SILICYCLE Inc.®
UltraPure SILICA GELS

SiliCycle MiniBlock® Maximize Productivity with Parallel Synthesis

Synthetic chemists - your choice for synthesis

SiliCycle **MiniBlock**

SiliCycle MiniBlock is a flexible, easy-to-use tool that maximizes the productivity of synthetic chemists. SiliCycle MiniBlock is the only compact parallel synthesizer that allows synthesis via solid or solution-phase as well as purification to be carried out on the same platform.

Originally designed by chemists at Bristol-Myers Squibb, SiliCycle MiniBlock has been further developed by Mettler Toledo® and SiliCycle to address a wide range of chemistry methodologies.

Chemists can now take advantage of SiliCycle's unique expertise in purification, metal scavenging, catalysis and solid-supported reagents in combination with the SiliCycle MiniBlock to increase productivity while reducing development time.

- Solution-phase synthesis
- Solid-phase synthesis
- Peptide synthesis
- Parallel purification

SiliCycle MiniBlock	Set Quantity	Package Quantity
MiniBlock Synthesizer	2	6
Shaking and Washing Station	1 Compact	1 High Capacity
Heat Transfer Block	2	2
Vacuum Collection Base	1	2
Tall Tube Extender	2	4
Recirculator Manifold	1 (*2-position*)	1 (*6-position*)
Counterweight for Shaking Station	1	4
Air Push Assist Device	1	1
Inerting/Purging Manifold	-	2
Transfer Adapter	-	2
Resin Dispenser	-	1
Consumables Kit	Small	Large

Inert conditions

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

Agitation and resin washing

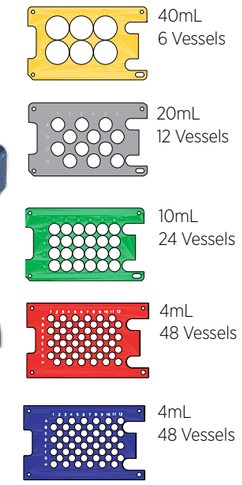
Customized 2 and 6 position shakers allow precision vortex mixing of reactions. Built in washing capability allows rapid preparation of resins or washing of products while reaction blocks remain on the shaker.

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.

One platform flexibility

Red and Blue SiliCycle MiniBlock combine to produce 96 compounds.

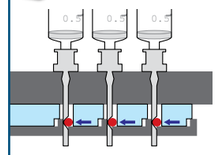


Configure your SiliCycle MiniBlock to suit your needs

SiliCycle MiniBlock can synthesize compounds in individual vessels ranging in size from as small as 4mL up to as large as 40mL, all delivered into racks with microplate footprints. This flexibility provides a smooth, seamless work-flow from synthesis to screening.

With just the turn of a key

Collect products from SiliCycle MiniBlock cleanly and efficiently.



Unique built-in valve

Provides rapid bottom filtration – no need to invert or disassemble the reactor. Saves time and prevents cross contamination.

*Since using SiliCycle MiniBlocks, our labs report a **400% increase** in new drug candidates and a 40% reduction in development time.*

SiliCycle MiniBlocks are so widely accepted by our medicinal chemists that 70% of all current programs now use high–throughput chemistry.

Dr. Harold Weller, Research Fellow
Bristol-Myers Squibb

Ultimate flexibility – one platform - four volumes

SiliCycle
MiniBlock XT

SiliCycle MiniBlock XT is an easy to use reaction block designed for synthesis and screening reactions. Applications include synthesis of small organic molecules, optimization of critical process parameters and screening for optimal reaction conditions.

The SiliCycle MiniBlock XT is widely used by chemists working in biopharma, chemical, petrochemical, and polymers. SiliCycle MiniBlock XT's flexible and modular design fits easily into your workflow, and is ideal for applications supported by statistical design of experiments (*DoE*).

SiliCycle MiniBlock XT enables reactions to be run under stringent conditions allowing complete freedom when choosing a synthetic route. Also designed by the discovery and development team at Bristol-Myers Squibb, the SiliCycle MiniBlock XT has been further developed and enhanced by Mettler Toledo and SiliCycle to be compatible with the SiliCycle MiniBlock product line.

