions based on its expertise in organic chemistry, material science, analytical chemistry to name only a few. With stateof-the-art instrumentation in the areas of chromatography, spectroscopy, and manufacturing combined to an applications support laboratory, we are devoted to extend your R&D and make your project a success.

SiliCycle has several sales offices in many countries such as China, India, European Union (*France & Germany*) just to name a few. All products are available worldwide through SiliCycle or via distributors.

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

Information about SiliCycle is available at www.SiliCycle.com

Analytical Chemistry Fields

Quality Commitment for SiliCycle Products

SiliCycle has developed products that are used in many fields of the analytical industry to help customers for their analytical needs. The SiliCycle Analytical Chemistry Catalog is designed in the 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.

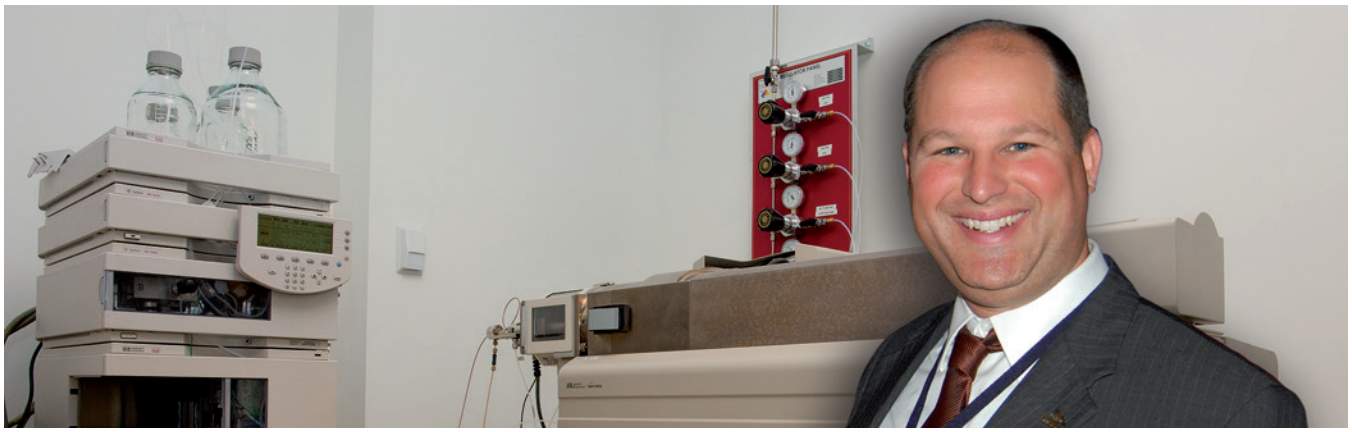
Energy

Energy

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

SILICYCLE

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.

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. Included within this new catalog, you will find our silica-based best-selling products such as our Silia*Chrom*® HPLC columns, Silia*Prep*™ and Silia*PrepX*™ SPE cartridges and well plates, Silia*Sphere*™ spherical silica gels, Silia*Plate*™ TLC plates, and Silia*Quick* QuEChERS solutions.

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 20 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.

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.

Quality Control Testing	
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

Analytical Products

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Silia*Quick*™
QuEChERS

SILICYCLE Inc.
UltraPure SILICA GELS

SiliaQuick™ QuEChERS

Food Environment

Using SiliaQuick QuEChERS ensures the following benefits:

- Clean extracts from pure products.
- High recovery and lot-to-lot reproducibility.
- Great variety of QuEChERS to cover 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 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, antibiotics, drugs, and any other compounds present in all food, beverage, animal and human matrices.

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

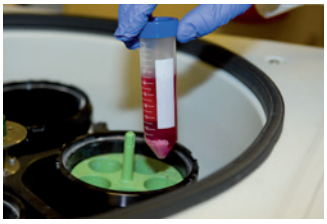
1) First step is to carry out the extraction of compounds of interest from your food or beverage matrix through a solvent (mainly *acetonitrile*).

2) 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 solution.

3) Final analysis step consists in a simple injection into a LC or GC coupled with MS or MS/MS instrument to quantify the analyte concentration.

Step 1
Liquid Extraction

Extract pesticides or analytes of interest into an organic layer relying on the perfect combination of salts and acetonitrile.



Step 2
dispersive SPE Clean-Up

Subject organic layer from 1st step to further clean-up and selectively remove unwanted interferences such as lipids and pigments.

Step 3
LC or GC Analysis

Analyze your clean from last step and ready for GC or HPLC with MS/MS, or your selective detector.

SiliaQuick QuEChERS for Food Sample Treatments

SiliaQuick QuEChERS are designed to ensure 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.

***Easy*:** Preweighed & ready-to-use tubes or packets for only 3 straightforward steps.

***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.

Traditional Liquid & Solid Extractions for Sample Preparation involve a number of issues that QuEChERS cam sort out:

Liquid-Phase Extractions are:

- Labor intensive
- Necessitate large volumes of organic solvents, including halogenated solvents
- Difficult to automate
- Emulsion prone
- Not specific to a given analyte

Solid-Phase Extractions are:

- Complex and difficult to master
- Necessitate large volumes of organic solvents, including halogenated solvents
- Lengthy to develop: necessitate time & efforts in method development
- Offer too many possibilities to choose from
- Ineffective toward many analytes

Advantages of QuEChERS over Traditional Sample Preparation

Advantages of QuEChERS Over Traditional Sample Preparation			
	Traditional SPE	**QuEChERS**	**QuEChERS Benefits**
Estimated time to process 6 samples	120 minutes	20 minutes	About 6 times faster
Solvent used per sample	90 mL	10 - 15 mL	About 6 - 9 times less solvent needed
Chlorinated waste	30 mL	None	Safer, greener, less costly
Gassware and specialized equipment	Clean separatory funnels, waterbath, round bottom flasks, rotary evaporator…	Centrifuge	No additional supplies needed

Remember, QuEChERS is the only sample preparation technique in line with green chemistry principles and it is highly effective.

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**
Anhydrous Magnesium Sulfate ($MgSO_4$)	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**
Silia*Quick* Diamine (Primary Secondary Amine)	Removes sugars, fatty acids, organic acids, lipids, and some pigments. Sterols and additional lipids can also be removed in combination with Silia*Quick* C18.
Silia*Quick* Amine	Removes sugars and fatty acids as well as the Silia*Quick* Diamine but is less likely to catalyze degradation of base sensitive analytes.
Silia*Quick* C18	Removes long chain, non-polar compounds, and sterols.
Graphitized Carbon Black	Removes pigments, polyphenols, and other polar compounds.
Anhydrous Magnesium Sulfate ($MgSO_4$)	Removes residual water from the organic phase.

