

## Sample Preparation

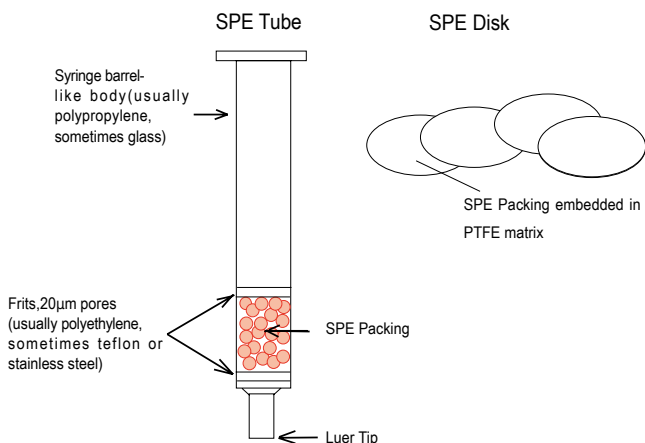
### Solid phase extraction (SPE)

#### Introduction of Solid phase extraction (SPE) technique

##### What is SPE, and what problems can SPE solve

Solid phase extraction (SPE) is a popular pretreatment method for purifying liquid samples with solid sorbents. Normally, SPE is used before chromatography or other analysis for sample purification, concentration, desalination, derivation or isolation.

##### Typical SPE Tube and Disk



##### The advantage of SPE compared with conventional LLE

The function of SPE and LLE (liquid/liquid extraction) is similar. LLE is the extraction of two immiscible liquid phases, while SPE is the extraction from liquid phase to solid phase. The advantage of SPE compared with LLE including:

- Avoid emulsification phenomena
- Make two-phase separation easier, and easy to perform
- Higher quantitative recoveries, and better purification effects
- Use less solvent
- Available in a wide variety of sorbents, and have more options than LLE
- Can be automated, enlarge treatment capacity

How to use SPE (Method development and key points of operating)

SPE is a five-step process:

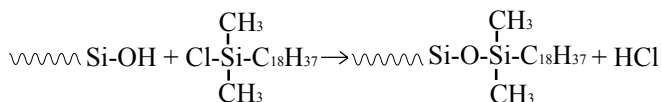
##### STEP ONE: Select suitable SPE product

1. SPE Theory and Pattern

##### SPE Theory: How Compounds Are Retained by the Sorbent

##### Reversed Phase SPE

Reversed phase separations involve a polar (usually aqueous) or moderately polar sample matrix (mobile phase) and a nonpolar stationary phase. The analyte of interest is typically mid- to nonpolar. Several SPE materials, such as the alkyl- or aryl-bonded silicas (C18, C8, C4, and Phenyl) are in the reversed phase category.



Here, the hydrophilic silanol groups at the surface of the raw silica packing (typically 60Å pore size, 40µm particle size) have been chemically modified with hydrophobic alkyl or aryl functional groups by reaction with the corresponding silanes. Retention of organic analytes from polar solutions (e.g. water) onto these SPE materials is due primarily to the attractive forces between the carbon-hydrogen bonds in the analyte and the functional groups on the silica surface. These nonpolar-nonpolar attractive forces are commonly called van der Waals forces, or dispersion forces. To elute an adsorbed compound from a reversed phase SPE tube or disk, use a nonpolar solvent to disrupt the forces that bind the compound to the packing. All silicabased bonded phases have some percentage of residual unreacted silanols that act as secondary interaction sites. These secondary interactions may be useful in the extraction or retention of highly polar analytes or contaminants, but may also irreversibly bind analytes of interest.

