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Abel Industries® QuEChERS

QuEChERS – a Simplified Method of Sample Preparation for Pesticide Analysis

In 2003, M Anastassisdes developed a simple way to prepare food samples for pesticide analysis. It's called QuEChERS (pronounced as "Catchers"), an acronym for Quick, Easy, Cheap, Effective, Rugged and Safe. With QuEChERS, you could prepare your samples in multi-class, multi-residue pesticide analysis while saving time and money.

Why ABEL QuEChERS?

- Saving time and money for your sample preparation
- High quality, best reproducibility
- Lowest contamination
- Lower cost as compared to other brands

How QuEChERS works?

QuEChERS extraction method is designed for multi-residue pesticide analysis of fruits and vegetables with high water content (80%-95%). Some compounds will interfere the detection of target pesticide, such as chlorophyll, fatty acid, pigment, which could be removed by QuEChERS.

Abel Industries® QuEChERS

2003 Anastassiades,Lehotay,etal	2007 Lehotay	2008 Anastassisdes
Original	**AOAC 2007.01**	**CEN 15662**
10g Subsample ↓ 10mL ACN 4g anh.$MgSO_4$ +1g NaCl ↓ Shake ↓ Centrifuge 150mg/mL $MgS0_4$ +25mg/mL PSA ↓ Shake and Centrifuge	15g Subsample ↓ 15mL ACN with 1%HOAC 6g anh.$MgSO_4$ +1.5g anh.NaOAC ↓ Shake ↓ Centrifuge 150mg/mL $MgS0_4$ +50mg/mL PSA ↓ Shake and Centrifuge	10g Subsample ↓ 10mL ACN ↓ Shake 4g anh.$MgSO_4$ +1g $Na3Cit.2H_2O$ +0.5g $Na2Cit.5H_2O$ ↓ Shake ↓ Centrifuge 150mg/mL $MgS0_4$ +25mg/mL PSA ↓ Shake and Centrifuge

Some QuEChERS methods add buffers during the extraction step. Two most common methods are the European Committee for Standardization (CEN 15662) method which applies citrate buffer for extraction and the Association of Analytical Communities (AOAC 2007.01) method using acetic acid buffer.

For low-water content fruits and vegetables, additional water needs to be added to optimize the extraction. For high-fatty content fruits and vegetables, C18E should be added to remove it. For high-pigment content fruits and vegetables, graphicarb should be added.

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ABEL QuECHERS Workflow

Step 1: Extraction

Transfer homogenized sample (10g or 15g) to 50ml tube, then add extraction solvent and salt, shake for one minute, centrifuge > 1500rcf for 1 minute.

ABEL QuEChERS Extraction Kits:

- 50ml tubes
- Pre-packaged $MgSO_4$, NaCl or other salts

ABEL QuEChERS Extraction Bags Ordering Information (without 50ml tubes)

	Part Numbers	Pack Size	$MgSO_4$	Na Acetate	Na Citrate	Na Citrate Sesquihtdrate	NaCl
AOAC QuEChERS Extraction Bags for 15 g samples	ABEL-QE-01	100	6 g	1.5 g			
EN QuEChERS Extraction Bags for 10 g Samples	ABEL-QE-02	100	4 g		1 g	0.5 g	1 g
Original QuEChERS Extraction Bags 10 g Samples	ABEL-QE-03		4 g				1 g

Step 2: Clean up

Choose right clean up tube, transfer the extracted sample in Step 1 to clean up tube, shake for 30 seconds, then centrifuge > 1500 rcf for 1 minute.

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ABEL QuEChERS Clean-up Tubes Ordering Information

	Part Numbers	Tubes	Pack Size	$MgSO_4$	PSA	C18E	GCB
AOAC Method fruits and vegetables	ABEL-QC-1102	2 mL	100	150 mg	50 mg	–	–
	ABEL-QC-1115	15 mL	50	1200 mg	400 mg		
EN Method fruits and vegetables	ABEL-QC-2102	2 mL	100	150 mg	25 mg	–	–
	ABEL-QC-2115	15 mL	50	900 mg	150 mg		
AOAC Method Waxy or fatty fruits and vegetables	ABEL-QC-1202	2 mL	100	150 mg	50 mg	50 mg	–
	ABEL-QC-1215	15 mL	50	1200 mg	400 mg	400 mg	
EN Method Waxy or fatty fruits and vegetables	ABEL-QC-2202	2 mL	100	150 mg	25 mg	25 mg	–
	ABEL-QC-2215	15 mL	50	900 mg	150 mg	150 mg	–
AOAC Method Pigment content fruits and vegetables	ABEL-QC-1302	2 mL	100	150 mg	50 mg	–	50 mg
	ABEL-QC-1315	15 mL	50	1200 mg	400 mg	–	400 mg
AOAC Method Pigment content fruits and vegetables	ABEL-QC-2302	2 mL	100	150 mg	25 mg	–	2.5 mg
	ABEL-QC-2315	15 mL	50	900 mg	150 mg	–	15 mg
AOAC Method High pigment and fatty content fruits and vegetables	ABEL-QC-1402	2 mL	100	150 mg	50 mg	50 mg	50 mg
	ABEL-QC-1415	15 mL	50	1200 mg	400 mg	400 mg	400 mg
EN Method High pigment content fruits and vegetables	ABEL-QC-2402	2 mL	100	150 mg	25 mg		7.5 mg
	ABEL-QC-2415	15 mL	50	900 mg	150 mg		45 mg

What are these sorbents used for?

$MgSO_4$	Remove H_2O in the matrix
PSA	Adsorb the carbohydrate, fatty acid, organic acid and some pigment in the matrix
C18E	Remove non-polar compounds in the matrix
GCB	Remove pigment, sterol in the matrix

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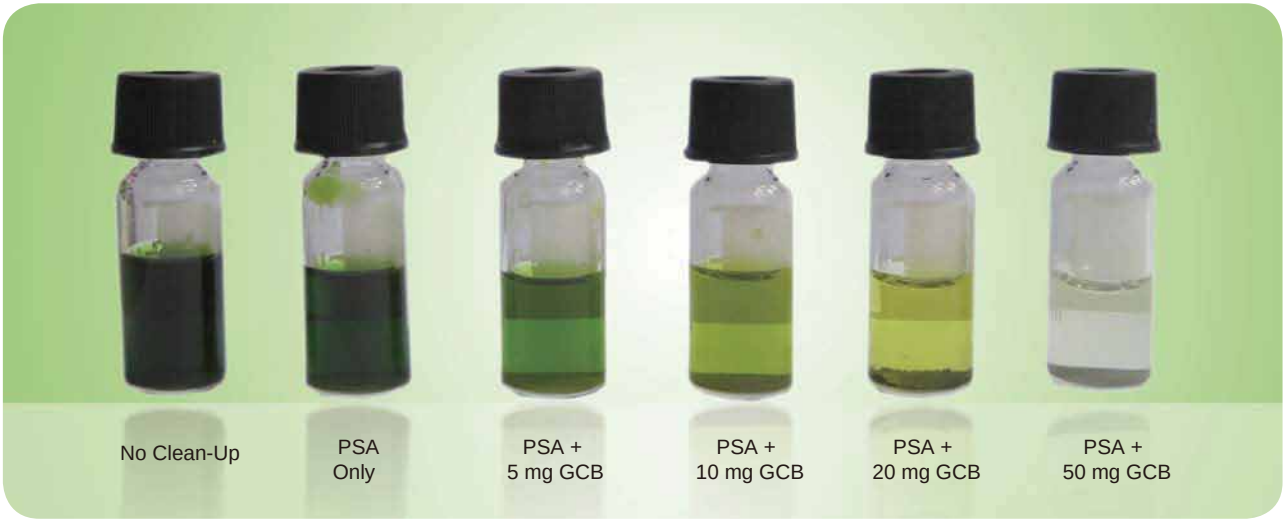
Bulk Sorbents

