

White Paper

Testing and Analysis of Cannabis Products for Safety & Potency



Testing and Analysis of Cannabis Products for Safety & Potency

The cannabis market has experienced rapid growth over the last 20 years with more and more countries legalizing its products. With its popularity has come more sophisticated production methods as well as analytical quality control.

Of key interest are two parallel segments growing in tandem: medical/recreational cannabis, and cannabidiol. Key substances found in these segments are: cannabidiol (CBD), tetrahydrocannabinol (THC) and cannabinol (CBN).

Cannabis analysis requires analytical data which are comparable between laboratories and over time

As of May 2021, 36 U.S. states as well as Canada and various European countries have passed laws allowing cannabis to be used for medical applications or for recreational purposes.

Predictably, as more countries are becoming open to legalizing cannabis, regulations are slowly following suit to ensure adequate product safety and quality. However, cannabis is unique in that while it spans healthcare, pharma, consumer goods, and agricultural markets, the rules and regulations governing cannabis products are inconsistent between countries and even within the same country.

The other sectors mentioned have had regulatory frameworks and product standards in place for a long time, and most of those standards are consistent from one jurisdiction to another. Eventually the same will happen for cannabis. One thing is for sure, with these new changes on the legal status of marijuana worldwide, there has been drastic requirements for inspecting, monitoring, and evaluating whether cannabinoid products present potential risks to human health.

SiliCycle offers products to support this industry to produce cannabis extracts of highest purity.



SiliaPrep™
SPE Cartridges



SiliaChrom®
HPLC Columns



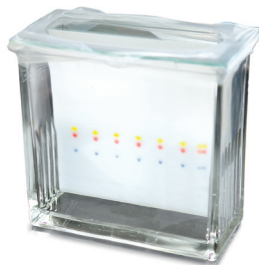
E-PAK®
Fixed Bed Flow-Through
Purification Cartridges



SiliaSep™
Flash Cartridges



- Bulk bare silica:
- **SiliaFlash®** Irregular Silica
 - **SiliaSphere™** Spherical Silica



SiliaPlate™
TLC Plates

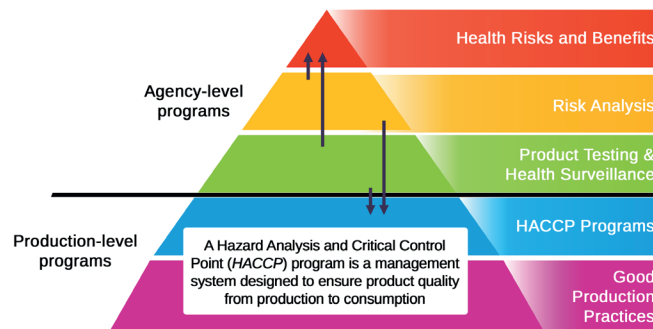


- Bulk Scavengers:
- **SiliaMets®** Metal Scavenger
 - **SiliaBond®** Organic Scavenger

Risk Assessment

There are various approaches to the assessment and management of hazards that can be applied to cannabis programs.

Drawing upon the variety of tools and methods applied in product evaluation and protection programs for other types of products, the product protection pyramid identifies activities implemented by public health agencies and by producers/product handlers to evaluate and ensure product quality.



Graph 1. Adapted from Gorris 2005. *Food safety objective: An integral part of food chain management*. Food Control 16: 801–809.

Lab Challenges

Even though cannabis laboratories are maturing, they're maturing in an environment far different than labs from regulated industries, like food laboratories.

Food safety testing laboratories have been governmentally regulated and funded from almost the very beginning, allowing them some financial breathing room to set up their operation, and ensuring they won't be penalized for failing samples.

In contrast, testing fees for cannabis labs are paid by growers and producers – many of whom are just starting their own business and limited resources. This creates fierce competition between cannabis laboratories in terms of testing cost and turnaround time.

One similarity that the cannabis industry shares with the food industry is consumer and regulatory demand for safe products. This demand requires laboratories to invest in instrumentation and personnel to ensure generation of quality data. In short, the two major demands placed on cannabis laboratories are low cost and scientific excellence.

Scientific excellence isn't cheap, thus cannabis laboratories are stuck between a rock and a hard place and are feeling the squeeze.