Carbon-GCB (Graphitized Carbon Black) and PSD (styrene-divinylbenzene copolymer) also are used under reversed phase conditions. Carbonaceous adsorption media, such as the Carbon-GCB materials, consist of graphitic, nonporous carbon that has a high attraction for organic polar and nonpolar compounds from both polar and nonpolar matrices. The carbon surface is comprised of atoms in hexagonal ring structures, interconnected and layered in graphitic sheets. The hexagonal ring structure demonstrates a strong selectivity for planar aromatic or hexagonal ring-shaped molecules and hydrocarbon chains with potential for multiple surface contact points. Retention of analytes is based primarily on the analyte's structure (size and shape), rather than on interactions of functional groups on the analyte with the sorbent surface. Elution is performed with mid- to nonpolar solvents. The unique structure and selectivity of Carbon-GCB materials, compared to bonded alkyl-silicas, makes them an excellent alternative when the bonded silicas will not work for an application. PSA is a styrene/divinylbenzene material that is used for retaining hydrophobic compounds which contain some hydrophilic functionality, especially aromatics.

Phenols are sometimes difficult to retain on C18-modified silica under reversed phase conditions, mainly due to their greater solubility in water than in organic matrices. The PSA material has been shown to retain phenols well under reversed phase conditions. Elution steps can be done with mid- to nonpolar solvents, because the polymeric packing is stable in almost all matrices.

##### Normal Phase SPE

Normal phase SPE procedures typically involve a polar analyte, a mid- to nonpolar matrix (e.g. acetone, chlorinated solvents, and hexane), and a polar stationary phase. Polar-functionalized bonded silicas (e.g. CN, NH<sub>2</sub>, and Diol), and polar adsorption media (e.g. Si, Florisil, and

Alumina) typically are used under normal phase conditions. Retention of an analyte under normal phase conditions is primarily due to interactions between polar functional groups of the analyte and polar groups on the sorbent surface. These include hydrogen bonding, pi-pi interactions, dipole-dipole interactions, and dipole-induced dipole interactions, among others. A compound adsorbed by these mechanisms is eluted by passing a solvent that disrupts the binding mechanism — usually a solvent that is more polar than the sample's original matrix.

The bonded silicas (e.g. CN, NH<sub>2</sub>, and Diol) have short alkyl chains with polar functional groups bonded to the surface. These silicas are much more hydrophilic relative to the bonded reversed phase silicas, because of their polar functional groups. As with typical normal phase silicas, these packings can be used to adsorb polar compounds from nonpolar matrices. Such SPE tubes have been used to adsorb and selectively elute compounds of very similar structure (e.g. isomers), or complex mixtures or classes of compounds such as drugs and lipids. These materials also can be used under reversed phase conditions (with aqueous samples), to exploit the hydrophobic properties of the small alkyl chains in the bonded functional groups. The Si material is underivatized silica commonly used as the backbone of all of the bonded phases. This silica is extremely hydrophilic, and must be kept dry. All samples used with this material must be relatively water-free. The functional groups that are involved in the adsorption of compounds from nonpolar matrices are the free hydroxyl groups on the surface of the silica particles. Si may be used to adsorb polar compounds from nonpolar matrices with subsequent elution of the compounds in an organic solvent that is more polar than the original sample matrix. In most cases, LC-Si is used as an adsorption media, where an organic extract is applied to the silica bed, the analyte of interest passes through unretained, and the unwanted compounds adsorb onto the silica and are discarded. This procedure is usually called sample cleanup.

Florisil SPE tubes are packed with a magnesium silicate that is used typically for sample cleanup of organic extracts. This highly polar material strongly adsorbs polar compounds from nonpolar matrices. There's a Florisil SPE tubes are made with either Teflon® or stainless steel frits, a configuration necessary for environmental procedures specified in US EPA methods. This Florisil SPE tubes is specifically tested for low backgrounds via GC analysis.

Alumina SPE tubes are also used in adsorption/sample cleanup-type procedures. The aluminum oxide materials can either be of acidic (Alumina-A, pH ~4.5), basic (Alumina-B, pH~9.5), or neutral (Alumina-N, pH ~7.5) pH, and are classified as having Brockmann Activities of I. The activity level of the alumina may be altered from grade I through grade IV with the controlled addition of water, prior to or after packing this material into tubes.