	Sorbent Name	Part Number	Unit	Packing Size
	PSA	ABEL-S46PS-0100	g	100
	NH_2	ABEL-S46NH-0100	g	100
	C18E	ABEL-S4618E-0100	g	100
	GCB	ABEL-G01-0100	g	100
	Sorbent Name	**Part Number**	**Specification**	**Packing Size**
	PSA	ABEL-S46PS-0302	200 mg/3 mL	50
		ABEL-S46PS-0605	500 mg/6 mL	30
	NH_2	ABEL-S46NH-0302	200 mg/3 mL	50
		ABEL-S46NH-0605	500 mg/6 mL	30
	C18E	ABEL-S4618E-0303	200 mg/3 mL	50
		ABEL-S4618E-0605	500 mg/6 mL	30
	GCB	ABEL-G01-0302	200 mg/3 mL	50
		ABEL-G01-0605	500 mg/6 mL	30
	Carb/NH_2	ABEL-GN01-0605	250 mg/250 mg, 3 mL	50
		ABEL-G0N1-0610	500 mg/500 mg, 6 mL	30

Abel Industries® QuEChERS

the Clean-up result from Spinage using different content of Abel GraphiCarb



Application: the analysis of multi-residue pesticide in apple using Abel QuEChERS Kit

Extraction

1. Transfer homogenized sample (10g or 15g) to 50ml tube
2. Add 15ml CAN with 1% HOAC
3. Add internal standard
4. Shake for 1 min
5. Add ABEL-QE-02 extraction salt into tube
6. Shake for 1 min
7. Centrifuge > 4000rpm for 5 min
8. Get the above liquid

Clean up

1. Add 1 ml above liquid sample into ABEL-QC-1102 clean up tube, shake for 1 min
2. Add 8 ml above liquid sample into ABEL-QC-1115 clean up tube, shake for 1 min
3. Centrifuge > 13000rpm for 2 min
4. Get the above liquid for injection

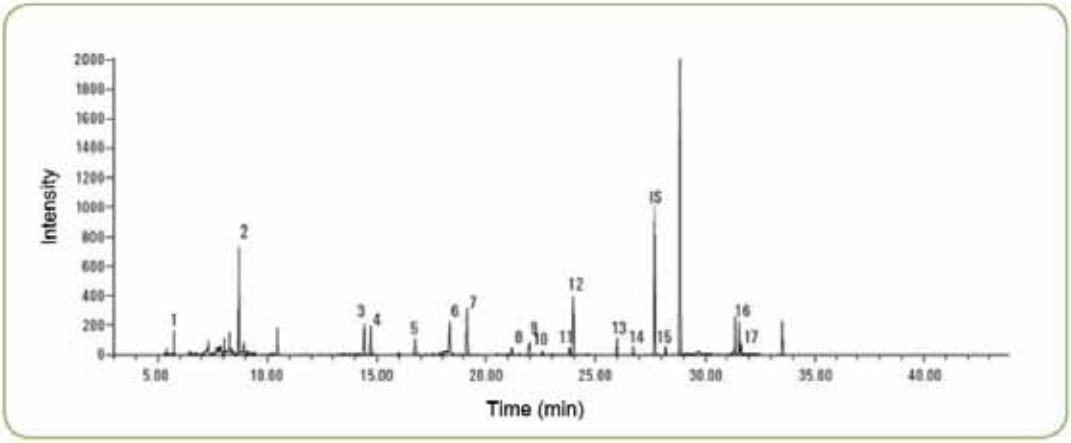
Abel Industries® QuEChERS

GC Method

Autosampler: Agilent 7683 AS
Column: Agilent J&W HP-5ms GC Column,30 m*0.25 mm, 0.25um
Gas: He
Temp: 70℃(2min),25℃/min to 150℃(0min),3℃/min to 200℃(0min),8℃/min to 280℃
Volume: 1.0ul