Responding to the Challenges

There are three types of data collected, evaluated and combined in a risk assessment:

- Sources/hazards such as: contaminants, pesticides, microbes or active ingredients.
- Health effects/consequences/adverse events associated with each hazard.
- Exposure which involves sampling of products to determine concentrations of ingredients/contaminants and human exposure through use of the target product.

SiliCycle offers one of the broadest selections of analytical solutions for contaminant data collection such as cannabinoids, terpenes, mycotoxins, heavy metals, pesticides, and residual solvents.

Various Contaminants, Various Solutions

■ Pesticides

Selection of target pesticides for testing vary by state. For example, Massachusetts' Medical Marijuana Program requires testing prohibited pesticides identified by the American Herbal Pharmacopoeia¹ which are commonly used in cannabis cultivation. But New Jersey's program selected pesticides for testing based on the EPA pesticide testing method 507.^{2,3} As another example, Oregon Health Authority's technical report can be found online as a guide.⁴

■ Solvents

Various solvents are used during the manufacturing of cannabis extracts and concentrates to remove cannabinoids from the plant material. One of the extraction processes involves a supercritical fluid process in which the marijuana plant material is placed in a vessel with the solvent at high pressures. Each solvent used has its own extraction efficiency, toxicity and latency within the extracted product. The compounds used for the extraction of cannabinoids may also pose a health risk.

While no health-based residual solvent limits have been established specifically for cannabis extract or concentrate products, practices around pharmaceutical production and limits provide a reasonable model, particularly for oral intake.

The US Pharmacopeia's National Formulary (*chapt. 467*)⁵ provides guidance for the use of solvents in the manufacturing of pharmaceutical products. This chapter has been adopted by many regulatory agencies in selecting solvents that may be utilized for extraction, as well as in setting the limits for residual solvents allowed in extracted products.

In Oregon, limits for solvents in cannabis products are based on the *International Conference on Harmonized Tripartite Guideline, impurities: Guideline for Residual Solvents Q3C(R5) (ICHQ3C)*.⁶



¹ AHP. 2013. Cannabis Inflorescence, Cannabis spp., Standards of Identity, Analysis, and Quality Control. American Herbal Pharmacopoeia 2013. Available for purchase at: <https://herbal-ahp.org/online-ordering-cannabis-inflorescence-qc-monograph/>

² EPA. Method 507: Determination of Nitrogen- and Phosphorus-containing pesticides in water by gas chromatography with a nitrogen-phosphorus detector. Revision 2.1. Edited by J.W. Munch (1995). Available at <https://www.cromlab.es/Articulos/Metodos/EPA/500/507.pdf>

³ EPA. Inert Ingredients Eligible for FIFRA 25(b) Pesticide Products (Updated December 2015). Available at <https://www.epa.gov/pesticide-registration/inert-ingredients-overview-and-guidance>

⁴ <https://public.health.oregon.gov/PreventionWellness/marijuana/Documents/oha-8964-technical-report-marijuana-contaminant-testing.pdf>

⁵ https://www.pharmacopeia.cn/v29240/usp29nf24s0_c467.html

⁶ <https://www.pmda.go.jp/files/000156308.pdf>

■ Microbiologicals & Mycotoxins

A review of existing literature shows that the presence of mold on cannabis can cause severe health complications and, in certain cases, death. Pathogenic bacteria may also be a cause of under-reported or recognized adverse events.

For example, kidney failure can occur due to gastrointestinal infection linked to the smoking of cannabis which previously failed testing for the presence of enterobacteria and mold.

In general, bacteria cannot survive either the drying or heating processes to which cannabis is subjected. Salmonella, however, can survive at very low moisture levels and is highly infectious in humans. E. coli itself does not usually pose a significant health risk, but it is an indicator of poor sanitary conditions and the possible presence of other fecal bacteria.

As examples: Aspergillus genus has spores which can withstand desiccation and high temperatures, and can cause respiratory infections in individuals who inhale it if they are immune-compromised. There is a known clinical correlation with cannabis smoking. Aflatoxins, a family of toxins produced by fungi and which the aspergillus genus is part of, are highly carcinogenic mycotoxins which pose significant threat to exposed individuals.