### Ion Exchange SPE

Ion exchange SPE can be used for compounds that are charged when in a solution (usually aqueous, but sometimes organic). Anionic (negatively charged) compounds can be isolated on SAX or NH<sub>2</sub> bonded silica cartridges. Cationic (positively charged) compounds are isolated by using SCX or WCX bonded silica cartridges. The primary retention mechanism of the compound is based mainly on the electrostatic attraction of the charged functional group on the compound to the charged group that is bonded to the silica surface. In order for a compound to retain by ion exchange from an aqueous solution, the pH of the sample matrix

must be one at which both the compound of interest and the functional group on the bonded silica are charged. Also, there should be few, if any, other species of the same charge as the compound in the matrix that may interfere with the adsorption of the compound of interest. A solution having a pH that neutralizes either the compound's functional group or the functional group on the sorbent surface is used to elute the compound of interest. When one of these functional groups is neutralized, the electrostatic force that binds the two together is disrupted and the compound is eluted. Alternatively, a solution that has a high ionic strength, or that contains an ionic species that displaces the adsorbed compound, is used to elute the compound.

**Anion Exchange SPE:** The SAX material is comprised of an aliphatic quaternary amine group that is bonded to the silica surface. A quaternary amine is a strong base and exists as a positively-charged cation that exchanges or attracts anionic species in the contacting solution — thus the term strong anion exchanger (SAX). The pKa of a quaternary amine is very high (greater than 14), which makes the bonded functional group charged at all pHs when in an aqueous solution. As a result, SAX is used to isolate strong anionic (very low pKa, <1) or weak anionic (moderately low pKa, >2) compounds, as long as the pH of the sample is one at which the compound of interest is charged. For an anionic (acidic) compound of interest, the pH of the matrix must be 2 pH units above its pKa for it to be charged. In most cases, the compounds of interest are strong or weak acids. Because it binds so strongly, SAX is used to extract strong anions only when recovery or elution of the strong anion is not desired (the compound is isolated and discarded). Weak anions can be isolated and eluted from SAX because they can be either displaced by an alternative anion or eluted with an acidic solution at a pH that neutralizes the weak anion (2 pH units below its pKa). If recovery of a strongly anionic species is desired, use NH<sub>2</sub>. The NH<sub>2</sub> SPE material that is used for normal phase separations is also considered to be a weak anion exchanger (WAX) when used with aqueous solutions. The NH<sub>2</sub> material has an aliphatic aminopropyl group bonded to the silica surface. The pKa of this primary amine functional group is around 9.8. For it to be used as an anion exchanger, the sample must be applied at a pH at least 2 units below 9.8. The pH must also be at a value where the anionic compound of interest is also charged (2 pH units above its own pKa). NH<sub>2</sub> is used to isolate and recover both strong and weak anions because the amine functional group on the silica surface can be neutralized (2 pH units above its pKa) in order to elute the strong or weak anion. Weak anions also can be eluted from LC-NH<sub>2</sub> with a solution that neutralizes the adsorbed anion (2 pH units below its pKa), or by adding a different anion that displaces the analyte.

**Cation Exchange:** The SCX material contains silica with aliphatic sulfonic acid groups that are bonded to the surface. The sulfonic acid group is strongly acidic (pKa <1), and attracts or exchanges cationic species in a contacting solution — thus the term strong cation exchanger (SCX). The bonded functional group is charged over the whole pH range, and therefore can be used to isolate strong cationic (very high pKa, >14) or weak cationic (moderately high pKa, <12) compounds, as long as the pH of the solution is one at which the compound of interest is charged. For a cationic (basic) compound of interest, the pH of the matrix must be 2 pH units below its pKa for it to be charged. In most cases, the compounds of interest are strong or weak bases. SCX SPE tubes should be used to isolate strong cations only when their recovery or elution is not desired. Weak cations can be isolated and eluted from SCX; elution is done with a solution at 2 pH units above the cation's pKa (neutralizing the analyte), or by adding a different cation that displaces the analyte. If recovery of a strongly cationic species is desired, use WCX. The