Mass Method

Mode: SIM
Source: Quadrupole
Interface Temp: 230℃, 150℃ and 280℃

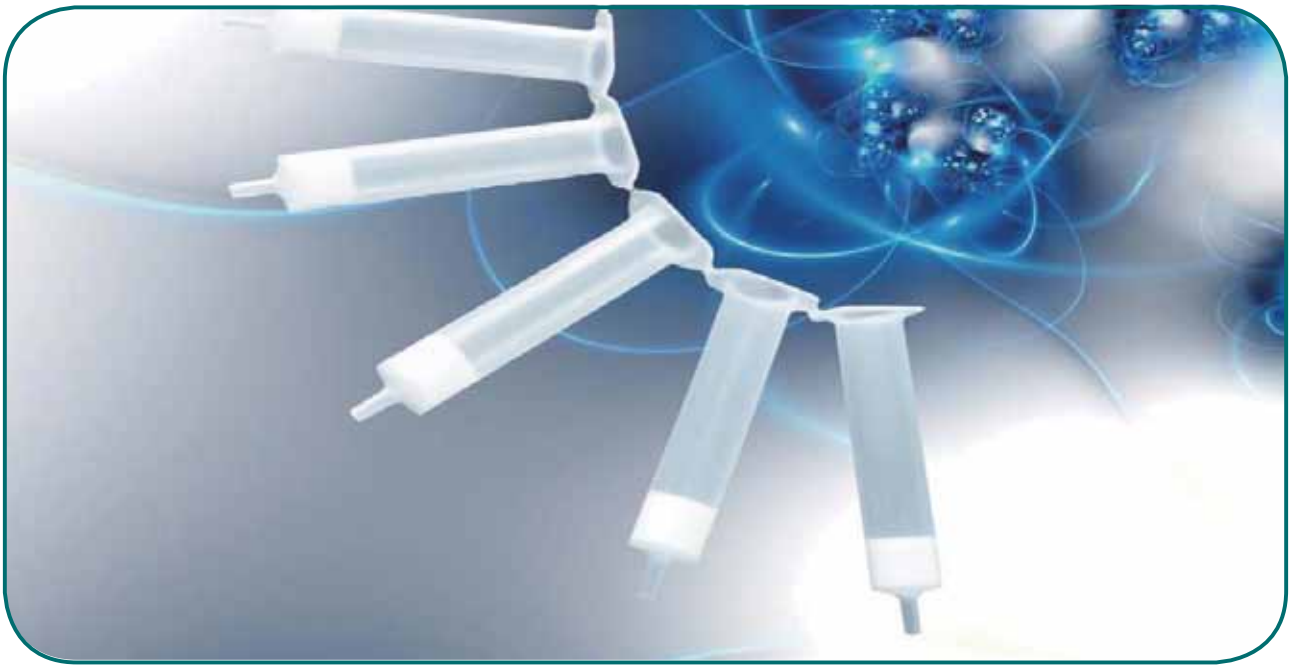


Abel Industries® QuEChERS

Results

	10 ng/g		50 ng/g		200 ng/g	
Target	Recovery	RSD(n=6)	Recovery	RSD(n=6)	Recovery	RSD(n=6)
Dichlorvos	86.8	7.0	83.9	11.6	81.5	5.5
2-Phenyl phenol	113.4	6.3	96.3	6.5	100.5	3.6
Diazinon	98.6	2.3	87.3	2.8	90.4	4.9
Chlorothalonil	86.1	10.0	84.4	2.9	93.2	7.6
Carbaryl	96.1	9.0	93.8	8.3	99.1	8.2
Dichlofluanid	90.0	7.0	84.6	2.9	94.6	5.0
Dichloroaceto-phenone	97.8	7.5	95.5	6.2	104.5	4.5
N-(trichloromethy-lthio)phthalimide	–	–	74.4	9.3	94.6	10.3
γ- Chlordane	9.6	4.7	88.8	4.6	95.3	3.4
Endosulfan	69.8	9.2	91.3	5.4	96.2	5.4
Dieldrin	90.5	10.3	86.6	3.4	92.8	4.8
DDE	84.0	4.8	89.4	3.8	95.4	4.5
Ethion	90.9	1.8	103.5	2.8	113.4	6.2
Endosulfan sulfate	79.8	1.9	80.4	4.6	86.9	5.5
Endrin Ketone Standard	85.2	10.4	80.7	4.3	92.7	4.5
Permethrin	87.9	2.7	93.8	2.0	94.0	4.6
Coumaphos	87.8	5.1	88.2	3.3	92.3	6.5

Solid Phase Extraction (SPE) Products



Solid Phase Extraction Cartridge

Sample preparation is one of the most important key steps for the entire analysis process as over 60% of the entire analysis process time and over 30% of the analysis errors are from the sample preparation. Over the last twenty years, SPE has become the most powerful technique prior to analytical chromatography for the cleanup, purification, and concentration of samples from various matrices, including urine, blood, water, beverages, soil, and animal tissue. Solid phase extraction is a form of digital (step-wise) chromatography designed to extract, partition, and/or adsorb one or more components from a liquid phase (sample) onto stationary phase (sorbent or resin). SPE extends a chromatographic system's lifetime, improves qualitative and quantitative analysis, and by changing an analyte of interest original matrix environment to a simpler matrix more suitable for subsequent analysis, the demand placed on an analytical instrument is considerably lessened.

Use SPE for Samples that:

- Contain particulate matter causing system clogging and high back-pressure
- Contain components that cause high background, misleading peaks, and/or poor sensitivity
- Require cleanup, trace enrichment/concentration, or purification
- Require sample matrix or solvent exchange

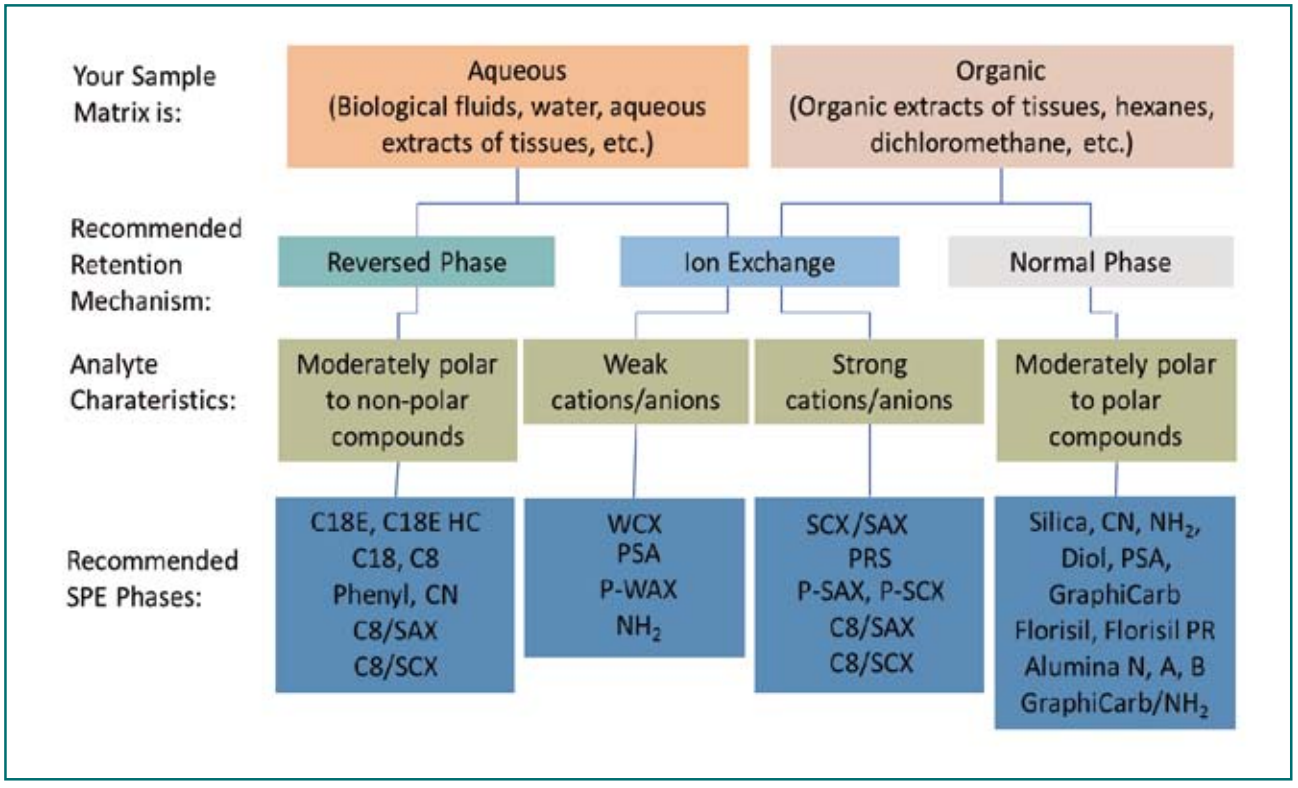
Benefits of SPE:

- Switch sample matrices to a form more compatible with chromatographic analyses
- Concentrate analytes for increased sensitivity
- Remove interferences to simplify chromatography and improve quantitation
- Protect the analytical column from contaminants

Common SPE Applications:

- Pharmaceutical compounds and metabolites in biological fluids
- Drugs of abuse in biological fluids
- Environmental pollutants in drinking and wastewater
- Pesticides and antibiotics in food/agricultural matrices
- Desalting of proteins and peptides
- Fractionation of lipids
- Water and fat soluble vitamins

ABEL SPE Selection Guide



Base Material	Phase	Category	Bonded Functional Group	Endcapped	Carbon Loading (%)	Surface Area (m^2/g)	Particle Size (μm)	Pore Size (A)
Silica-Based	C18E	Non-polar	C18	Yes	17	480	45	60
	C18E HC	Non-polar	C18	Yes	25	480	45	60
	C18	Non-polar	C18	No	24	480	45	60
	C8	Non-polar/polar	C8	Yes	9	480	45	60
	Phenyl	Polar/Non-polar	Phenyl	Yes	7	480	45	60
	CN	Polar	CN	No	7	480	45	60
	Diol	Polar	Diol	No	7	480	45	60
	NH_2	Polar	Aminopropyl	No	7	480	45	60
	PSA	Polar/Weak anion exchange	Ethylenediamine-n-propyl	No	8	480	45	60
	Silica	Polar	Silica	N/A	N/A	480	45	60
	SAX	Polar/Anion exchange	Trimethylaminopropyl	No	8	480	45	60
	SCX	Cation exchange	Benzenesulfonic acid	No	11	480	45	60
	WCX	Weak cation exchange	Carboxylic acid	Yes	7	480	45	60
	PRS	Cation exchange	Propylsulfonic acid	No	2	480	45	60
Non-silica Inorganic-based	Florisil	Polar	Florisil	N/A	N/A		75-150	N/A
	Florisil PR	Polar	Florisil/Na_2SO_4	N/A	N/A		150-250	N/A
	Alumina-A	Alumina acidic		N/A	N/A		50-200	N/A
	Alumina-B	Alumina basic		N/A	N/A		50-200	N/A
	Alumina-N	Alumina neutral		N/A	N/A		50-200	N/A
	Celite	Polar		N/A	N/A		75-100	N/A
Polymer-Based	BRP	non-polar/Polar		N/A	N/A	850	45	N/A
	P-SAX	Anion exchange /Polar	SAX functionalized	N/A	N/A	850	45	80
	P-SCX	Cation exchange/ Polar/	SCX functionalized	N/A	N/A	850	45	80
	P-WAX	Weak cation exchange/ Polar	WAX functionalized	N/A	N/A	850	45	80
	PS/DVB	Polar/non-polar		N/A	N/A	850	45	80
Specialty and Mixed Mode	GraphiCarb	Strongly non-polar/Anion exchange	Graphitized carbon	N/A	N/A	100	120-400	N/A
	GraphiCarb/NH_2	Non-polar/ Polar/ Anion exchange	Graphitized carbon/ aminopropyl	No	N/A	480	45	60
	C8/SCX	Non-polar/ Cation exchange	C8/SCX	No	N/A	480	45	60
	C8/SAX	Non-polar/ Anion exchange	C8/SAX	No	N/A	480	45	60

1) Silica-Based SPE:

Abel Industries® SPE silica products are based on high-quality high-purity amorphous silica with the average particle size of 45μm, the average pore size of 60, the pore volume of 0.80 cm^3/g, and the specisurface area of 480 m^2/g. Abel's unique surface treatment technology and bonding chemistry on SPE silica, to ensure high extraction efficiency of the analytes. Silica-based Abel SPE phases include C18E (endcapped), C18E HC (endcapped), C18 (not endcapped), C8, CN, NH_2, PSA (diamine), Phenyl, SCX, SAX, WCX, PRS (sulfonic acid), Silica, Diol, and other 13 kinds of packing.

2) Non-Silica Inorganic SPE:

Non-silica inorganic Abel Industries® SPE sorbents include six normal phase adsorbents: Florisil, Florisil PR, Alumina-N (neutral alumina), Alumina-A (acidic alumina), Alumina-B (basic alumina) and Celite. They have different polarity and basicity, and provide different selectivity and adsorption than normal phase silica gel for the cleanup and analysis of complex matrix samples.

3) Polymeric SPE:

Polymeric SPE have been in rising trend year by year. Abel Industries® polymer–based SPE is made from monodisperse polymer beads, and currently includes five different sorbents to meet your needs: BRP, P-SCX, P-SAX, PS/DVB, and P-WAX. Polymeric Abel SPE sorbents have the following advantages over silica sorbents:

- A wide pH range (0-14); suitable for most organic solvents
- No active surface silanols; no loss of basic compounds due to the secondary adsorption
- High binding capacity, high recovery rate, and better consistence
- Low the detection limit, good for trace amount analysis;
- No hydrolysis of the bonded phase like silica substrate; no contamination
- Spherical particles and narrow particle size distribution, to ensure reproducibility of results
- Easy to use; if accidently dried in the process, the cartridge is still usable, and there is no risk of losing the analyte or the result
- Superior retention with a wide pH range for a wide pKa range of compounds

1. Abel Industries® Silica Based SPE

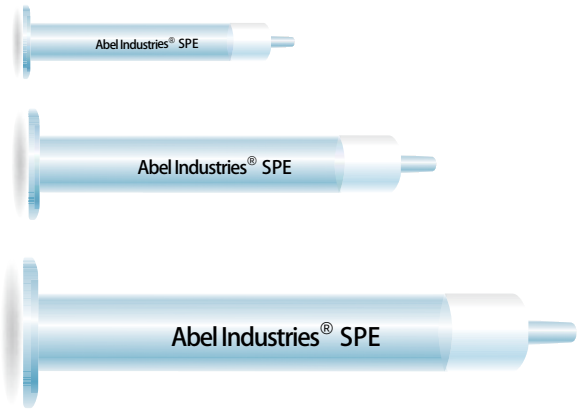
Abel Industries® C18E

- Extremely retentive for non-polar compounds
- Effective for desalting aqueous mixtures
- The most popular SPE C18 sorbent
- The least selective phase: retain most organic analytes from aqueous matrices
- Benecial for extracting numerous analytes diverse in structure from the same sample
- Typical applications include herbicides, fungicides, pesticides and other aqueous hazardous waste materials

Abel Industries® C18E ordering information

Specification	Packing (pcs /bag)	Part No.
100mg/1ml	100	ABEL-S4618E-0101
100mg/3ml	50	ABEL-S4618E-0301
150mg/3ml	50	ABEL-S4618E-0315
200mg/3ml	50	ABEL-S4618E-0302
500mg/3ml	50	ABEL-S4618E-0305
500mg/6ml	30	ABEL-S4618E-0605
1000mg/6ml	30	ABEL-S4618E-0610
2g/10ml	20	ABEL-S4618E-1020
10g / bottle		ABEL-S4618E-0010
100g / bottle		ABEL-S4618E-0100

Abel C18E (endcapped C18) is very hydrophobic and the most popular SPE sorbent in Abel SPE products because of its extreme retentive nature for non-polar compounds. C18 is generally regarded as having the broadest spectrum of retention among bonded silica sorbents, since it retains most organic analytes from aqueous matrices. When analyzing small to intermediate molecules, Abel C18E can be used for desalting aqueous matrices prior to ion exchange, as salts pass through the sorbent unretained. Because of its strong binding ability, it has less selectivity for non-polar organic compounds, so it is often used for separation of compounds with big difference in structure and polarity.