Schematic Flow Chart of the Most Used QuEChERS Technique

	Original QuEChERS 2003	AOAC Buffered AOAC 2007.01	European Buffered EN 15662
	In a 50 mL centrifuge tube, add 10 g of comminuted sample and 10 mL of acetonitrile.	In a 50 mL centrifuge tube, add 15 g of comminuted sample and 15 mL of a solution of 1% acetic acid in acetonitrile.	In a 50 mL centrifuge tube, add 10 g of comminuted sample and 10 mL of acetonitrile.
	Add internal standard and shake well.		
Step 1 : Liquid Extraction	To the 50 mL centrifuge tube, add 4 g of $MgSO_4$ & 1 g of NaCl. Centrifuge the mixture for 5 min at 5,000 rpm.	To the 50 mL centrifuge tube, add 6 g of $MgSO_4$ & 1.5 g of NaOAc. Shake vigorously for 1 min & centrifuge the mixture for 1 min at > 1,500 rpm.	To the 50 mL centrifuge tube, add 4 g of $MgSO_4$, 1 g of NaCl, 1 g of $Na_3Citrate{\cdot}2H_2O$ & 0.5 g of $Na_2HCitr{\cdot}1.5\ H_2O$. Shake vigorously for 1 min & centrifuge the mixture for 5 min at 3,000 rpm.
Step 2 : dispersive SPE Clean-up	To a 2 mL centrifuge tube with 150 mg of $MgSO_4$ & 25 mg of SiliaQuick Diamine (*PSA*) (*add Carbon Black for additional clean-up*), transfer 1 mL of the supernatant obtained from step 1. Shake for 0.5 min & centrifuge the mixture for 5 min at 3,000 rpm.	To a 2 mL centrifuge tube with 150 mg of $MgSO_4$ & 50 mg of SiliaQuick Diamine (*PSA*) (*add SiliaQuick C18 & Carbon Black for additional clean-up*) transfer 1 mL of the supernatant obtained from step 1. Shake for 0.5 min & centrifuge the mixture for 1 min at > 1,500 rpm.	To a 2 mL centrifuge tube with 150 mg of $MgSO_4$ & 25 mg of SiliaQuick Diamine (*PSA*) (*add Carbon Black for additional clean-up*), transfer 1 mL of the supernatant obtained from step 1. Shake for 0.5 min & centrifuge the mixture for 5 min at 3,000 rpm.
Step 3 : LC or GC Analysis	Add 500 mL to a vial for LC or GC analysis.	Add 6.7 mM of formic acid for LC-MS or preserve with toluene for GC-MS & add triphenyl phosphate surrogate.	Add 5% of formic acid in acetonitrile & analyze by LC-MS or GC-MS.

Note : Please note that these procedures are a convenient starting point for method development but are only meant to orient. Further optimization depending on the analyte of interest may be required to tailor the method to your application needs and maximize your LC-MS or GC-MS analysis.

$MgSO_4$: Anhydrous Magnesium Sulfate
NaCl : Sodium Chloride
$Na_3Citrate{\cdot}2H_2O$: Trisodium Citrate Dihydrate
$Na_2HCitr{\cdot}1.5H_2O$: Disodium Hydrogencitrate Sesquihydrate

PSA : Primary Secondary Amine - SiliaQuick Diamine
GCB : Graphitized Carbon Black
C18 : C18 Fonctionnalized Silica - SiliaQuick C18

How to Choose the Proper Silia*Quick* QuEChERS Kit

Step 1: For Liquid Extraction

Extract the pesticides or analytes of interest into an organic layer by relying on the perfect combination of salts and organic solvents (*usually acetonitrile*).

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.

Selection Criteria:

- For base or heat-sensitive analytes, use buffered method.
- With doubt, use buffered method.

BLEND AND WEIGH

Original Method	Buffered Methods AOAC 2007.01 Method	 EN 15662 Method
10 g Sample	15 g Sample	10 g Sample
4 g $MgSO_4$; 1.5 g NaCl	6 g $MgSO_4$; 1.5 g NaOAc	4 g $MgSO_4$; 1 g NaCl; 1 g SCTD; 0.5 g SCDS
PN: QE-0001-100P (*packets only*) PN: QE-0001-100K (*packets & tubes*)	PN: QE-0002-100P (*packets only*) PN: QE-0002-100K (*packets & tubes*)	PN: QE-0003-100P (*packets only*) PN: QE-0003-100K (*packets & tubes*)

$MgSO_4$ = Anhydrous Magnesium Sulfate , **NaCl** = Sodium Chloride, **NaOAc** = Sodium Acetate, **GCB** =Graphitized Carbon Black, **SCTD**=Sodium Citrate Dibasic Sesquihydrate, **SCDS**=Sodium Citrate Tribasic Dihydrate

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

An aliquot of the organic layer from the 1st step is subjected to further clean-up. This step helps selectively remove unwanted interferences such as lipids and pigments but NOT your analytes of interest!

The following table presents the 4 types of SiliaQuick QuEChERS dispersive Solid-Phase Extraction clean-up kits to match your food matrices.

dSPE kits contain pre-weighed sorbents/salts inside 2 mL or 15 mL centrifuge tubes. We recommend using 2 mL dispersive tubes for an extract volume of 1 mL and 15 mL dispersive tubes for extract volumes higher than 3 mL.

Selection Criteria:

- Aliquot size is specified by the method.
- Kits are created for these specific amounts.
- 4 easy-to-choose typed of food matrices.
- Colour-coded caps that match matrix category for reduced error.
- Two methods depending on molecules to be removed.

Check pH and adjust to pH 5 – 5.5
Add internal standards aliquot
SHAKE AND CENTRIFUGE