WCX SPE material contains an aliphatic carboxylic acid group that is bonded to the silica surface. The carboxylic acid group is a weak anion, and is thus considered a weak cation exchanger (WCX). The carboxylic acid functional group in WCX has a pKa of about 4.8, will be negatively charged in solutions of at least 2 pH units above this value, and will isolate cations if the pH is one at which they are both charged. WCX can be used to isolate and recover both strong and weak cations because the carboxylic acid functional group on the silica surface can be neutralized (2 pH units below its pKa) in order to elute the strong or weak cation. Weak cations also can be eluted from WCX with a solution that neutralizes the adsorbed cation (2 pH units above its pKa), or by adding a different cation that displaces the analyte. In many cases, the analyte in ion exchange SPE is eluted in an aqueous solution. If you must use an acidic or basic solution to elute an analyte from an SPE tube, but the extracted sample must be analyzed in an organic solvent that is not miscible with water, try to elute the compound with acidic methanol (98% methanol/2% concentrated HCl) or basic methanol (98% methanol/2% NH<sub>4</sub>OH). The methanol can be evaporated quickly, and the sample may be reconstituted in a different solvent. If you need a stronger (more nonpolar) solvent to elute the analyte from the SPE tube, add methylene chloride, hexane, or ethyl acetate to the acidic or basic methanol.

## Secondary Interactions

The primary retention mechanisms for compounds on the SPE materials are described above. For the bonded silicas, it is possible that secondary interactions will occur. For reversed phase bonded silicas, the primary retention mechanism involves nonpolar interactions. However, because of the silica particle backbone, some polar secondary interactions with residual silanols — such as those described for normal phase SPE — could occur. If a nonpolar solvent does not efficiently elute a compound from a reversed phase SPE packing, the addition of a more polar solvent (e.g. methanol) may be necessary to disrupt any polar interactions that retain the compound. In these cases, methanol can hydrogen-bond with the hydroxyl groups on the silica surface, thus breaking up any hydrogen bonding that the analyte may be incurring. The silanol group at the surface of the silica, Si-OH, can also be acidic, and may exist as an Si-O<sup>-</sup> group above pH 4. As a result, the silica backbone may also have cation exchange secondary interactions, attracting cationic or basic analytes of interest. In this case, a pH adjustment of the elution solvent may be necessary to disrupt these interactions for elution (acidic to neutralize the silanol group, or basic to neutralize the basic analyte). This can be done by using acidic methanol (98% MeOH:2% concentrated HCl) or basic methanol (98% MeOH:2% concentrated NH<sub>4</sub>OH), or by mixtures of these with a more nonpolar, methanol-miscible solvent. Normal phase bonded silicas will exhibit primary polar retention mechanisms via the bonded functional group, but also can have some secondary nonpolar interactions of the analyte with the small alkyl chain that supports the functional group. In this case, a more nonpolar solvent, or a mix of polar and nonpolar solvents, may be needed for elution. As with the reversed phase silicas, secondary polar or cation exchange interactions of the adsorbed compound may occur with the silica backbone. Ion exchange bonded silicas can provide secondary nonpolar interactions of analytes with the nonpolar portions of their functional groups, as well as polar and cation exchange interactions of the analyte with the silica backbone. A delicate balance of pH, ionic strength, and organic content may be necessary for elution of the analyte of interest from these packings.