Abel Industries® C18E HC

- The most retentive for non-polar compounds in Abel SPE C18
- Use for organic compounds which typically couldn´t be retained by other C18
- The most hydrophobic, bonded silica sorbent; 25% carbon loading

Abel Industries® C18E HC ordering information

Specification	Packing (pcs /bag)	Part No.
100mg/1ml	100	ABEL-S4618EH-0101
100mg/3ml	50	ABEL-S4618EH-0301
150mg/3ml	50	ABEL-S4618EH-0315
200mg/3ml	50	ABEL-S4618EH-0302
500mg/3ml	50	ABEL-S4618EH-0305
500mg/6ml	30	ABEL-S4618EH-0605
1000mg/6ml	30	ABEL-S4618EH-0610
2g/10ml	20	ABEL-S4618EH-1020
10g / bottle		ABEL-S4618EH-0010
100g / bottle		ABEL-S4618EH-0100

Abel C18E HC is the most hydrophobic, bonded silica sorbent. It is similar to Abel C18E, but contains even higher carbon content, up to 25% carbon. Such high carbon loading helps to further enhance the retention of very polar compounds that typically couldn´t be retained by other SPE C18.

Abel Industries® C18

- Very retentive for non-polar compounds
- Silanol activity permits metabolite fractionation
- Enhanced retention for polar and basic compounds

Abel C18 is a non-endcapped version of Abel C18E HC, leaving more active residual surface silanols that provide additional polar-polar interactions, permit the fractionation of metabolites, and enhance retention of polar and basic compounds compared to an endcapped C18. Its performance is equivalent to BondElute C18 OH.

Abel Industries® C18 ordering information

Specification	Packing (pcs /bag)	Part No.
100mg/1ml	100	ABEL-S4618-0101
200mg/3ml	50	ABEL-S4618-0302
500mg/3ml	50	ABEL-S4618-0305
200mg/6ml	30	ABEL-S4618-0602
500mg/6ml	30	ABEL-S4618-0605
1000mg/6ml	30	ABEL-S4618-0610
2g/10ml	20	ABEL-S4618-1020
10g / bottle		ABEL-S4618-0010
100g / bottle		ABEL-S4618-0100

Abel Industries® C8

- Excellent for strong retained non-polar compounds
- Less retentive than C18
- Some polar interaction, but not significant
- Used to elute very large hydrophobic molecules too strongly retained on Abel C18E
- Use this less retentive phase for the rapid release of hydrophobic molecules using weaker organic

Abel C8 has a very similar property to C18, but is less retentive for non-polar compounds due to its shorter carbon chain. At the same time, the analytes access more to C8 silica surface silanols than to C18. Therefore, C8 have more polar interaction for polar compounds than C18, but not significant. Abel C8 is a good replacement when the analyte is irreversibly retained on C18. Experiments show that C8 adsorbent can extract both fat-soluble and water-soluble vitamins in human blood.

Abel Industries® C8 ordering information

Specification	Packing (pcs /bag)	Part No.
100mg/1ml	100	ABEL-S4608-0101
200mg/3ml	50	ABEL-S4608-0302
500mg/3ml	50	ABEL-S4608-0305
500mg/6ml	30	ABEL-S4608-0605
1000mg/6ml	30	ABEL-S4608-0610
2g/10ml	20	ABEL-S4608-1020
10g / bottle		ABEL-S4608-0010
100g / bottle		ABEL-S4608-0100

Abel Industries® Phenyl

- Similar polarity to C8
- Additional polar secondary π-π interactions enhanced retention of aromatic compounds
- Different selectivity compared with the C18 and C8 phases when both aromatic and non-aromatic compounds are being extracted

Abel Phenyl is commonly used to extract non-polar compounds. Its polarity is similar to C8, but because of unique aromatic π-π polar interaction, conjugated compounds have strong retention. Abel Phenyl has the best selectivity for a mixture of aromatic compounds and non-aromatic compounds.

Abel Industries® Phenyl ordering information

Specification	Packing (pcs /bag)	Part No.
100mg/1ml	100	ABEL-S46PH-0101
200mg/3ml	50	ABEL-S46PH-0302
500mg/3ml	50	ABEL-S46PH-0305
500mg/6ml	30	ABEL-S46PH-0605
1000mg/6ml	30	ABEL-S46PH-0610
10g / bottle		ABEL-S46PH-0010
100g / bottle		ABEL-S46PH-0100

Abel Industries® Silica

- Unbonded acid washed high purity silica, ideal for normal-phase SPE and other modified flash techniques
- Considered the most polar normal-phase sorbent available
- Highly polar sorbent to retain polar compounds from non-polar matrices
- Separating compounds with very similar structure

Abel Silica is generally regarded as the most polar SPE sorbent available. Its retention is mainly due to hydrogen bonds. Abel Silica is particularly effective at separating compounds with a very similar structure. It also exhibits a character of weak acids; at the mid pH conditions, silica surface silanols can be ionized.

Abel Industries® Silica ordering information

Specification	Packing (pcs /bag)	Part No.
100mg/1ml	100	ABEL-S46Si-0101
200mg/3ml	50	ABEL-S46Si-0302
500mg/3ml	50	ABEL-S46Si-0305
500mg/6ml	30	ABEL-S46Si-0605
1000mg/6ml	30	ABEL-S46Si-0610
10g / bottle		ABEL-S46Si-0010
100g / bottle		ABEL-S46Si-0100

Abel Industries® CN

- Endcapped cyanopropyl (7% C)
- Ideal for extracting aqueous analytes
- Retention in aqueous and organic matrices
- Behave as either reversed-phase or normal-phase
- Ideal for very hydrophobic analytes that may be irreversibly retained on more hydrophobic sorbents such as Abel C18E
- Less retentive than Abel Si or Abel Diol when used as normal-phase (organic matrices such as hexane or oils)

Abel CN is a cyano bonded polar phase, and can be used in either normal phase or reversed phase mode for polar and non-polar compounds. In the normal phase mode, it is the least to retain polar adsorbent; in reversed phase mode, it is also the least to retain non-polar adsorbent. It can be used as a non-polar sorbent for extraction of both polar and non-polar molecules from aqueous samples, and for extraction of polar molecules from relatively non-polar solvents. It is ideal for applications in which extremely non-polar compounds would be irreversibly retained on high carbon load sorbents such as C8 and C18.