Picture 2. Typical Mycotoxins that may develop on cannabinoid crops.

■ Metals

Cultivation of cannabis requires soil and water of a certain quality, i.e. free of contaminants. Since this might not always be the case, screening of heavy metals is recommended to safeguard the cannabis user's health. Heavy metals such as lead, cadmium, mercury, and arsenic are toxic to both plants and humans, and therefore often the focus of testing.

For purification means, our Metal & Organic Scavengers offer a powerful, quick and versatile solution at all scales and formats. They have rapidly become a useful and recognized tool in all sorts of purification processes.

■ Cannabinoids

Potency of cannabis products may vary largely by strain.

The goal in determining what cannabinoids should be quantified is to support label accuracy. Although cannabis contains more than 150 cannabinoids, delta-9-tetrahydrocannabinol (Δ^9 -THC) has received the most attention since it is the principal psychoactive component of the plant.



Picture 3. Sugary crystals of a cannabis nugget.

Other analytes often required for analysis include cannabidiolic acid (CBD-A), cannabigerolic acid (CBGA), cannabidiol (CBD), cannibigerol (CBG), tetrahydrocannabinol acid (THCA), cannabinol (CBN) and delta-8-THC (Δ^8 -THC).

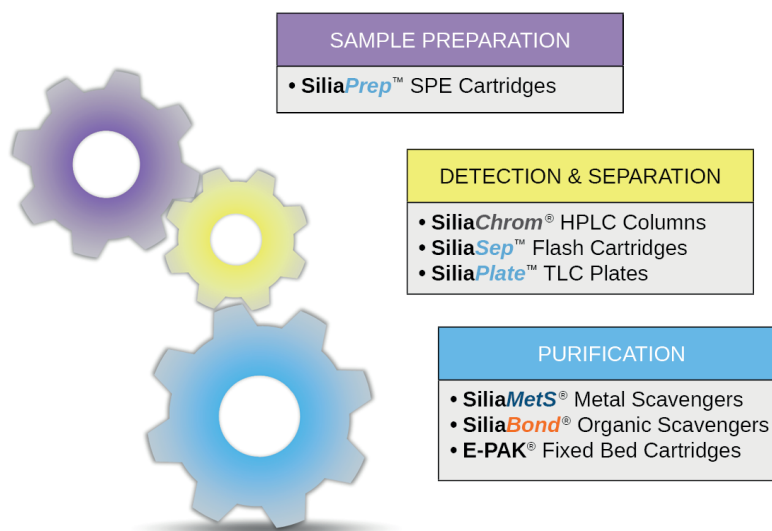
SiliCycle's Solutions Flow Chart

Cannabis analysis cannot be done with a simple and unique experiment.

Analytical labs first need to:

- **Prepare an effective sample** for subsequent detection of the various compounds previously presented,
- **Detect**, and then **separate** the latter for thorough analysis,
- **Purify** the sample lot for delivery to market while minimizing loss of yield.

The schematic flow chart below presents at a glance SiliCycle's recommended products for each step of a comprehensive and exhaustive analysis.



Picture 4. Flow chart of cannabis analysis

SiliCycle: Purity at work!

■ Sample Preparation

Given the wide range of physical properties of contaminants, both liquid chromatography (LC) and gas chromatography (GC) methods are required for testing, but this can only be achieved once an efficient sample preparation step has been done.

SiliaPrep™ SPE Cartridges

By using our products you will generate higher purity samples and reduce the number of false positives in your screening, resulting in higher quality data. All our SPE cartridges are packed with sorbents made of our fine-free SiliaFlash silica gel which has the highest purity on the market. When you use SiliCycle's SPE we guarantee the following:

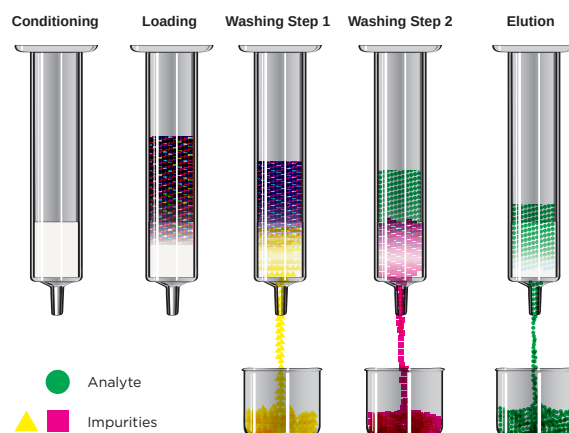
- High quality and wide variety of SiliaBond sorbents available
- Excellent separation (*very tight particle size distribution and no fines*)
- High recoveries and yields
- No needle clogging
- Less time and solvent spent conditioning the sorbent
- No silica, plastic, or grease contamination of your final product
- Lot-to-lot reproducible results



SiliCycle SPE Interference Removal Strategy

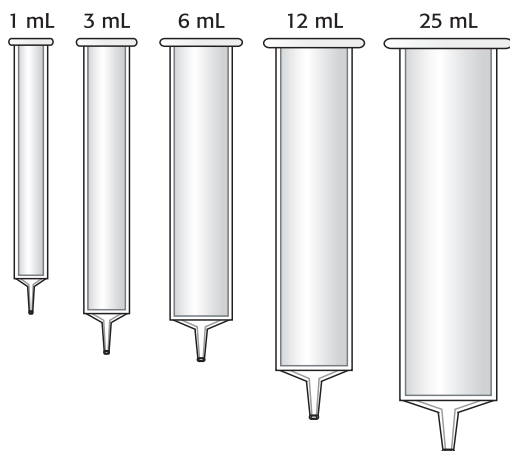
Special sorbent of choice is packed in a SPE cartridge:

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



SiliCycle SPE cartridges formats are adaptable to all scales

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



SiliaPrep™ Phases Portfolio

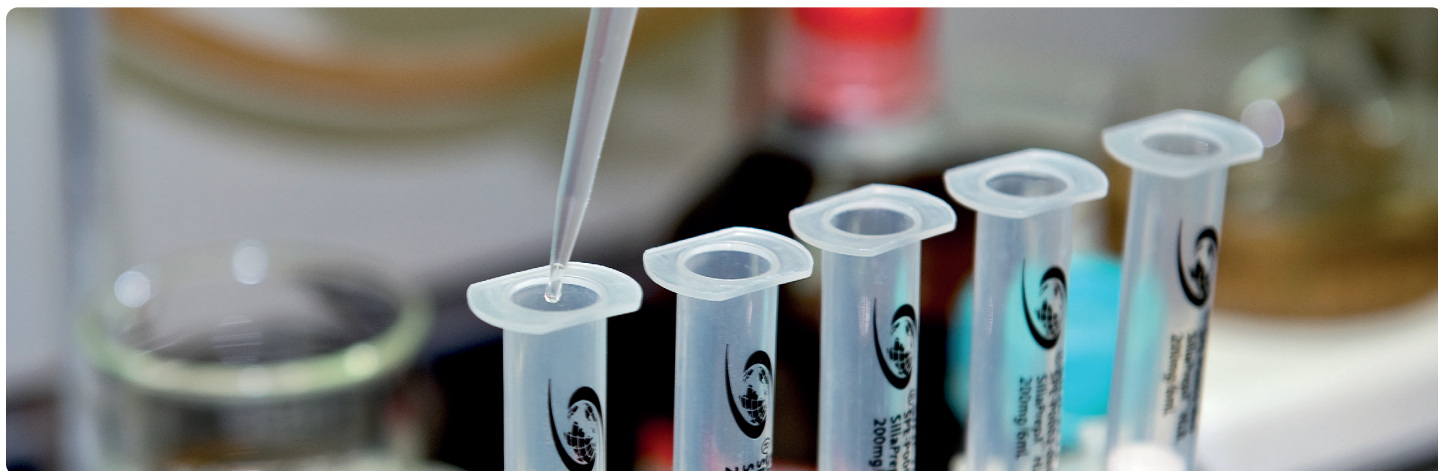
Silica-Based Non Polar Phases		
SiliaPrep		Product Number
C18 (17%)	🌿	SPE-R00230B
C18 <i>nec</i> (17%)		SPE-R35530B
C18 WPD		SPE-R33229G
C8		SPE-R31030B
C8 <i>nec</i>		SPE-R31130B
Phenyl		SPE-R34030B
PFP	🌿	SPE-R67530B