Cap Color for 2 mL tubes	Matrix	2 mL tubes for small extract volumes		15 mL tubes for large extract volumes	
		AOAC 2007.01	EN 15662	AOAC 2007.01	EN 15662
Clear	General matrices •Apples •Bananas •Broccoli •...	150 mg $MgSO_4$ 50 mg PSA PN: QD-1000-2T	150 mg $MgSO_4$ 25 mg PSA PN: QD-1001-2T	1200 mg $MgSO_4$ 400 mg PSA PN: QD-2000-15T	900 mg $MgSO_4$ 150 mg PSA PN: QD-2001-15T
Pink	Pigmented matrices •Lettuces •Peppers •Strawberries •...	150 mg $MgSO_4$ 50 mg PSA 50 mg GCB PN: QD-1002-2T	150 mg $MgSO_4$ 25 mg PSA 2.5 mg GCB PN: QD-1003-2T	1200 mg $MgSO_4$ 400 mg PSA 400 mg GCB PN: QD-2002-15T	900 mg $MgSO_4$ 150 mg PSA 15 mg GCB PN: QD-2003-15T
Green	Highly pigmented matrices •Urine •Avocados •Coffee •...	150 mg $MgSO_4$ 50 mg PSA 50 mg GCB 50 C18 PN: QD-1004-2T	150 mg $MgSO_4$ 25 mg PSA 7.5 mg GCB PN: QD-1005-2T	1200 mg $MgSO_4$ 400 mg PSA 400 mg GCB 400 mg C18 PN: QD-2004-15T	900 mg $MgSO_4$ 150 mg PSA 45 mg GCB PN: QD-2005-15T
Blue	Fatty and waxed matrices •Milk •Shrimps •Blood •Liver •...	150 mg $MgSO_4$ 50 mg PSA 50 mg C18 PN: QD-1006-2T	150 mg $MgSO_4$ 25 mg PSA 25 mg C18 PN: QD-1007-2T	1200 mg $MgSO_4$ 400 mg PSA 400 mg C18 PN: QD-2006-15T	900 mg $MgSO_4$ 150 mg PSA 150 mg C18 PN: QD-2007-15T

$MgSO_4$ = anhydrous Magnesium Sulfate, **PSA** = SiliaQuick Primary Secondary Diamine, **GCB** = Graphitized Carbon Black, **C18** = SiliaQuick C18

Step 3: For dispersive Solid-Phase Extraction Clean-Up

The extract, containing the analyte(s) is ready to be analysed by GC or HPLC with MS, MS/MS or your selective detector.

Selection Criteria:

- Consider your application (*analyte MW, solubility*).
- Consider the stationary phase (*column chemistry, separation mode, particle size, retention capacity*).
- Column dimensions (*internal diameter, length*).

SHAKE AND CENTRIFUGE

SiliaChrom dt C18	SiliaChrom XDB C18	SiliaChrom SCX
Universal C18 for most popular applications (*highest purity silica gel*)	Ideal for barbiturates, fat-soluble vitamins, fatty acids, steroids	Ideal for charged analytes

Check pages 112 - 165 of our Analytical Catalog, visit our website or contact us for more information

Bulk Sorbents Available for Your Own Recipe Creation

SiliCycle Bulk Sorbents for QuEChERS		
Description	**Available Quantities**	**Product Number**
Silia*Quick*™ C18	1 g 5 g 10 g 25 g 50 g 100 g 250 g 500 g 1 kg 5 kg 10 kg 25 kg … up to multi-ton Contact us for details	AUT-1313
Silia*Quick*™ Anhydrous Magnesium Sulfate (*$MgSO_4$*)		AUT-0310
Silia*Quick*™ Primary Secondary Amine (*PSA*)		AUT-0312
Silia*Quick*™ Amine		AUT-0412
Silia*Quick*™ Graphitized Carbon Black (*GCB*)		AUT-0311

New to QuEChERS Technology? We Have Starter Kits to Introduce This New Technique:

Sili*Quick* QuEChERS Starter Kits			
PN	**Product Name**	**Tube Volume (*mL*)**	**Qty/box**
QD-2001-15K	Silia*Quick*™ Extraction + dSPE Clean-up Kit for EN 15662 (*QE-0003-100K + QD-2001-15T*)	50 + 15	50 + 50
QD-1004-2K	Silia*Quick*™ Extraction + dSPE Clean-up Kit for AOAC 2007.01 (*QE-0002-100K + QD-1004-2T*)	50 + 2	100 + 100
QD-2004-15K	Silia*Quick*™ Extraction + dSPE Clean-up Kit for AOAC 2007.01 (*QE-0002-100K + QD-2004-15T*)	50 + 15	50 + 50
QD-1007-2K	Silia*Quick*™ Extraction + dSPE Clean-up Kit for EN 15662 (*QE-0003-100K + QD-1007-2T*)	50 + 2	100 + 100
QD-2007-15K	Silia*Quick*™ Extraction + dSPE Clean-up Kit for EN 15662 (*QE-0003-100K + QD-2007-15T*)	50 + 15	50 + 50

SiliaQuick QuEChERS Tips & Troubleshooting

When facing poor recovery of pesticide compounds:

Step 1:

- Each sample has to be at the minimum 80% hydrated to perform optimal liquid extraction.
- Homogenization is a key step and can significantly impact your results.
- Freezing sample at -20 °C can significantly improve the breaking behavior of the sample in order to obtain a higher fineness and homogeneity.
- Great care must be taken in keeping the sample cool, as many pesticides are volatile and some analytes are heat-sensitive. Some mills will continuously cool the sample with liquid nitrogen while grinding.
- Homogenize with dry ice until a fine powder is obtained.
- For base sensitive compounds use buffered method. If you don't know, use buffered method.
- If analyte is sensible, always mix the sample with the solvent first to reduce the exothermic reaction produced by the addition of Magnesium Sulfate (*hence, choose packets instead of pre-filled tubes*).

Step 2:

- Choose minimal possible tube size. Aliquot size is specified by the method, and kits are created for these specific amounts.
- You can build your own recipe in function of your unwanted interferences using bulk sorbents.

Step 3:

- 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.

Select the Right Silia*Quick* QuEChERS dSPE Clean-Up Kit According to your Matrix Type

The Silia*Quick* QuEChERS dispersive Solid-Phase Extraction clean-up kits are assembled to match different types of matrices. Here is below a table with multiple examples of typical matrices, to help you choose the right kit and combination of sorbents.

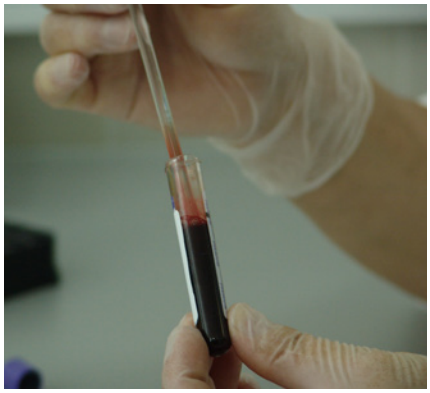
Silia*Quick* QuEChERS Dispersive Solid-Phase Extraction Kits				
Food Matrices	**General Fruits & Vegetables**	**Pigmented Fruits & Vegetables**	**Highly Pigmented and Fatty Fruits & Vegetables**	**Fatty and Waxed Fruits & Vegetables**
Root and Tuber Vegetables				
Beets				
Carrot				
Radish				
Potato				
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)*

Silia*Quick* 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				

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

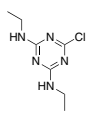
SiliaQuick QuEChERS Solid-Phase Extraction Kits				
Food Matrices	**General Fruits & Vegetables**	**Pigmented Fruits & Vegetables**	**Highly Pigmented and Fatty Fruits & Vegetables**	**Fatty and Waxed Fruits & Vegetables**
Animal Proteins				
Organs (*liver, intestine...*)				
Milk				
Shrimps & seafood				
Biological Fluids				
Blood				
Urine				



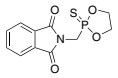
Case study: Detection of Multiple Pesticides Residues in Canadian Apples

The QuEChERS approach was used by SiliCycle scientists for the extraction and clean-up of nine of the most used pesticides for apple-growing sector in Canada. The application outlines the AOAC 2007.01 methodology, and exacts from this procedure were then diverted to HPLC/MS/MS for analysis.

