

An Innovative Solution for Large-Scale Fixed-Bed Purification

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

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

E-PAK cartridges are available in a range of various sizes and embedded sorbents (*SiliaMetS[®] Metal Scavengers*, and *Ecosorb C-Series Activated Carbons*) to accommodate the broad range of processing requirements encountered over an API development cycle.



Applications

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

Features & Benefits

- Proven cartridge design ensures rapid, simple & reliable technology
- High adsorption capacity and flow rate
- Eliminates the use of insoluble particulates in reactors
- Fixed-bed design ensuring safer handling, clean-up and disposal
- Available with *SiliaMetS* Metal Scavengers and activated carbons
- Various sizes available for easy scale-up from laboratory to industrial scale
- Large adsorbent capacity in small area footprint increases product recovery & reduces solvent requirements
- Extended flow path provides increased contact time and better adsorption performance



Adsorbent Cartridges versus Loose Media

Filtration and chromatography products converted to incorporate silica gel or activated carbon have provided handling and safety improvements for pilot scale use but done little to address the practical requirements of large-scale processing.

Silica-based Sorbents for E-PAK Cartridges

SiliCycle offers many *SiliaMetS* Scavengers, showing various affinities towards more than 30 different metals. At this time, our 2 best sellers scavengers are available in E-PAK cartridges: *SiliaMetS* Thiol and *SiliaMetS* DMT. Another very useful metal scavenger, *SiliaMetS* Diamine, will be soon available.

Metal Scavengers for E-PAK		
Metal Scavenger	Best scavenger for:	Good scavenger for:
<i>SiliaMetS</i> Thiol	Ag, Hg, Os, Pd & Ru	Cu, Ir, Pb, Rh & Sn
<i>SiliaMetS</i> DMT	Ir, Ni, Os, Pd, Pt, Rh & Ru	Cd, Co, Cu, Fe, Sc & Zn
<i>SiliaMetS</i> Diamine	Cr, Pd, Pt , W & Zn	Cd, Co, Cu, Fe, Hg, Ni, Pb, Ru , Sc & Se



E-PAK cartridges are also offered with our *SiliaFlash[®] F60* irregular silica gel.

Chemical Compatibility

E-PAK cartridges are formed using a proprietary technology and chemically stable materials in common organic solvents. They have been tested and found satisfactory for use with the following usual solvents:

- dichloromethane,
- dimethylformamide,
- ethyl acetate,
- n-ethyl-2-pyrrolidone,
- isopropanol & mixture with water,
- methanol,
- MTBE,
- water.

E-PAK cartridges are suitable for operation at pH of 1 to 14 for activated carbon, and 2 to 10 for silica-based sorbents.

Cartridge Housings

Lab Scale

- Various housing length available
- Operated with standard pump
- Typical pressure rating for housing 150 psi
- Easy housing conversion for all lengths by simply changing the bowl



Pilot & Commercial Scale

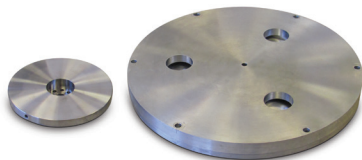
A series of semi-custom fabricated cartridge housings for operation of 1 to 12 cartridges are available.

- Made in stainless steel or Hastelloy
- Code stamped ASME or CE
- Pressure rating: 150 psi
- 1, 3, 7, 12-round versions
- Can be operated in parallel to process batch sizes of $\geq 10,000$ L
- Adapter kits available for lenticular cartridge filter housings conversion

Housing options: ASME or PED pressure rated/stamped, conductive casters, Kalrez® gaskets, type and size of inlet & outlet, connections - wetted and non wetted surface finish.

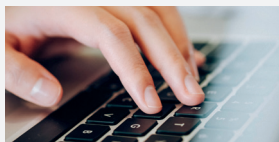


Adapter Kits



We offer conversion kits that allow E-PAK cartridges to be operated in existing lenticular cartridge housings. Adapter kits are available to convert 8", 12" and 16" housings for use with E-PAK Pilot and Commercial cartridges.

Installation is as simple as removing the old tie rod and bolting down the new adapter base plate. Adapter kits are available in 316LSS and Hastelloy® 276 with a 20 Ra surface finish.