Silica-Based Polar Phases		
SiliaPrep		Product Number
Cyano		SPE-R38030B
Silica	🌿	SPE-R10030B
Silica WPD		SPE-R10029G
Diol <i>nec</i>		SPE-R35030B
Florisil		SPE-AUT-0014
Florisil PR		SPE-AUT-0015
Alumina Acidic		SPE-AUT-0053
Alumina Neutral		SPE-AUT-0054
Alumina Basic		SPE-AUT-0055

Silica-Based Ion Exchange Phases		
SiliaPrep		Product Number
SAX <i>nec</i>		SPE-R66530B
SAX-2 <i>nec</i>		SPE-R66430B
Carbonate		SPE-R66030B
WAX	🌿	SPE-R52030B
SCX		SPE-R60530B
SCX-2		SPE-R51230B
WCX		SPE-R70030B

Silica-Based Mixed-Mode and Specialty Phases		
SiliaPrep		Product Number
C8/SAX-2 <i>nec</i>		SPM-R026630B
SCX-2/SAX <i>nec</i>		SPM-R802830B
PCB <i>nec</i>		SP2-R00650030B
CleanDRUG		SPEC-R651230B
PAH		SPE-R0610030B
CleanENVI		SPEC-R31930B
Metal Scavengers		Various Phases Available

Find much more at: <https://www.silicycle.com/SPE>



All products identified with 🌿 are our clients' favourite for cannabis analysis & purification

■ Separation

The rapid growth of the cannabis testing market has prompted the development of equally rapid methods to analyze the active ingredients.

SiliaChrom® HPLC Columns





SiliaChrom columns are made from extremely pure silicas and are well known for their high efficiency and resolution capacity. Based on spherical, totally porous silica, SiliaChrom columns provide enhanced chemical and mechanical stability as well as very high loading capacity.

All SiliaChrom columns are packed using our proprietary slurry packing process, to achieve a uniform column-to-column reproducibility.

SiliCycle has been manufacturing and packing HPLC columns for many years and offer more than 40 different phases. Raw materials and HPLC columns go through our ISO 9001-2008 registered manufacturing facility, under strict SOP's and standard QC column performance testing, assuring column performance, peak symmetry and lot-to-lot reproducibility.

The SiliaChrom portfolio ranges from reversed-phase to normal phase columns, columns for large proteins and peptide analysis and SFC compatible solutions. An incredibly range of column dimensions and particle sizes are available to accommodate the vast majority of your applications.



SiliaChrom HPLC Columns Characteristics					
Main Characteristics		SiliaChrom Phases	Particle Size (μm)	Pore Size (Å)	Specific Surface Area (m ² /g)
SiliaChrom Plus	<ul style="list-style-type: none"> • Wide range of selectivities • Ultra-pure metal-free silica (99.9999 % purity) • High column performance and resolution • Enhanced batch-to-batch reproducibility • Extended column lifetime • Reduced silanol activity, better peak symmetry • Extremely low bleeding for LC-MS applications • Easy scale-up to preparative formats 	Plus C18 	3, 5, 10	100	370 - 430
		Plus C18-300	3, 5, 10	300	80 - 120
		Plus C8	3, 5, 10	100	370 - 430
		Plus C8-300	3, 5, 10	300	80 - 120
		Plus C4	3, 5, 10	100	370 - 430
		Plus C4-300	3, 5, 10	300	80 - 120
		Plus PFP 	3, 5, 10	120	320 - 360
		Plus Phenyl	3, 5, 10	100	370 - 430
		Plus Cyano	3, 5, 10	100	370 - 430
		Plus Amino 	3, 5, 10	100	370 - 430
		Plus Diol	3, 5, 10	100	370 - 430
		Plus Silica 	3, 5, 10	100	370 - 430
		Plus SAX	3, 5, 10	PI (Proprietary Information)	
		Plus SCX	3, 5		
SiliaChrom dt	<ul style="list-style-type: none"> • Stable from 100 % aqueous to 100 % organic • Enhanced retention of hydrophilic molecules • Inertness for acidic and basic analytes 	dt C18	2.5, 3, 5, 10	100	410 - 440

Find much more at: <https://www.silicycle.com/HPLC>

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Purification

SiliaMetS E-PAK® – Radial Fixed Bed Flow-Through Cartridges


Created with proprietary technology, E-PAK cartridges provide rapid adsorption kinetics at flow rates and processing capacities suitable for laboratory, pilot and commercial operations.