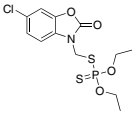
Pesticides Analyzed



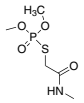
Simazine



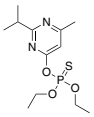
Phosmet



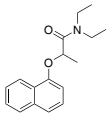
Phosalone



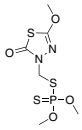
Dimethoate



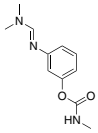
Diazinon



Napropamide



Methidation



Formetanate

Carbaryl

Silia*Quick* Kits Used

- **STEP 1: PN: QE-0002-100P (*6 g $MgSO_4$ & 1.5 g NaOAc*)**
  - 10 g of apple matrix was weighed in a 50 mL centrifuge tube.
  - 10 mL of H_2O was added.
  - Mixture was homogenized.
  - Salt packet was added.
  - Tube was vortexed for 30 sec and then centrifuged at 3,000 rpm for 5 min.

- **STEP 2**: **PN: QD-2000-15T (*«AOAC method for General Fruits & Veggies» : 1,200 mg $MgSO_4$, 400 mg PSA*)**
  - Supernatant was transfered into a 15 mL dSPE.
  - Tube was vortexed for 30 sec and then centrifuged at 3,000 RPM for 5 min.

- **STEP 3**: **Silia*Chrom* dt C18 PN: H141802E-G050 *(3.0 x 50 mm, 2.5 µm, 100 Å)***
  - Extract, containing the pesticides, was transferred to a 2 mL, 9 mm wide opening vial PN: **2SW-C9-C** and then injected for subsequent analysis.

Instruments Conditions

HPLC Conditions

MOBILE PHASE	MPA: 1 mM Ammonium Formate in 95/5 H_2O/MeCN, 0.1 % Formic Acid (v/v) MPB: 1 mM Ammonium Formate in 5/95 H_2O/MeCN, 0.1 % Formic Acid (v/v)
COLUMN	Silia*Chrom*® dt C18, 2.5 µm
COLUMN SIZE	3.0 x 50 mm
SILICYCLE PN	H141802E-G050
FLOW RATE	0.600 mL/min
TEMPERATURE	23°C
INJECTION VOL	2 µL

MS/MS Detection

DETECTOR	Sciex API 3000
IONISATION MODE	ESI+
GAS FLOW	8,000 cc/min
TEMPERATURE	375°C

Experimental Results

Quality Control					
Pesticide	***LLQC**	***QC1** (*3 X LLOQ*)	***QC2** (*30% ULQC*)	***QC3** (*70% ULQC*)	***ULQC**
Carbaryl	92 ± 3	103 ± 9	96 ± 5	95 ± 3	95 ± 2
Diazinon	102 ± 7	104 ± 2	96 ± 1	97 ± 2	98 ± 2
Dimethoate	106 ± 3	105 ± 5	98 ± 3	93 ± 1	95 ± 1
Formetanate	101 ± 6	99 ± 3	93 ± 2	97 ± 2	97 ± 2
Methidation	95 ± 7	103 ± 4	101 ± 2	96 ± 4	96 ± 3
Napropamid	92 ± 10	102 ± 6	95 ± 3	95 ± 2	95 ± 1
Phosalone	83 ± 4	103 ± 6	94 ± 5	98 ± 1	94 ± 5
Phosmet	85 ± 5	96 ± 6	102 ± 5	100 ± 6	98 ± 6
Simazine	106 ± 8	103 ± 4	97 ± 1	94 ± 2	95 ± 2

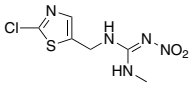
Concentration Levels						
Pesticide	**LLOQ** (*%*)	**3 X LLOQ**	**30% ULOQ**	**70% ULOQ**	**ULOQ**	**LOQ** (*ppt*)
Carbaryl	100 ± 3	113 ± 2	104 ± 3	103 ± 3	103 ± 3	0.05
Diazinon	94 ± 4	101 ± 2	99 ± 2	102 ± 1	103 ±1	0.03
Dimethoate	109 ± 8	96 ± 7	110 ± 3	104 ± 2	105 ± 2	0.10
Formetanate	88 ± 6	87 ± 1	81 ± 1	86 ± 1	89 ± 1	0.50
Methidation	109 ± 2	110 ± 3	109 ± 2	106 ± 1	108 ± 2	0.06
Napropamid	91 ± 9	103 ± 5	107 ± 2	106 ± 1	107 ± 1	0.05
Phosalone	97 ± 8	106 ± 4	110 ± 2	115 ± 3	111 ± 4	0.20
Phosmet	112 ± 2	94 ± 7	100 ± 1	101 ± 1	106 ± 4	0.25
Simazine	107 ± 10	107 ± 7	106 ± 3	106 ± 2	106 ± 2	0.25

- The **accuracy** of the method, expressed as **recovery**, was between 81 and 113 %
- The **precision**, expressed as RSD, was between 0.3 and 11.6 %
- The established limit of quantification (*LOQ*) was 25 ng/g, which is significantly lower than the respective Maximum Residue Limit for such pesticides in food by the FDA and Santé Canada

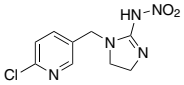
Case Study: Detection of Common Neonicotinoids Residues in Honey

Clothianidin, Imidacloprid and Thiamethoxan are three of the most common neonicotinoids, which is a type of neuroactive insecticide. In January 2013, the European Food Safety Authority declared that these three neonicotinoids pose a high risk for bees and set up maximum residue limits in honey. The QuEChERS approach was used by SiliCycle scientists for the extraction and clean-up of nine of the most used pesticides in apple-growing sector in Canada. The QuEChERS AOAC technique coupled with LDTDMS/ MS was used to obtain a clean extract of honey and a high extraction recovery for these insecticides.