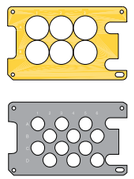
SiliCycle MiniBlock XT	Set Quantity	Package Quantity
Inerting/Purging Manifold	1	2
Reactor Frame	1	2
Removable Vessel Rack	1	4
Refluxing Layer	1	2
Vessel Rack Removal Tool	1	2
Sealing Gaskets	5	10
Inner/Piercing Septa	5	10
Top Plate	1	2
Multi-Layer Septa, Pre-scored for Top Plate	5	10
IKA Hot Plate Stirrer *(115V/60Hz or 230V/50Hz)*	1	1
Stir Bars	*	*
Reaction Vessels	*	*

*Applicable Reaction Vessels and Stir Bars Included

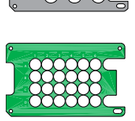
- **Parallel synthesis**
- **Reaction screening**
- **Catalyst screening**
- **Reflux and inerting**

Inert conditions

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

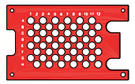


55mL
6 Vessels



25mL
12 Vessels

10mL
24 Vessels



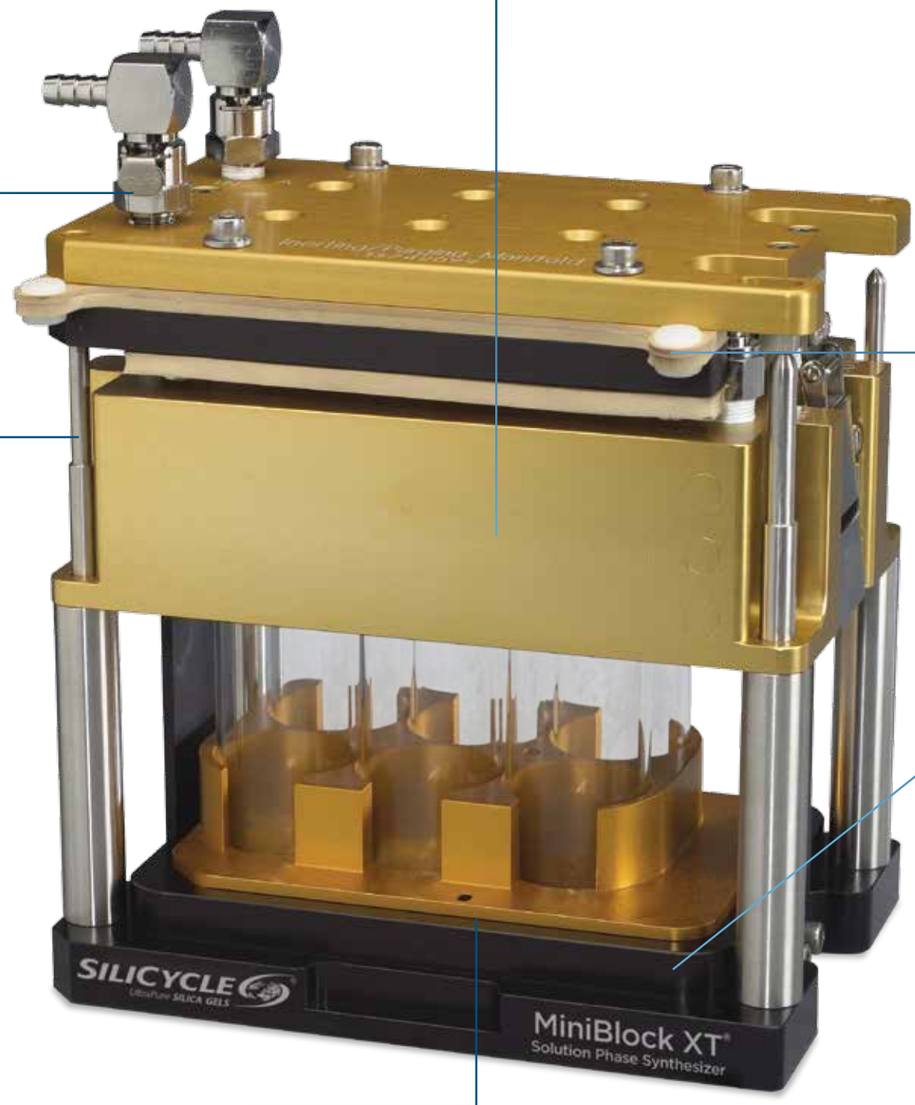
3mL
48 Vessels

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 one layer. A single septum seals vessels and allows easy access to reactions.

Precise temperature control

Controller displays temperature and regulates heating. Working temperature range: -70°C (*with ice bath*) to 160°C.

Modular racks

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

SiliCycle MiniBlock's performance has been outstanding even under the most stringent reaction conditions. Many of these require completely inert and anhydrous conditions at temperatures as low as –70°C.