Features & Benefits

- Proven cartridge design ensures rapid, simple & reliable technology
- High adsorption capacity and flow rate
- Fixed-bed design ensuring safer handling, clean-up and disposal
- Large adsorbent capacity in small area footprint increases product recovery & reduces solvent requirements



Sorbents

Sorbents for E-PAK	
Active Adsorbents	For Removal and/or Recovery of:
SiliaMetS Amine, Diamine and Trimine 	Pd, Cr, Pt, W, Zn / Cd, Co, Cu, Fe, Hg, Ni, Pb, Ru, Sc & Se
SiliaMetS AMPA	Al, Ce, Dy, Er, Eu, Gd, Ho, La, Lu, Mn, Nd, Ni, Pm, Pr, Sb, Sn, Tb, Tm, V, Yb / Co, Cu, Fe, Mg & Zn
SiliaMetS DMT	Pd, As, Ir, Ni, Os, Pt, Rh, Ru, Se / Cd, Co, Cu, Fe, Sc & Zn
SiliaMetS Imidazole	Cd, Co, Cu, Fe, Ir, Li, Mg, Ni, Os, W, Zn / Cr, Pd & Rh
SiliaMetS TAAcOH	Ca, Co, Ir, Li, Mg, Ni, Os, Ru, Sc / Cr, Cs, Fe, Pd, Rh & Sn
SiliaMetS TAAcONa	Ca, Cd, Cs, Cu, Fe, Ir, La, Li, Mg, Ni, Os, Rh, Sc, Sn / Cr, Pd, Ru, Se & Zn
SiliaMetS Thiol	Pd, Ag, Hg, Os, Ru / Cu, Ir, Pb, Rh, Se & Sn
SiliaFlash Bare Silica	Very vast range of organic impurities, metals, pigments, etc.
SiliaBond Cyano & Florisil®	Various organic molecules
SiliaBond Propylsulfonic Acid (SCX-2)	Amines & Anilines, Ion Exchange
SiliaCarb VW, VA, HA and CA	Precious metal catalysts, pigments and reaction contaminants

Lab Sale Purification

Lab Scale Cartridges			
Cartridge Size	Flow Rate Range*	SiliaMetS & SiliaBond Weight	SiliaFlash & Activated Carbons Weight
5 x 1 cm	1 - 20 mL/min	8 g	5 g
5 x 10 cm	10 - 200 mL/min	75 g	50 g
5 x 25 cm	25 - 500 mL/min	200 g	125 g

* Faster flow rate can be used for the lab scale cartridges depending on the application or the scavenging difficulty (1 cm up to 100 mL/min, 10 cm up to 500 mL/min and 25 cm up to 1 L/min).

Pilot and Commercial Scale Purification

Pilot & Commercial Scale Cartridges				
Purification Scale	Cartridge Size	Flow Rate Range	SiliaMetS & SiliaBond Weight	SiliaFlash & Activated Carbons Weight
Pilot Scale	16.5 x 12.5 cm	0.10 - 2.5 L/min	875 g	850 g
	16.5 x 25 cm	0.25 - 5 L/min	1.75 kg	1.7 kg
Commercial Scale	16.5 x 50 cm	0.50 - 10 L/min	3.5 kg	3.4 kg
	16.5 x 100 cm	1 - 20 L/min	7 kg	6.8 kg

Find much more at: <https://www.silicycle.com/EPK>

All products identified with  are our clients' favourite for cannabis analysis & purification

SiliaSep™ Flash Cartridges

Silica is the most widely 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.

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



Functionalized Silicas for Flash Chromatography		
Reversed-Phases	Normal Phases	Ion-Exchange Phases
Si-C18, C8, C6, C4, C1	Amine	Amine
Si-Cyano	Bare Silica	Diethylamine (Si-WAX2)
Si-PHE	Si-Cyano nec	TMA Chloride (Si-SAX)
Si-PFP	Si-Diol	TMA Acetate (Si-SAX2)
	AgNO ₃	Tosic Acid (Si-SCX)
		Propylsulfonic Acid (SCX-2)
		Carboxylic Acid (WCX)

Our silica-based flash cartridges offer superior performances over competitive cartridges.