Abel Industries® CN ordering information

Specification	Packing (pcs /bag)	Part No.
100mg/1ml	100	ABEL-S46CN-0101
200mg/3ml	50	ABEL-S46CN-0302
500mg/3ml	50	ABEL-S46CN-0305
500mg/6ml	30	ABEL-S46CN-0605
1000mg/6ml	30	ABEL-S46CN-0610
10g / bottle		ABEL-S46CN-0010
100g / bottle		ABEL-S46CN-0100

Abel Industries® NH_2

- Normal phase or anion exchange sorbent
- Weaker anion exchange than SAX
- Amenable to separating structural isomers
- Allows the rapid release of very strong anions such as sulfonic acids that may be retained irreversibly on SAX (a quarternary amine sorbent that is always positively charged)

Abel NH_2 is anaminopropyl bonded sorbent for polar compounds. This dual purpose sorbent can act either as a polar phase or weak anion exchanger. When using non-polar solvent such as n-hexane as eluting solvent, it can be used for compounds containing-OH,-NH or-SH group by hydrogen bonding. Because of its pKa value of 9.8, in an aqueous environment with pH 7.8 or less, it can function as a weak anion exchanger. Similar to Diol and Silica sorbents, Abel NH_2 is excellent for the separation of structural isomers.

Abel Industries® NH_2 ordering information

Specification	Packing (pcs /bag)	Part No.
100mg/1ml	100	ABEL-S46NH-0101
200mg/3ml	50	ABEL-S46NH-0302
500mg/3ml	50	ABEL-S46NH-0305
500mg/6ml	30	ABEL-S46NH-0605
1000mg/6ml	30	ABEL-S46NH-0610
10g / bottle		ABEL-S46NH-0010
100g / bottle		ABEL-S46NH-0100

Abel Industries® PSA

- Alternative choice to Abel NH_2 for polar compounds
- Higher ionic capacity than Abel NH_2
- Chelating sorbent

Abel PSA is an ethylene diamine-N-propyl bonded sorbent, and is similar to Abel NH_2. In reversed phase condition, its polarity is between C18 and silica. It has excellent selectivity for a broad range of polar and medium-polar compounds. It is also can be used as a weak anion exchange cartridge. Abel PSA has two amino groups (pKa values of 10.1 and 10.9), providing a higher ion exchange capacity. Abel PSA can effectively remove fatty acids in the pesticide residues in food (including oleic acid, palmitic acid, linoleic acid, etc.), organic acids, some polar pigments, sugars, and other matrices. It can also be used as a metal ion chelating agent by two amino groups.

Abel Industries® PSA ordering information

Specification	Packing (pcs /bag)	Part No.
100mg/1ml	100	ABEL-S46PS-0101
200mg/3ml	50	ABEL-S46PS-0302
500mg/3ml	50	ABEL-S46PS-0305
500mg/6ml	30	ABEL-S46PS-0605
1000mg/6ml	30	ABEL-S46PS-0610
10g / bottle		ABEL-S46PS-0010
100g / bottle		ABEL-S46PS-0100

Abel Industries® Diol

- Polymerically bonded, 2,3-Dihydroxypropoxypropyl (7% C)
- Provides polar and non-polar modes
- Strong hydrogen bonding with analytes
- Resembles Abel Silica in its capabilities

Abel Diol is a silica-based polar SPE adsorbent bonded with two hydroxyl groups for polar compounds. Depending on the cartridge preparation and sample matrix, this polar bonded sorbent can exhibit both polar and weak non-polar interactions, It is more frequently used to extract polar molecules from relatively non-polar solvents using hydrogen bonding interactions. With appropriate cartridge conditioning, it can be used as a non-polar sorbent to extract relatively non-polar molecules from aqueous samples. It could differentiate among isomers and other structurally similar compounds. It is a better choice than Abel Silica when used as an absorbent to extract polar compounds in a polar solvent.

Abel Industries® Diol ordering information

Specification	Packing (pcs/bag)	Part No.
100mg/1ml	100	ABEL-S46Di-0101
200mg/3ml	50	ABEL-S46Di-0302
500mg/3ml	50	ABEL-S46Di-0305
500mg/6ml	30	ABEL-S46Di-0605
1000mg/6ml	30	ABEL-S46Di-0610
10g/bottle		ABEL-S46Di-0010
100g/bottle		ABEL-S46Di-0100

Abel Industries® SCX

- A polymerically bonded, benzene sulfonic acid phase with a H+ counter ion
- Very low pKa ligand elicits strong analyte interaction
- Useful for compounds with cationic and non-polar characteristics
- Superior cleanup a single sorbent

Abel SCX is a strong cation exchanger with a very low pKa. It is used to extract positively charged basic compounds. The presence of the benzene ring in the functional group increases the potential for non-polar interactions. This non-polar characteristic becomes particularly important when conducting ion-exchange from aqueous systems.

Abel Industries® SCX ordering information

Specification	Packing (pcs/bag)	Part No.
100mg/1ml	100	ABEL-S46SC-0101
200mg/3ml	50	ABEL-S46SC-0302
500mg/3ml	50	ABEL-S46SC-0305
500mg/6ml	30	ABEL-S46SC-0605
1000mg/6ml	30	ABEL-S46SC-0610
10g/bottle		ABEL-S46SC-0010
100g/bottle		ABEL-S46SC-0100

Abel Industries® SAX

- A polymerically bonded quarternary amine that remains charged at all pH levels
- Retains negatively charged compounds, especially those that elute from weak anion exchange sorbents
- Selectivity can be user-modified for increased exibility
- Minimal non-polar interactions

AbelSAX is a silica-based strong anion exchange SPE adsorbent, usually used for extraction of negatively charged substances from water or aqueous solution, especially for the extraction of weak acids such as carboxylic acids, which may not retain effectively on weak anion exchange sorbents.

Abel Industries® SAX ordering information

Specification	Packing (pcs/bag)	Part No.
100mg/1ml	100	ABEL-S46SA-0101
200mg/3ml	50	ABEL-S46SA-0302
500mg/3ml	50	ABEL-S46SA-0305
500mg/6ml	30	ABEL-S46SA-0605
1000mg/6ml	30	ABEL-S46SA-0610
10g/bottle		ABEL-S46SA-0010
100g/bottle		ABEL-S46SA-0100

Abel Industries® WCX

- A moderate polarity sorbent and weak cation exchanger (pKa 4.8)
- Cation exchange with no need for extreme basic conditions
- Wider selectivity range provides more eluent options
- Polar or non-polar depending on matrix or solvent
- Typically used when dealing with very strong cationic (high pKa) compounds that may be irreversibly retained on strong cation exchangers

Abel WCX is a silica-based weak cation exchange SPE adsorbent, bonded with carboxyl functional groups, commonly used in extraction of the quaternary ammonium compounds or other strong cation.