Learn more about E-PAK

- Visit www.silicycle.com/epak
- Contact us: scavengers@silicycle.com

Portfolio

Lab Scale

Lab scale cartridges are designed to facilitate the evaluations of small samples. Testing with loose media can be done with samples as small as a few milliliters and are normally done in advance of cartridge testing to identify the formula with the highest capacity to remove contaminants with the highest recovery.

Lab Scale Cartridges			
Sorbent	Active Adsorbent	Available Sizes	Media Weight
Silica	SiliaFlash F60 Irregular Silica Gel	5 cm Diameter • 1 cm High • 10 cm High • 25 cm High	1 cm: 8 g 10 cm: 75 g 25 cm: 200 g
Thiol	SiliaMetS Thiol Silica-Based		
DMT	SiliaMetS DMT Silica-Based		
Diamine	SiliaMetS Diamine Silica-Based		1 cm: 5 g 10 cm: 50 g 25 cm: 125 g
Carbon	Carbon-Wood Acid Activated (3 grades)		



Pilot Scale

E-PAK pilot scale cartridges provide rapid processing for volumes from 10 to hundreds of liters, and can establish the parameters upon moving to larger scales, since E-PAK achieve true linear scalability.

Pilot Scale Cartridges			
Sorbent	Active Adsorbent	Available Sizes	Media Weight
Silica	SiliaFlash F60 Irregular Silica Gel	16.5 cm Diameter • 12.5 cm High • 25 cm High	12.5 cm: 875 g 25 cm: 1.75 kg
Thiol	SiliaMetS Thiol Silica-Based		
DMT	SiliaMetS DMT Silica-Based		
Diamine	SiliaMetS Diamine Silica-Based		12.5 cm: 850 g 25 cm: 1.7 kg
Carbon	Carbon-Wood Acid Activated (3 grades)		



Both Pilot and Commercial cartridges are provided with a Code 8 (closed top & open bottom end caps-bottom with double 2-222 Teflon® encapsulated Viton® o-ring) cartridge sealing configuration.

Commercial Scale

E-PAK cartridges provide rapid processing for manufacturing operations needing to process batch sizes of > 10,000 liters or can be adapted for continuous operation using a duplex design.

For applications where precious metal catalyst recovery is an important consideration, E-PAK cartridges can be thoroughly flushed with a low volume of solvent followed by water and a final blow down with nitrogen. All carbon-based E-PAK cartridges are low-ash residue material, therefore suitable for precious metal recoverings

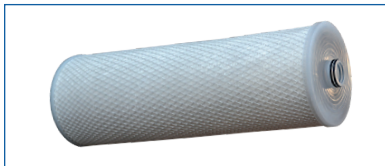
Commercial Scale Cartridges			
Sorbent	Active Adsorbent	Available Sizes	Media Weight
Silica	SiliaFlash F60 Irregular Silica Gel	16.5 cm Diameter • 50 cm High • 100 cm High	50 cm: 3.5 kg 100 cm: 7 kg
Thiol	SiliaMetS Thiol Silica-Based		
DMT	SiliaMetS DMT Silica-Based		
Diamine	SiliaMetS Diamine Silica-Based		50 cm: 3.4 kg 100 cm: 6.8 kg
Carbon	Carbon-Wood Acid Activated (3 grades)		



To meet commercial processing requirements, E-PAK cartridges can be operated in parallel for increased capacity.

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

E-PAK® : FLOW CARTRIDGES FOR METAL REMOVAL NEW



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

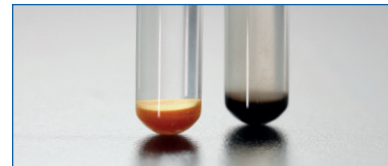
METAL & ORGANIC SCAVENGING



Removal of:

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

CATALYSIS & SYNTHESIS



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

SAMPLE PREPARATION



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

HIGH PRESSURE CHROMATOGRAPHY



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

LOW PRESSURE CHROMATOGRAPHY



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

EXTRACTION & PURIFICATION NEW



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

R&D SERVICES



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



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