They are available in various silica gel grades:

- 40 - 63 µm, 60 Å irregular silica (SiliaSep Cartridges)
- 25 µm spherical silica (SiliaSep PREMIUM Cartridges)

... and in the most vast array of fonctionnalités:

- reversed phases
- normal phases
- ion-exchange phases
- metal & organic scavengers

SiliaFlash® & SiliaSphere® PC Bulk Silica Gels

All our SPE & Flash cartridges phases are available in bulk as well, so you can do your own packing in the format that best suits your application or routine.

SiliaFlash irregular gel and SiliaSphere spherical gel are available from g to multi tons, both as bare or functionalizes silicas, in all kind of particle and pore sizes.

For easy and simple separation, our blockbuster is a 40 - 63 µm, 60 Å gel. We name it R12030B.

For trickier separation, spherical particles are ideal, and S10030B is R12030B equivalent in terms of particle / pore size.

Learn more at: <https://www.silicycle.com/silica-gels>



All products identified with  are our clients' favourite for cannabis analysis & purification

Detection

Because there is more than just analysis.

Purification of your sample is your final aim, and we will be your best partner for all kind of purification issues and scales.

SiliaPlate™ TLC Plates

Thin layer chromatography (TLC) is a quick, simple and inexpensive analytical technique frequently used in various laboratories as it is one of the most versatile. It is used for:




- Reaction Monitoring
- Screening
- Compound purity evaluation

Rapid and cost-efficient selection and optimization of chromatographic conditions prior to flash chromatography purification or HPLC analysis.

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

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



SiliaPlate Available Chemistries		
Normal Phases	Reversed-Phases	Speciality Phases
Bare Silica (TLX-R10014BK-XXX) 	C18 (TLX-R30414BK-XXX) 	Aluminium Oxide (TLX-AUT0337-XXX)
Amine (TLX-R52014BK-XXX) 	C8 (TLX-R31014BK-XXX)	Cellulose (TLX-R52014BK-XXX)
Cyano (TLX-R38014BK-XXX)	C2 (TLX-R32614BK-XXX)	Chiral Copper Complex (TLX-AUT0310-XXX)
Diol (TLX-R35014BK-XXX)	Silver Nitrate (10-15 or 20 %) (TLX-R32X14BK-XXX)	

SiliaPlate Portfolio	
Characteristics	Available Plates
Backings	<ul style="list-style-type: none"> • Glass (TLG-RXX14BK-XXX) • Aluminium (TLA-RXX11B-XXX) • Plastic (TLP-RXX11B-XXX)
Sizes	<ul style="list-style-type: none"> • 2.5 x 5 cm • 2.5 x 7.5 cm • 2.5 x 10 cm • 4 x 8 cm • 5 x 6.7 cm • 5 x 7.5 cm • 5 x 10 cm • 5 x 20 cm • 10 x 10 cm • 10 x 20 cm • 20 x 20 cm
Plate Types	<ul style="list-style-type: none"> • Scored Plates • Channeled Plates • Preparative Plates • High Performance Plates • Thicknesses from 100 to 2,000 µm

Find much more at: <https://www.silicycle.com/TLC>

All products identified with  are our clients' favourite for cannabis analysis & purification

SiliaMetS Metal Scavengers & SiliaBond Organic Scavengers

SiliCycle grafted technology enables more powerful purification processes to help reach new purity standards. Our solutions are extremely versatile and customizable.

Because it's not enough just to identify and quantify,

Because you don't need to waste a given lot just by reason of too many impurities,

This is when our scavengers come to the rescue

- **SiliaMetS** are functionalized silica that will scavenge various types of metals (we pretty much have functionalities for almost all metals & metallic complexes).
- **SiliaBond** are functionalized silica that will scavenge various types of organic residues (we pretty much have functionalities for almost all organic functionalities).