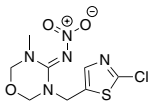
Pesticides Analyzed



Clothianidin



Imidacloprid



Thiamethoxam

Silia*Quick* Kits Used

- **STEP 1**: **PN: QE-0002-100K *(tube with 6 g $MgSO_4$ & 1.5 g NaOAc)***
    - 1 g of honey was weighed in a 50 mL centrifuge tube containing the salts
    - Sample was diluted and homogenized in 10 mL of saturated H_2O with NaCl and spiked with the desired concentration
    - 3 mL of ACN was added and tube was vortex

- **STEP 2**: **PN: QD-1006-2T (*«AOAC method for Fatty and Waxed Fruits & Veggies» : 150 mg $MgSO_4$, 50 mg PSA, 50 mg 18*)**
    - Supernatant was transfered into a 2 mL dSPE tube
    - Tube was vortexed for 30 sec and then centrifuged at 14,000 RPM for 2 min

- **STEP 3**: **Silia*Chrom* dt C18 PN: H141802E-G050 (*3.0 x 50 mm, 2.5 µm, 100 Å*)**
    - A 4 µL extract, containing the pesticides, was transferred to a 2 mL, 9 mm wide opening vial PN: **2SW-C9-C** and then injected for subsequent analysis

Instruments Conditions

LTDT Conditions

FLOW RATE	3 mL/min
TEMPERATURE	22°C
INJECTION VOL	4 µL

LASER PATTERN

Time (*s*)	Power (%)
0.0	0
2.0	0
5.0	65
6.0	65
6.1	0
8.0	0

MS/MS Detection

Insecticide	Transition	CE	DP
Clothianidin	250.1 -> 169.1	17	80
Imidacloprid	292.1 -> 211.1	17	80
Thiamethoxan	256.1 -> 209.1	20	80

- MODE : Positive

Experimental Results

Linearity Results

Excellent linearity (*r2 > 0.99*) with no sign of carryover effect was achieved within the quantification range (*10 to 500 ng/g of honey for Clothianidin and Thiamethoxan and 25 to 1,250 ng/g of honey for Imidacloprid*) without the use of an internal standard.

Clothianidin

	LLOQ	Low-QC	Mid-QC	High-QC	ULOQ
Conc. (*ng/g honey*)	10	25	100	250	500
N	3	3	3	3	3
Mean (*ng/g honey*)	9.18	28.42	89.13	277.41	497.44
% RSD	7.3	4.5	11.1	3.4	10.1
% Nom	91.83	113.67	89.13	110.96	99.49

Thiamethoxan

	LLOQ	Low-QC	Mid-QC	High-QC	ULOQ
Conc. (*ng/g honey*)	10	25	100	250	500
N	3	3	3	3	3
Mean (*ng/g honey*)	9.50	27.11	110.37	276.45	497.98
% RSD	14.3	9.9	4.5	2.7	10.7
% Nom	94.85	108.44	110.37	110.58	99.60

Imidacloprid

	LLOQ	Low-QC	Mid-QC	High-QC	ULOQ
Conc. (*ng/g honey*)	25	63	250	625	1250
N	3	3	3	3	3
Mean (*ng/g honey*)	23.70	73.48	224.95	690.64	1213.12
% RSD	9.3	4.1	8.1	5.2	12.3
% Nom	94.81	117.56	89.98	110.50	97.05

- The accuracy of the method, expressed as recovery, was between 89 and 117 %.
- The precision, expressed as RSD, was between 2.7 and 14.3 %.
- The established limit of quantification (*LOQ*) for Clothianidin, imidacloprid and thiamethoxan respectively was found to be 9, 24 and 9 ng/g, hence falling within the respective maximum residue limit for such insecticide in honey set by the FDA, Santé Canada and the European Food Safety Authorities.

Matrix Effect

Matrix effect was also evaluated by adding a known concentration of neonicotinoids (*50 ng/g of honey for Clothianidin and Thiamethoxan, and 125 ng/g of honey for Imidacloprid*) in different honey brands. All non-spiked compounds were negative for neonicotinoids. As shown in tables below, no matrix effect was observed between four different honey brands.

Clothianidin				
	A	B	C	D
Conc. (*ng/g honey*)	50	50	50	50
N	3	3	3	3
Mean (*ng/g honey*)	45.44	57.74	48.28	57.28
% RSD	9.1	2.1	14.4	10.6
% Nom	90.88	115.47	96.57	114.57

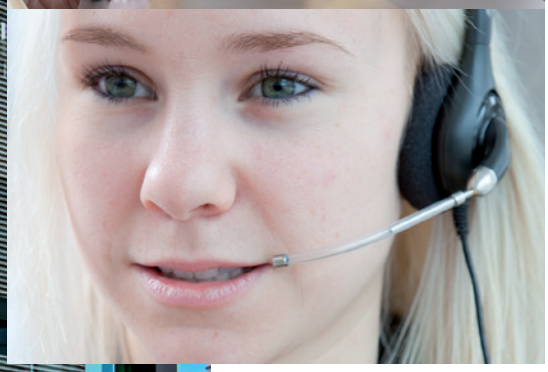
Imidacloprid				
	A	B	C	D
Conc. (*ng/g honey*)	125	125	125	125
N	3	3	3	3
Mean (*ng/g honey*)	116.79	132.30	122.20	138.16
% RSD	12.7	14.5	14.1	3.4
% Nom	93.43	105.84	97.76	110.52

Thiamethoxan				
	A	B	C	D
Conc. (*ng/g honey*)	50	50	50	50
N	3	3	3	3
Mean (*ng/g honey*)	42.62	57.60	51.22	48.83
% RSD	13.4	10.7	13.2	9.2
% Nom	85.25	115.20	102.44	97.66

Hence, no matrix effect was observed. LDTD-MS/MS provides the high-throughput analysis of clothianidin, imidacloprid and thiamethoxan in honey in **9 seconds sample-to-sample** without carryover.