Abel Industries® WCX ordering information

Specification	Packing (pcs/bag)	Part No.
100mg/1ml	100	ABEL-S46WC-0101
200mg/3ml	50	ABEL-S46WC-0302
500mg/3ml	50	ABEL-S46WC-0305
500mg/6ml	30	ABEL-S46WC-0605
1000mg/6ml	30	ABEL-S46WC-0610
10g/bottle		ABEL-S46WC-0010
100g/bottle		ABEL-S46WC-0100

Abel Industries® PRS(propylsulfonic acid)

- A propylsulfonic acid phase
- Strong cation exchange sorbent, also capable of polar and hydrogen bonding interactions
- Less acidic than Abel SCX
- No appreciable non-polar interactions
- Unique selectivity properties

It is less acidic than Abel SCX, so is referred to as Abel SCX-2.They have slightly different selectivity. Abel PRS shows less non-polar hydrophobic interaction than Abel SCX. So in non-polar solvents, PRS is capable of polar and hydrogen bonding interactions. Due to the very low pKa of PRS, it is recommended for sample preparation of weak cation, such as pyridine, etc., with a high recovery rate. It is also widely used for sample preparation of malachite green.

Abel Industries® PRS ordering information

Specification	Packing (pcs/bag)	Part No.
100mg/1ml	100	ABEL-S46PR-0101
200mg/3ml	50	ABEL-S46PR-0302
500mg/3ml	50	ABEL-S46PR-0305
500mg/6ml	30	ABEL-S46PR-0605
1000mg/6ml	30	ABEL-S46PR-0610
10g/bottle		ABEL-S46PR-0010
100g/bottle		ABEL-S46PR-0100

2. Abel Industries® inorganic non-Silica based SPE

Abel inorganic non-Silica based SPE sorbents are used as normal phase adsorbents. Their polarity, surface acidity and application are different from each other or from silica. They are usually specifically for sample preparation of very complex samples, such as pesticide residues, plant and animal tissue samples in the organic solvents, and Sudan dyes and malachite green in foods.

Like our Abel silica-based SPE adsorbents, non-Silica SPE adsorbents have been passed through a series of cleaning and activation processes and strict quality control process, to ensure high quality and excellent reproducibility.

Abel Industries® Florisil

- Particles size is 100-200 mesh
- Fast flow so ideal for viscous samples
- Highly polar material that strongly adsorbs polar compounds from non-polar matrices under normal-phase conditions
- Economical material
- For cleanup of polar impurities from non-polar samples
- Typical applications include alcohols, aldehydes, amines, herbicides, pesticides, PCBs, ketones, nitro compounds, organic acids, and phenols

Abel Florisil, made from magnesium silicate, is a highly selective SPE sorbent. Similar to silica, it is use for extraction of polar compounds, but is much adsorptive than silica. It is widely use to extracts polar compounds from non-polar solvent. The larger particle size of the sorbent enables fast flow for large sample volumes and therefore can be an attractive alternative to silica if the sample matrix is particularly viscous. Typical applications include organic chlorinated pesticide, PCBs, and PAHs. It is also included in AOAC and EPA methods.

Abel Industries® Florisil ordering information

Specification	Packing (pcs/bag)	Part No.
100mg/1ml	100	ABEL-F4601-0101
200mg/3ml	50	ABEL-F4601-0302
500mg/3ml	50	ABEL-F4601-0305
500mg/6ml	30	ABEL-F4601-0605
1000mg/6ml	30	ABEL-F4601-0610
10g/bottle		ABEL-F4601-0010
100g/bottle		ABEL-F4601-0100

Abel Industries® Florisil PR

- Contains Na_2SO_4 (upper layer) and Florisil (magnesium silicate; lower layer)
- Bigger particle size- 60/100 mesh (150-200 mm); pesticide grade
- Generally used to retain polar analytes
- Excellent for removing/isolating polar compounds from organic matrices
- A great option when more generally-used sorbents, such as C18, don't perform specifi cally enough for your particular application

Abel Florisil PR is a selective synthetic adsorbent of silica, magnesium and sodium sulfate, especially processed to give consistent results when used for cleanup and separation of chlorinated pesticide residues, amines, polychlorinated biphenyls (PCBs), ketones and organic acids prior to identifi cation and measurement of by gas, thin layer, or paper chromatography. It meets the EPA 608 method.

Abel Industries® Florisil PR ordering information

Specification	Packing (pcs/bag)	Part No.
100mg/1ml	100	ABEL-FPR01-0101
200mg/3ml	50	ABEL-FPR01-0302
500mg/3ml	50	ABEL-FPR01-0305
500mg/6ml	30	ABEL-FPR01-0605
1000mg/6ml	30	ABEL-FPR01-0610
10g/bottle		ABEL-FPR01-0010
100g/bottle		ABEL-FPR01-0100

Abel Industries® Alumina-N

- Neutral polar alumina SPE sorbent(pH 6.5)
- 50 - 200 μm particle size for high extraction efficiency
- Ideal for electron-rich compounds
- Better high pH stability than bare silica

Abel Alumina-N can adsorb molecules by interaction with the aluminum metal center, or by hydrogen bonding with the surface hydroxyl groups. The neutralized surface allows interaction with compounds whose heteroatoms are electronegative (e.g., N, O, P, S) or with an electron-rich, highly aromatic structure. The alumina surface tends to be slightly more stable under high pH conditions than bare silica. The small particle size range ensures high extraction efficiency. It is widely used in the sample preparation of Sudan and malachite green.

Abel Industries® Alumina-N ordering information

Specification	Packing (pcs /bag)	Part No.
100mg/1ml	100	ABEL-AN01-0101
200mg/3ml	50	ABEL-AN01-0302
500mg/3ml	50	ABEL-AN01-0305
500mg/6ml	30	ABEL-AN01-0605
1000mg/6ml	30	ABEL-AN01-0610
1000mg/3ml	50	ABEL-AN01-0310
10g/bottle		ABEL-AN01-0010
100g/bottle		ABEL-AN01-0100

Abel Industries® Alumina-B

- Basic alumina SPE sorbent (pH 8.5)
- 50 - 200 μm particle size for high extraction efficiency
- Ideal for polar and cationic compounds
- Better high pH stability than bare silica

Abel Alumina-B is washed with basic solution; so its surface is negatively charged. It is ideal for extraction of polar or cationic compounds.