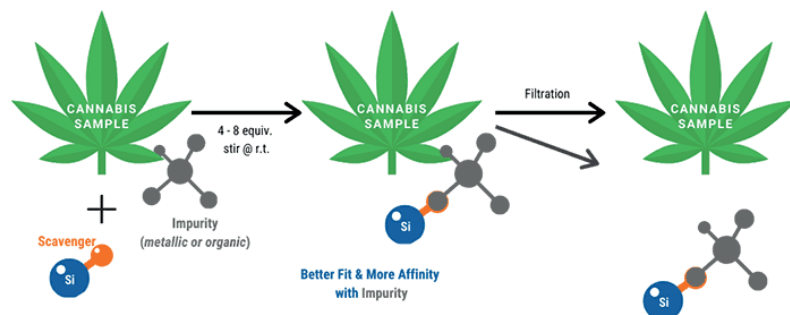
Easier, Cleaner, Faster, Efficient Purification Processes

- Almost two decades of know-how in silica-grafting and scavenging technology
- Broadest portfolio of scavengers with associated applications
- agrochemicals, mining, fine chemicals, water and waste treatment
- Great compatibility with a myriad of experimental conditions, solvents, pH and temperatures
- Strong chemical, physical, thermal and mechanical stability

How Will Scavengers Help You Clean Your Sample?

Because we all know images speak more than words:

How will SiliaMetS and SiliaBond scavengers trap impurities in your sample



Learn more at: <https://www.silicycle.com/scavengers>

SiliCycle R&D Services

Need help to develop your purification method for the highest cannabis purity on the market ?

We'll help you. Reinvesting our experts' talent in your own expertise is what drives our passion

For any issue you may have, we offer high-throughput R&D services.

- **We listen. We understand. We work with you.**
- **Assistance to start-ups & young tech companies.**
- **We are flexible, committed, reliable, innovative, fast & affordable.**



Fuelling R&D to be innovation leaders in the marketplace is what drives and motivates us

Our Scientific Team Expertise & Talents

Scientific Team & Know-How

SiliCycle's mandate is to offer on-time tailored packages of work with communication report format, cost and timeframe in line with your projects.

Our domain of expertise lies in our experts' vast knowledge and skills in a variety of core competencies in various domains. SiliCycle's team of in-house experts ensures that every project comes with an original and flexible solution that matches your needs.

A Brief Overview of Our Scientists' Competencies

■ Analytical Chemistry

- Analytical method development and optimization (UPLC, HPLC, GC, etc.)
- Extraction of natural compounds
- Sample preparation using various techniques (SPE, etc.)
- Method validation under Good Laboratories Practices norms

... as well as a vast experiences in other spheres of competence such as:

- Medicinal & Organic Chemistry
- Biology, Biochemistry
- Catalysis & Organometallic Chemistry
- Chemical Engineering, Mesostructured Material, Physical & Petrochemistry

Come & visit us at: <https://www.silicycle.com/R&D>

DISCOVER OUR BROCHURES

METAL & ORGANIC SCAVENGING

SiliaMetS® – Metal Scavengers
SiliaBond® – Organic Scavengers
E-PAK® – Fixed Bed Flow-Through Purification Cartridges



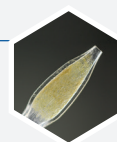
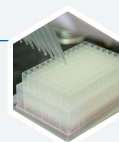
CHROMATOGRAPHY & PURIFICATION

SiliaFlash® – Irregular Silica Gels
SiliaSphere™ PC – Spherical Silica Gels
SiliaBond® – Chromatographic Phases
SiliaSep™ – Flash Cartridges
SiliaPlate™ – TLC Plates



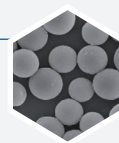
SAMPLE PREPARATION

SiliaPrep™ – Silica-based SPE Cartridges & Well Plates
SiliaPrepX™ – Polymeric SPE Cartridges & Well Plates
SiliaPrep™ – Micro-SPE Tips



ANALYTICAL & PREPARATIVE CHROMATOGRAPHY

SiliaSphere™ – Spherical Silica Gels
SiliaChrom® – HPLC Columns



ORGANIC SYNTHESIS

SiliaBond® – Reagents & Oxidants



R&D SERVICES

Metal & Organic Scavenging Screening
 Organic Synthesis
 Extraction & Purification
 Custom Column Packing
 Material Science