## The Role of pH in SPE

Solutions used in SPE procedures have a very broad pH range. Silica-based packings, such as those used in HPLC columns, usually have a stable pH range of 2 to 7.5. At pH levels above and below this range, the bonded phase can be hydrolyzed and cleaved off the silica surface, or the silica itself can dissolve. In SPE, however, the solutions usually are in contact with the sorbent for short periods of time. The fact that SPE cartridges are disposable, and are meant to be used only once, allows one to use any pH to optimize retention or elution of analytes. If stability of the SPE cartridge at an extreme pH is crucial, polymeric or carbon-based SPE materials such as PSA or Carbon-GCB may be used. These materials are stable over the pH range of 1-14.

For reversed phase SPE procedures on bonded silicas, if trapping the analyte in the tube is desired, the pH of the conditioning solution and sample (if mostly or entirely aqueous) should be adjusted for optimum analyte retention. If the compound of interest is acidic or basic you should, in most cases, use a pH at which the compound is not charged. Retention of neutral compounds (no acidic or basic functional groups) usually is not affected by pH. Conversely, you can use a pH at which the unwanted compounds in the sample are retained on the SPE packing, but the analyte of interest passes through unretained. Secondary hydrophilic and cation exchange interactions of the analyte can be used for retention at a proper pH. (For more detail, see Secondary Interactions). For adsorption media (e.g. Carbon-GCB and PSA) that are used under reversed phase conditions, a pH should be chosen to maximize retention of analytes on the sorbent as with reversed phase bonded silicas. Elution is usually done with an organic solvent, so pH is usually not a factor at this point. Surprisingly, phenols retain better on PSA when applied in solutions at a neutral pH, where phenols can be charged, than at an acidic pH levels where they are neutral. This shows that adsorption media may have different selectivities than the bonded silicas for certain compounds, and that a range of pH levels of the sample and conditioning solutions should be investigated when using these materials. In normal phase SPE procedures on bonded silicas or adsorption media, pH is usually not an issue, because the solvents used in these processes are typically nonpolar organic solvents, rather than water. Retention in ion exchange SPE procedures depends heavily on the pH of the sample and the conditioning solutions. For retention of the analyte, the pH of the sample must be one at which the analyte and the functional groups on the silica surface are charged oppositely.

## **SPE Pattern**

SPE has two patterns as following:

1. Sample Concentration: The content of analytes of interest is low, they are retained when the sample passes through the solid phase packing, collect the adsorbed compounds of interest through elution then do test.
2. Sample Cleanup: Only impurities or disturbing substances are retained on the SPE packing but the compounds of interest are not adsorbed in the packing.