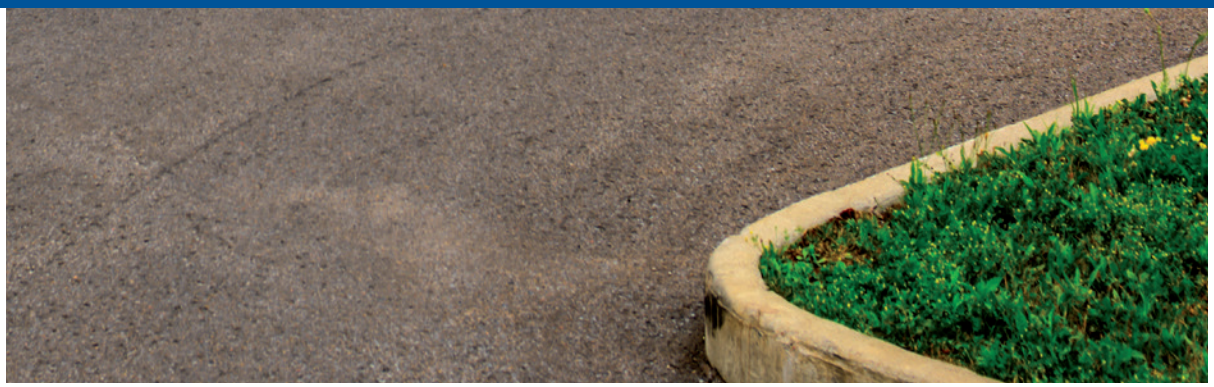
Please contact us for more applications and case studies, such as:

- Detection and analysis of Oxytetracyclines and Sulfadiazines in Shrimps.
- Detection and analysis of Plant Protection Products (*PPPs*) in different Tobacco Grades.
- Detection and analysis of Pesticides Residues in Green Tea.
- Detection and analysis of Nicotine and Nicotine Metabolites in Biological Fluids.
- Detection and analysis of Pesticides Residues in Rice.
- Detection and analysis of over 20 Veterinary Drugs in Animal Food.



Contact Us

Pharmaceutical Catalog & Order now



SILICYCLE Inc.®
UltraPure SILICA GELS

Check Out SiliCycle's Pharmaceutical Catalog for Further Insights into our Vast Array of Innovative Products

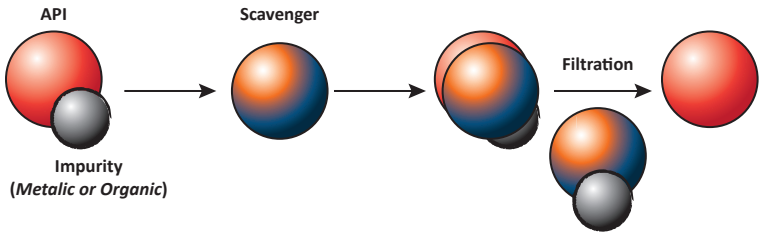
Drug Purification: Immobilised Scavengers for Metal and Organic Removal Technology (Silia*MetS*® & Silia*Bond*®)

This technology has proven to be extremely effective for a variety of fields such as pharmaceuticals, organic chemistry labs, agrochemicals, mining, fine chemicals, water and waste treatments.

SiliCycle has pioneered the field of functionalized silicas, so you can benefit from our scavenging expertise.

Our functionalized silicas are an elegant and practical approach for the removal of metals or organic impurities in your final compound or solution. Challenging purifications in chemistry can now be overcome creatively and elegantly!

A functional group is bound to a silica backbone, that will specifically react with a product either excess reagents (*unreacted*) or impurities. Your molecule of interest is then recovered by simple filtration:



This is a clean, easy, fast, cheap and strongly effective strategy for drug purification, with great compatibility for a myriad of experimental conditions, solvents, pH and temperature.

We have over 20 years of know-how in silica-grafting and scavenging technology and the broadest portfolio on the market of scavengers with associated applications.

This also means the widest range of formats (*bulk, SPE...*), addressing all purification scales (*from laboratory to plant scale*), and the largest range of metals and organics that can be scavenged.

Functionalized Silicas for Metal & Organic Scavenging		
Silia*MetS* Metal Scavengers	Both Metal & Organic Scavengers	Silia*Bond* Organic Scavengers
AMPA (***R85130B***)	Amine (***R52030B***)	Maleimide (***R71030B***)
Cysteine (***R80530B***)	Diamine (***R49030B***)	Propylsulfonic Acid (***R51230B***)
DMT (***R79030B***)	Triamine (***R48030B***)	Tosic Acid (***R60530B***)
DOTA (***R91030B***)	DEAM (***R54430B***)	Isocyanate (***R50030B***)
Imidazole (***R79230B***)		Tosyl Chloride (***R44030B***)
TAAcOH (***R69030B***)		Carboxylic (***R70030B***)
TAAcONa (***R69230B***)		TMA Acetate (***R66430B***)
Thiol (***R51030B***)		DMAP (***R75530B***)
Thiourea (***R69530B***)		Piperazine (***R60030B***)
		Guanidine (***R68230B***)
		Carbonate (***R66030B***)
		Diol (***R35030B***)

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Immobilisation of different organic functionalities is an elegant, clean and practical strategy to overcome these concerns. These unique and strongly effective materials offer a whole new range of possibilities to medicinal, process, R&D and screening chemists, researchers and manufacturers.

Functionalized Silicas for Heterogeneous Catalysis			
SiliaCat Catalyst	SiliaBond Oxidants	SiliaBond Reagents	
Si-DPP-Pd (***R390-100***)	Si-$KMnO_4$ (***R23030B***)	Aluminium Chloride (*Si-AlCl*x) (**R74030B**)	DMAP (*Si-DMAP*) (***R75530B***)
Si-Pd0 (***R815-100***)	Si-PCC (***R24030B***)	Carbodiimide (*Si-DCC*) (**R70530B**)	HOBt (*Si-HOBt*) (***R70730B***)
Si-Pt0 (***R820-100***)	Si-PDC (***R24530B***)	Dichlorotriazine (*Si-DCT*) (**R52230B**)	Morpholine (*Si-MOR*) (***R68030B***)
		EDC (*Si-EDC*) (***R70630B***)	Piperidine (*Si-PIP*) (***R71530B***)
		Diphenylphosphine (*Si-DPP*) (***R39030B***)	

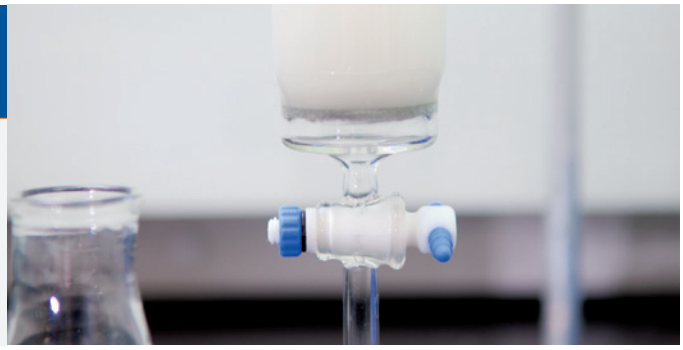
Our silica gels are ideal for both analytical and preparative chromatography, from laboratory to pilot-plant processes and production scale.

Check Out SiliCycle's Pharmaceutical Catalog for Further Insights into our Vast Array of Innovative Products

Drug Purification: Functionalized Silicas as Chromatographic & Ion Exchange Phases (SiliaBond® & SiliaSphere® PC)

Silica is the most wodely used matrix in chromatography. These bare and grafted supports process great properties for uses as stationary phases and are particularly appreciated for their high mechanical resistance.