Prof. Dieter Enders, Head of the Institute of Organic Chemistry, Aachen University of Technology (RWTH), Germany

Chemistry applications

Reactions*			
Acylation	Enolate Formation	Metallation	Sulfonylation
Alkylation	Grignard Reaction	Reduction	S_NAr
Biaryl Coupling	Heck Reaction	Reductive Amination	Suzuki Coupling
Stille Reaction	Heterocycle Formation	Saponification	Sonogashira

Reagents*			
Acid Chlorides	Borohydrides	LDA	TFA
Alkyl Halides	Grignard Reagents	$LiAlH_4$	Silia*Bond* Reagents
Amines	Hydroxides	Mercaptans	Silia*MetS* Metal Scavengers
Boranes	Isocyanates	*n*-BuLi	Silia*Cat* Heterogeneous Catalysts

* These are only some of the numerous possible applications that can be run with the SiliCycle MiniBlock.

Metal Scavenging Screening Using Silia*MetS*

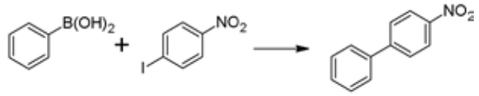
Metal scavenging screening using silica-supported Silia*MetS* Metal Scavengers

SiliCycle MiniBlock is ideal for optimizing post-reaction removal of metal residues. The SiliCycle MiniBlock enables quick screening of metal scavenging conditions using Silia*MetS* Metal Scavengers. The influence of the solvent, temperature, reaction time, number of equivalent and nature of the metal scavenger can be, quickly and efficiently, evaluated in parallel.

More information on Silia*MetS* Metal Scavengers can be found on our website at: www.SiliCycle.com/products/metal-scavengers

4 x 10 Silia*MetS* scavengers = 40 conditions evaluated at the same time, on a single station

Post-Suzuki-Miyaura coupling scavenging



Reaction conditions

- Iodoaryl (*1 eq.*)
- Boronic acid (*2 eq.*)
- $Pd(PPh_3)_4$ (*0.03 eq.*)
- Toluene
- 90 °C, 2h

Work-up conditions

- Saturated aq. $NaHCO_3$
- H_2O
- 1M HCl
- Brine
- $MgSO_4$

Residual metal content after work-up : 147 ppm

Scavenging conditions:

- 1 eq. Silia*MetS*, 4h 22°C
- 4 eq. Silia*MetS*, 4h 22°C
- 1 eq. Silia*MetS*, 4h 80°C
- 4 eq. Silia*MetS*, 4h 80°C

Metal Scavengers	1 eq. 4h 22°C	4 eq. 4h 22°C	1 eq. 4h 80°C	4 eq. 4h 80°C
Silia*MetS* DMT	89%	91%	69%	**99%**
Silia*MetS* Diamine	66%	78%	65%	**99%**
Silia*MetS* Amine	39%	42%	56%	93%
Silia*MetS* Imidazole	53%	56%	60%	97%
Silia*MetS* TAAcOH	25%	24%	33%	35%
Silia*MetS* TAAcONa	34%	34%	56%	72%
Silia*MetS* TBD	28%	29%	53%	96%
Silia*MetS* Thiol	38%	42%	51%	79%
Silia*MetS* Thiourea	60%	64%	63%	82%
Silia*MetS* Triamine	53%	57%	56%	**99%**

Solution-Phase Synthesis

Rapid analogue generation of pyran-based macrocycles

A library of 352 complex pyran-containing macrocycles was synthesized through the use of modular fragments and rapid solid-phase assisted parallel solution-phase techniques. A straightforward synthetic path featuring the use of Silia*Bond* reagents in a SiliCycle MiniBlock afforded the expected macrocycles in both high yield and purity.

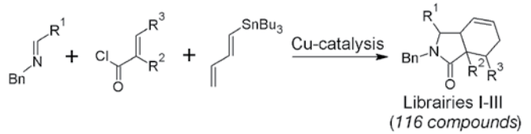
The key steps involve an amide coupling using Silia*Bond* Carbodiimide (*DCC*) followed by work-up with Silia*Bond* Carbonate and Silia*Bond* Carboxylic Acid to remove excess reagents and starting materials. An S_NAr reaction allowed closure of the macrocycle, once again followed by a purification step involving Silia*Bond* Carbonate.