## 2. Select SPE Phase Types and Bed Weight

### SPE Phase Types

Reversed Phase (Hydrophobic)		
LC-C18	octadecyl bonded, endcapped silica	High acid and alkali resistance, and have high capacity for non-polar compounds. For reversed phase extraction of nonpolar to moderately polar compounds, such as antibiotics, barbiturates, benzodiazepines, caffeine, drugs, dyes, essential oils, fat soluble vitamins, fungicides, herbicides, pesticides, hydrocarbons, parabens, phenols, phthalate esters, steroids, surfactants, theophylline, and water soluble vitamins.
HC-C18	octadecyl bonded, endcapped silica	Higher carbon content, and higher hydrophobicity, can greatly increase capacity and recovery, 17% carbon content can resist extreme pH conditions. For reversed phase extraction of nonpolar to moderately polar compounds, such as antibiotics, caffeine, drugs, dyes, essential oils, fat soluble vitamins, fungicides, herbicides, pesticides, PNAs, hydrocarbons, parabens, phenols, phthalate esters, steroids, surfactants, water soluble vitamins.
C8	octyl bonded, endcapped silica	High acid and alkali resistance, and have high capacity for non-polar compounds. For reversed phase extraction of nonpolar to moderately polar compounds, such as barbiturates, benzodiazepines, caffeine, drugs, dyes, essential oils, fat soluble vitamins, fungicides, herbicides, pesticides, hydrocarbons, parabens, phenols, phthalate esters, steroids, surfactants, theophylline, and water soluble vitamins.
PHE	phenyl bonded silica	Slightly less retention than C18 or C8 material. For reversed phase extraction of nonpolar to moderately polar compounds, especially aromatic compounds.
Normal Phase (Hydrophilic)		
CN	cyanopropyl bonded, endcapped silica	For reversed phase extraction of moderately polar compounds, normal phase extraction of polar compounds, such as aflatoxins, antibiotics, dyes, herbicides, pesticides, phenols, steroids. Weak cation exchange for carbohydrates and cationic compounds.
Diol	diol bonded silica	For normal phase extraction of polar compounds.
NH <sub>2</sub>	aminopropyl bonded silica	For normal phase extraction of polar compounds, weak anion exchange for carbohydrates, weak anions, and organic acids.
Ion Exchange (Anion and Cation)		
PSA	ethylenediamine-N-propyl, polymerically bonded	For normal and anion exchange, similar to aminopropyl SPE phases (NH <sub>2</sub> ) in terms of selectivity, but has a much higher capacity. Suitable for removing fatty acids, organic acids, and some polar pigments and sugars.
SAX	quaternary amine bonded silica	For strong anion exchange of anions, organic acids, nucleic acids, nucleotides, and surfactants.
MAX	polymerically bonded quaternary amine	For reversed and anion exchange of acidic compounds and their products.
WCX	carboxylic acid bonded silica	For weak cation exchange of cations, amines, antibiotics, drugs, amino acids, catecholamines, nucleic acid bases, nucleosides, and surfactants.
PRS	propanesulfonic acid	For cation exchange of for pyridine, cationic, antibiotics, drugs, organic bases, amino acids, catecholamines, herbicides, nucleic acid bases, nucleosides, and surfactants.
SCX	benzene sulfonic acid bonded silica	For strong cation exchange for cations, antibiotics, drugs, organic bases, amino acids, catecholamines, herbicides, nucleic acid bases, nucleosides, and surfactants.
MCX	polymerically bonded benzene sulfonic acid	For reversed and cation exchange of alkaline compounds and their products.
Adsorption (Multifunction)		
Carbon-GCB	graphitized carbon black	For adsorption extraction of polar and nonpolar compounds, especially the separation or removing of pigments (such as chlorophyll and carotenoids), sterols, phenol, p-chloroaniline, organochlorine pesticides, carbamate, triazine herbicides in various media.
Florisil	magnesium silicate	For adsorption extraction of polar compounds, such as alcohols, aldehydes, amines, drugs, dyes, herbicides, pesticides, PCBs, ketones, nitro compounds, organic acids, phenols, and steroids.
Alumina-A	acidic Alumina	For anion exchange and adsorption extraction of polar compounds, such as vitamins.
Alumina-N	neutral Alumina	For adsorption extraction of polar compounds. With pH adjustment, cation or anion exchange. For extraction of vitamins, antibiotics, essential oils, enzymes, glycosides, and hormones.
Alumina-B	basic Alumina	For adsorption extraction of polar compounds, and cation exchange.
Silica	silica gel with no bonded phase	For extraction of polar compounds, such as alcohols, aldehydes, amines, drugs, dyes, herbicides, pesticides, ketones, nitro compounds, organic acids, phenols, and steroids.
PSD	styrene-divinylbenzene copolymer	For extraction of polar aromatic compounds such as phenols from aqueous samples. Also for adsorption extraction of nonpolar to midpolar aromatic compounds.
HLB	modified styrene-divinylbenzene copolymer	For extraction of hydrophilic and hydrophobic compound, While retaining polar compounds such as polychlorinated phenols phosphate, and drugs and other non-polar compounds.