We offer the largest range of functionalized silicas, all available with capped or uncapped residual silanol groups.



In a mixture, the interactions between the two phases will generate the separation. Hence, depending on the analyte's polarity, the appropriate stationary phase has to be chosen, and the mobile phase's polarity has to be tuned.

I**n an ion exchange process**, the silica support is modified by a function carrying a charge with its counter ion. This counter ion is exchangeable with other ions in solution. If the immobilized phase is carrying an anion, the exchangeable species is a cation. Inversely, if the immobilized phase carries a cation, the ion exchangeable species will be an anion.

Functionalized Silicas for Chromatography

SiliaBond Reversed-Phases	SiliaBond Normal Phases	SiliaBond Ion-Exchange Phases
Si-C18, C8, C6, C4, C1	Amine (*R52130B*)	Amine (*R52130B*)
Si-Cyano (*R38030B*)	Bare Silica (*R10030B*)	Diethylamine (Si-WAX2) (*R76630B*)
Si-PHE (*R33830B, R34030B, R34130B*)	Si-Cyano nec (*R38130B*)	TMA Chloride (Si-SAX) (*R66230B*)
Si-PFP (*R67530B*)	Si-Diol (*R35030B*)	TMA Acetate (Si-SAX2) (R66430B)
	AgNO3 (*R23530B*)	Tosic Acid (Si-SCX) (*R60430B*)
		Propylsulfonic Acid (SCX-2) (*R51430B*)
		Carboxylic Acid (WCX) (*R70130B*)

SiliCycle Prepacked Flash Cartridges (SiliaSep™)

The use of flash cartridges improves purification efficiency by offering superior reproducibility and productivity compared to conventional manual flash chromatography.

More tight & more homogeneous packing equals better separation.

Our silica-based flash cartridges offer superior performances over competitive cartridges. They are availabla in various silica gel grades (*40-63 & 15-40 µm*) and in the most vast array of functionnalities (*reversed, normal, ion-exchange phases, functionnalized with metal & organic scavengers etc.*)

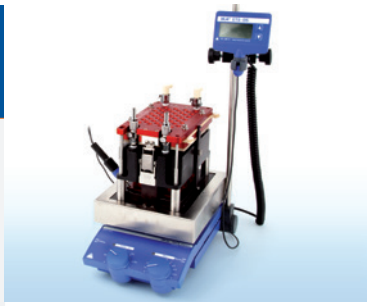
Small scale purification	Production scale purification
up to 1.6 kg	up to 40 kg cartridge

Check Out SiliCycle's Pharmaceutical Catalog for Further Insights into our Vast Array of Innovative Products

SiliCycle MiniBlock XT: Multifunctional Synthesis Platform

SiliCycle MiniBlock XT is a compact easy-to-use reaction block designed for synthesis and screening reactions.

SiliCycle MiniBlock XT is widely used by chemists working in biopharma, chemical, petrochemical and polymers.



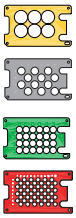
Applications include synthesis of small organic molecules, optimization of critical process parameters and screening for optimal reaction conditions.

It enables reactions to be run under stringent conditions, allowing complete freedom when choosing a synthetic route.

- Parallel Synthesis
- Reaction Screening
- Catalyst Screening
- Reflux and Inerting

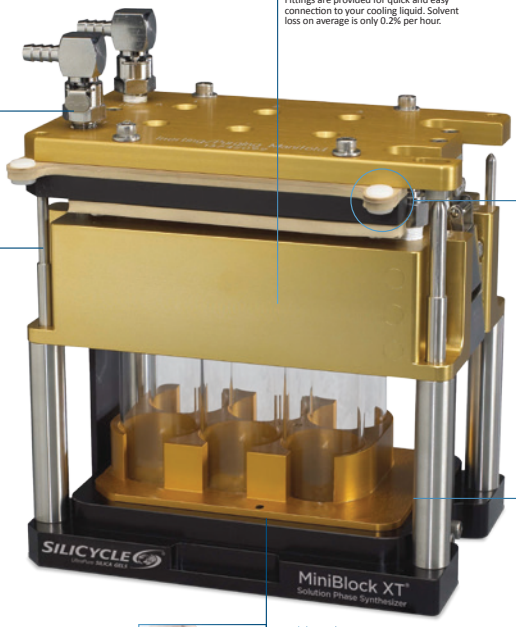
Inert Conditions

Continuous inert gas flow enables air/moisture sensitive reactions. Easily add reagents through the septum layer.



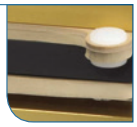
Configure Your SiliCycle MiniBlock XT to Suit Your Needs

Easily configure the SiliCycle MiniBlock XT to choose the scale and number of experiments based on your project requirements.



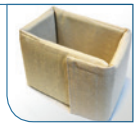
Efficient Reflux

Single reflux jacket cools all vessels. No need for individual condensers. Fittings are provided for quick and easy connection to your cooling liquid. Solvent loss on average is only 0.2% per hour.



Easy Reaction Setup

All vessels are sealed with a single septum layer and allow easy access to reactions.



Heating and Cooling

Precision heating to 120°C and cooling down to -20°C are achieved using modular heat transfer jackets. Temperature uniformity and reproducibility is within 1°C at 80°C.

Modular Racks

Readily interchangeable reaction vessel racks enable simple conversion between 6, 12, 24, and 48-Positions arrays. The 24 and 48-Positions vessel racks are compatible with parallel centrifugal evaporators.

SiliCycle R&D Services

We aim at establishing long-term partnership with our customers by offering all-inclusive service.

SiliCycle is devoted to serving the global chemical industry and constantly focuses on quality. Our flexible approach for each project brings added value to our services to match each client's requirement.

Our mandate is to offer on-time tailored package of work with communication report format, cost and timeframe in lined with your projects.

Portofolio of some available services:

- Scavenging
- Screening
- Catalysis services
- Organic services
- Chromatography, purification & analytical services
- Material science services
- Custom HPLC packing services

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 50% 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.

Ordering Information

How to order

You can order any SiliCycle product on-line through the new SiliCycle e-commerce website at www.SiliCycle.com.