Ref.: W. Comer, H. Liu, A. Joliton, A. Clabaut, C. Johnson, L.B. Akella, L. Marcaurelle, Proc. Natl. Acad. Sci. USA; **2011**, *108*, 6751-6756.

Solution-phase parallel synthesis of hexahydro-1H-isoindolone libraries

SiliCycle MiniBlock XT is extremely useful for complex, multi-step synthesis protocols where a variety of volumes and reaction conditions are needed. Several steps in the synthesis described below were run at reflux and under inert conditions. Multiple steps required different scales and a variety of reaction arrays to be used.

In this example, parallel solution-phase synthesis of a series of libraries involving the synthesis of hexahydro-1H-isoindolones was performed exploiting a novel "tactical combination" of Cu-catalyzed three-component coupling and Diels–Alder reactions. Three distinct libraries consisting of 24 members, 60 members, and 32 members were constructed. Additional sub libraries of isoindolone scaffolds were prepared initially in a one-pot/two-step process and were further diversified via Pd-catalyzed Suzuki cross-coupling reactions with boronic acids at two different diversification points.



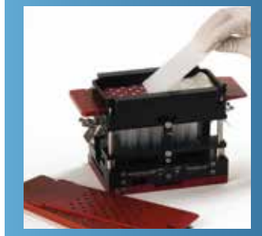
Ref. : L. Zhang, G.H. Lushington, B. Neuenswander, J.C. Hershberger, H.C. Malinakova, J. Comb. Chem. **2008**, *10*, 285-302.

Expand Your Capabilities

SiliCycle MiniBlock Accessories

Parallel Purification

SiliCycle MiniBlock is ideal for post-synthesis clean-up using Solid-Phase Extraction (*SPE*) and techniques involving scavenger resins. Applications include removal of excess reagents and reactants, scavenging of metals, and removal of catalysts.



Resin Dispensing

Resin loading is made simple with the SiliCycle MiniBlock Resin Dispenser. Pre-determined amounts of resins and powders are delivered to all the desired reaction positions in seconds, saving time and reducing errors.

Parallel Evaporation

Microtiter plate design enables compatibility with commercially available parallel evaporation systems and eliminates the need for reformatting.

SiliCycle MiniBlock XT Accessories

SiliCycle MiniBlock XT Plus

Enables heating and cooling with common laboratory recirculators for chemists who desire more elaborate temperature control. Heating or cooling liquid circulates through the XT frame and conducts to the reaction vessel rack.

Low Temperature Bath

Efficiently cool SiliCycle MiniBlocks using a solvent/dry ice mixture. Insulated ice bath maintains dry ice/acetone mixture up to four hours.

Orbital Shaking

SiliCycle MiniBlock Shaking Stations allow controlled agitation of reactions using vigorous vortex mixing. Built-in washing capability permits rapid addition and removal of solvents for resin washing steps. Heating and cooling is enabled via a recircular manifold.

Custom R&D Services

- Scavenging Screening
- Catalysis Services
- Organic Services
- Chromatography, Purification & Analytical Services
- Material Science Services
- Custom Packing Services

Other services available

Scavenging Technology (*Silica-Based*)

- Metal Scavengers
- Electrophiles
- Nucleophiles
- Potential Genotoxic Impurities (*PGI*)
- Etc.

Sample Preparation

- SPE Cartridges and Well-Plates
- Micro-SPE Tips
- QuEChERS
- Accesssories (*Vacuum Manifold, Collection Plates, etc.*)
- Etc.

Chromatography

- Irregular Silica Gels
- Spherical Silica Gels for Preparative Chromatography
- Chromatographic Phases (*C18, NH_2 ...*)
- Flash Cartridges and Accessories
- TLC Plates
- Etc.

Analytical Chromatography

- Spherical Silica Gels
- HPLC Columns and Guard Columns
- HPLC Column Distribution for Different Manufacturers
- Etc.

Heterogeneous Catalysis

- Coupling (Suzuki, Stille, Heck, Sonogashira, Kumada)
- Debenzylation
- Hydrosilylation
- Hydrogenation
- Oxydation
- Etc.

Organic Synthesis

- Amide Coupling
- Oxydation
- Reductive Amination
- Other Reagents Available

Equipments

- SiliCycle MiniBlock®
- TLC Scanner
- Vacuum Manifold
- Storage Cabinet
- Other Equipments on Our Website

Consumables

- Syringe Filters
- Membrane Filters
- Vials & Caps
- Etc.

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 state-of-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.

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