### Comparison Table of Common SPE column brands

Functional groups	CNW	Waters	Phenomenex	Supelco	Agilent (varian)
Si (Silicon)	CNWBOND Si	Sep-pak Silica	Strata Si-1	DSC-Si, LC-Si	Bond Elut Si
Florisil	CNWBOND Florisil		Strata Florisil	LC and ENVI Florisil	
	CNWBOND Florisil PR	Sep-pak Florisil	Strata Florisil-PR		Bond Elut Florisil
Alumina-A	CNWBOND Alumina-A	Sep-pak Alumina A		LC-Alumina A	Bond Elut AL-A
Alumina-N	CNWBOND Alumina-N	Sep-pak Alumina N		LC-Alumina N	Bond Elut AL-N
Alumina-B	CNWBOND Alumina-B	Sep-pak Alumina B		LC-Alumina B	Bond Elut AL-B
GCB (Graphitized Carbon Black)	CNWBOND Carbon-GCB			ENVI-Carb	Bond Elut Carbon
GCB/NH <sub>2</sub>	CNWBOND GCB/NH <sub>2</sub>			ENVICarb-II/NH <sub>2</sub>	Bond Elut Carbon/NH <sub>2</sub>
GCB/PSA	CNWBOND GCB/PSA			ENVICarb-II/PSA	