Orders can also be placed by phone, fax, mail or e-mail. If you prefer, you can reach us by e-mail *(info@silicycle.com)* or by phone *(1 418.874.0054 or Toll free for North America only 1 877.745.4292)*. Please have the following information on hand:

- Your name
- Company name, billing and shipping address
- Purchase order number
- Credit card information
- Product number and description
- Size, quantity and unit of measure
- E.I.N. or F.I.N. *(for United States clients only)*

Technical Support

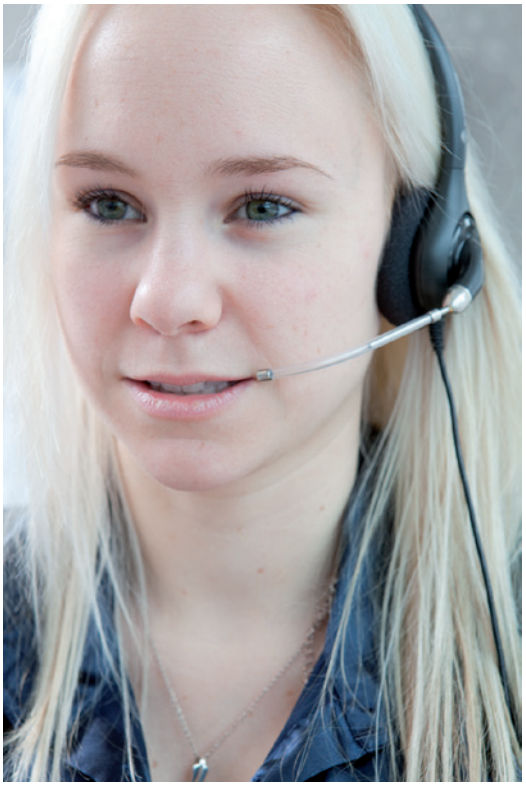
At SiliCycle, we are committed to providing the best technical support possible. Our worldwide Technical Support Group is comprised of a team of highly qualified M.Sc., Engineers and PhD Chemists, Technical Support Professionals and Service Coordinators who are prepared to troubleshoot, answer questions,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

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

- E-mail: support@silicycle.com
- Phone: International 1 418.874.0054
  North America 1 877.745.4292 *(Toll-Free)*

SiliCycle headquarters address:

2500, Parc-Technologique Blvd
Quebec City, Quebec
G1P 4S6, CANADA



Solvent Properties and Miscibility Chart

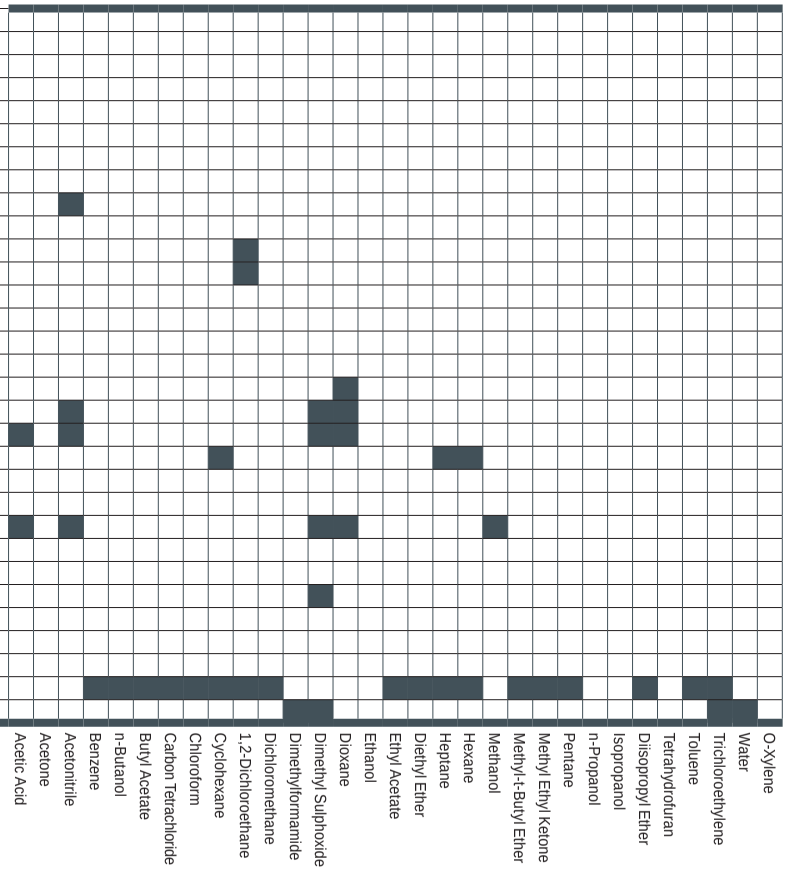
SILICYCLE Inc.
UltraPure SILICA GELS

Your Partner of Choice for HPLC Analysis

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.: 1 418 874.0054 FAX: 1 418 874.0355 TOLL-FREE: 1 877.SILICYCLE (NORTH AMERICA ONLY) WWW.SILICYCLE.COM INFO@SILICYCLE.COM

As a recognized industry leader in the development, manufacturing and commercialization of innovative silica gel products, and with multi-ton manufacturing capability, SiliCycle® is your partner of choice for all your METAL REMOVAL, CATALYSIS, SYNTHESIS, and PURIFICATION requirements.

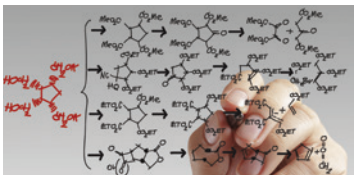
METAL & ORGANIC SCAVENGING

Removal of:
- Metals
- Electrophiles & Nucleophiles
- Potential Genotoxic Impurities (*PGI*)

CATALYSIS & SYNTHESIS

- Couplings (*Suzuki, Stille, Heck, ...*)
- Debenzylation & Hydrogenation
- Oxidation
- And Many More Reactions

ACIDS, BASES & REAGENTS



- Acids & Bases
- Amide Couplings
- Reductive Aminations
- Other Reactions

LOW PRESSURE CHROMATOGRAPHY

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

SAMPLE PREPARATION

- SPE & Well Plates
- Micro-SPE Tips
- QuEChERS
- SPE Hardware & Manifold

HIGH PRESSURE CHROMATOGRAPHY

- Bulk Sorbents
- HPLC & UHPLC Columns
- SEC & SFC Columns
- Guard Cartridges & Accessories

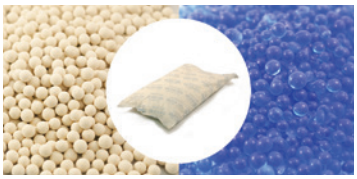
CONSUMABLES

- Vials & Caps
- Syringe Filters
- Membrane Filters

EQUIPMENTS

- Parallel Synthesis Station - SiliCycle MiniBlock® Family
- TLC Scanner
- Vacuum Manifold

DESICCANTS & OTHER BULK ABSORBENTS



- Desiccant
- Activated Alumina
- Molecular Sieve

R&D SERVICES

- Scavenging Screening
- Method Development & Optimization
- Impurities Determination
- Custom Column Packing

CONTACT INFORMATION:

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