Abel Industries® Alumina-B ordering information

Specification	Packing (pcs /bag)	Part No.
100mg/1ml	100	ABEL-AB01-0101
200mg/3ml	50	ABEL-AB01-0302
500mg/3ml	50	ABEL-AB01-0305
500mg/6ml	30	ABEL-AB01-0605
1000mg/6ml	30	ABEL-AB01-0610
10g/bottle		ABEL-AB01-0010
100g/bottle		ABEL-AB01-0100

Abel Industries® Alumina-A

- Slightly acidic alumina SPE sorbent (pH = 4.5)
- 50 - 200 μm particle size for high extraction efficiency
- Ideal for polar and anionic compounds
- Better high pH stability than bare silica

Abel Alumina-A surface is slightly acidic with pH = 4.5. Adsorbent can be used as polar and middle-cation exchanger.

Abel Industries® Alumina-A ordering information

Specification	Packing (pcs /bag)	Part No.
100mg/1ml	100	ABEL-AA01-0101
200mg/3ml	50	ABEL-AA01-0302
500mg/3ml	50	ABEL-AA01-0305
500mg/6ml	30	ABEL-AA01-0605
1000mg/6ml	30	ABEL-AA01-0610
10g/bottle		ABEL-AA01-0010
100g/bottle		ABEL-AA01-0100

Abel Industries® Celite

- Macroporous (302 Å) with large pore volume
- Chemically inert
- Stable across a broad pH range: 1-13
- 100 – 200 mesh particle size for high extraction efficiency
- Very abroad application

Abel Celite is a specially treated, chemically inert and pH stable, macroporous diatomite sorbent; It has broad applications, including pre-treatment of urine, whole blood, plasma, serum, gastric juice, amniotic fluid, feces and animal and plant tissue samples, environmental analysis and residual analysis (industrial waste, household waste and hospital waste), drug content analysis, traditional Chinese medicine analysis.

Abel Industries® Celite ordering information

Specification	Packing (pcs /bag)	Part No.
100mg/1ml	100	ABEL-CE01-0101
200mg/3ml	50	ABEL-CE01-0302
500mg/3ml	50	ABEL-CE01-0305
500mg/6ml	30	ABEL-CE01-0605
1000mg/6ml	30	ABEL-CE01-0610
10g/bottle		ABEL-CE01-0010
100g/bottle		ABEL-CE01-0100

3. Abel Industries® Polymer-based SPE

Abel polymer –based SPE is made from monodisperse polymer beads, which surface is modified by the Abel's uniqu surface modiication and functionalization technology to produce various types of polymer SPE sorbents. Abel SPE polymer beads have accurate particle size of 40μm with a high degree of uniformity of particle size and pore size, excellent surface area, and the optimal bonding density of functional groups, which can meet high sensitivity analysis requirement forfa wide variety of applications of acidic, neutral and basic compounds. Abel polymer-based SPE currently includes five different sorbents to meet your needs: BRP, P-SCX, P-SAX, PS/DVB, and P-WAX.

Abel Industries® BRP

- Monodispersed polymer beads
- Balanced hydrophobic and hydrophilic adsorbent surface
- Most versatile SPE option
- Appropriate for a broad range of samples, including weak acids, neutrals, and weak bases
- Equivalent to Waters Oasis HLB, Agilent's OPT, and Phenomenex Strata X

BRP is abbreviation of 'Banlanced Reverse Polymer'. Abel BRP surface is modifiled by our proprietary surface modification technology. It has balanced hydrophobic and hydrophilic adsorbent surface, and is used to separate polar and non- polar substances. Its extraction capacity is 3-10 times of C18 bonded silica SPE. It is appropriate for a broad range of samples, including weak acids, neutrals, and weak bases, such as naproxen, ibuprofen, fenoprofen, indomethacin, caffeine, theobromine.

Abel Industries® BRP ordering information

Specification	Packing (pcs /bag)	Part No.
30mg/1ml	100	ABEL-P01-0103
60mg/3ml	50	ABEL-P01-0306
150mg/3ml	50	ABEL-P01-0315
200mg/3ml	50	ABEL-P01-0302
200mg/6ml	30	ABEL-P01-0602
500mg/6ml	30	ABEL-P01-0605

Abel Industries® P-SCX

- Ideal solid phase extraction for melamine analysis
- Excellent retention for both basic and neutral compounds over a wide range of hydrophilicity
- Inert to a wide variety of solvents
- Equivalent to Waters Oasis MCX, Phenomenex Strata-XC

Abel P-SCX polymeric resin is a sulfonic acid-modifiled divinyl benzene polymer with both ion exchange and reverse phase retention properties. As a result, the Abel P-SCX resin exhibits excellent retention for both basic and neutral compounds over a wide range of hydrophilicity; examples including melamine, amphetamines, chlorpheniramine, and phencyclidine.

Abel Industries® P-SCX ordering information

Specification	Packing (pcs /bag)	Part No.
30mg/1ml	100	ABEL-P02-0103
60mg/3ml	50	ABEL-P02-0306
150mg/3ml	50	ABEL-P02-0315

Abel Industries® P-SAX

- Excellent retention for both acidic and neutral compounds over a wide range of hydrophilicity
- Inert to a wide variety of solvents

Abel Strong Anion Exchange (SAX) polymeric resin is a mixed-mode, tertiary amine-modifiled divinyl benzene polymer that displays both anion exchange and reversed phase behavior. As a result, Abel P-SAX resin exhibits excellent retention for both acidic and neutral compounds over a wide range of hydrophilicity, typically used for purification of acidic substances, such as tyrosine, estrone, adenine and nucleoside and so on, from alkaline and neutral impurities.

Abel Industries® P-SAX ordering information

Specification	Packing (pcs /bag)	Part No.
30mg/1ml	100	ABEL-P03-0103
60mg/3ml	50	ABEL-P03-0306
150mg/3ml	50	ABEL-P03-0315

Abel Industries® PS/DVB

- Highly cross-linked polystyrene-divinyl benzene copolymer
- High surface area (800m^2/g) and high adsorption capacity; ideal for extracting polar compounds from aqueous solutions
- Large particle size allows fast extraction speeds
- Equivalent to Bond Elute LMS, Bond Elute PPL, SampliQ PS-DVB

Abel PS/DVB is a highly cross-linked polystyrene/divinyl benzene copolymer resin with high surface area (800m^2/g) and high adsorption capacity for rapid adsorption and separation of hydrophobic substances such as phenol, surfactants, non-B pyridine bromide, antibiotics, amino acids and peptides, etc. It is ideal for the extraction of polar analytes that are not adequately retained on a C18 or C8 sorbent. The nonselective characteristic of this sorbent is useful for screening applications where a broad range of analytes is to be extracted.

Abel Industries® PS/DVB ordering information

Specification	Packing (pcs /bag)	Part No.
30mg/1ml	100	ABEL-P04-0103
60mg/3ml	50	ABEL-P04-0306
150mg/3ml	50	ABEL-P04-0315