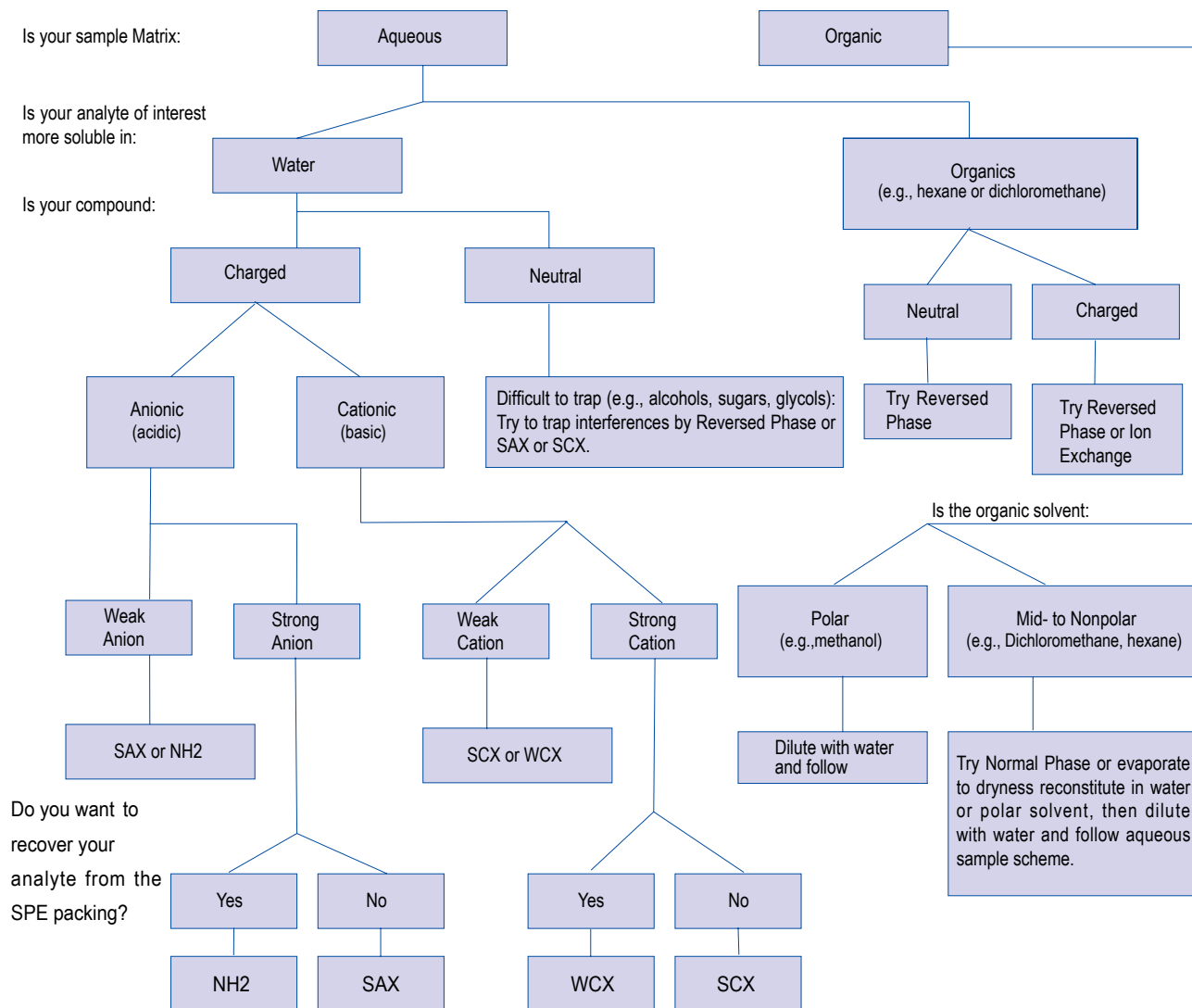
# Solid phase extraction

Functional groups	CNW	Waters	Phenomenex	Supelco	Agilent (varian)
C2	Cnwbond C2-ne	Sep-Pak tC2			Bond Elut C2
C4	Cnwbond C4			LC-4	
	Cnwbond C4-ne				
C8	Cnwbond c8	Sep-Pak C8	Strata C8	DSC-8, Envi-8, LC-8	Bond Elut C8
	Cnwbond c8-ne				
C18	Cnwbond LC-C18	Sep-Pak C18	Strata C18-U	LC-18	Bond Elut C18 OH
	Cnwbond HC-C18	Sep-Pak tC18	Strata C18-E	ENVI-18, DSC-18	Bond Elut C18
CH (Cyclohexane)	Cnwbond CYH				Bond Elut CH
Ph (Phenyl)	Cnwbond PHE		Strata Phenyl	DSC-Ph, LC-Ph	Bond Elut PH
CN (Cyanopropyl)	Cnwbond CN	Sep-Pak CN	Strata CN	DSC-CN, LC-CN	Bond Elut CN-U
Diol	Cnwbond diol	Sep-Pak Diol		DSC-Diol, LC-Diol	Bond Elut 2OH
NH2 (Aminopropyl)	Cnwbond NH2	Sep-Pak Amino Propyl	Strata NH2	DSC-NH2, LC-NH	Bond Elut NH2
	Cnwbond NH2-ne				
PSA (Ethylenediamine-N-propyl)	Cnwbond PSA				Bond Elut PSA
CBA (Weak Cation Exchange)	Cnwbond WCX				Bond Elut CBA
SAX (Strong Anion Exchange)	Cnwbond SAX	Accell Plus QMA	Strata SAX	DSC-SAX, LC-SAX	Bond Elut SAX
SCX (Strong Cation Exchange)	Cnwbond SCX	Accell Plus CM		DSC-SCX, LC-SCX	Bond Elut SCX
PRS (Propanesulfonic Acid)	Cnwbond PRS				Bond Elut PRS
PS-DVB (Styrene-divinylbenzene)	poly-sery PSD		Strata SDB-L	Envi-Chrom P	Bond Elut ENV/LMS
PS-DVB-NVP NVP (Vinyl Pyrrolidone)	poly-sery HLB	Oasis HLB	Strata X		Bond Elut Plexa
PS-DVB-NVP/ Sulfonic Acid	poly-sery MCX	Oasis MCX	Strata XC		Bond Elut Plexa PCX
PS-DVB-NVP/ Quaternary Ammonium Salts	poly-sery MAX	Oasis MAX			Bond Elut Plexa PAX
Phthalazinone Cyclohexane	poly-sery PWAX	Oasis WAX			

## Packings Selection Guide

You can select directly if the sample is liquid, while you should extract the sample by solvent if the sample is solid, then take the extract as sample matrix to select refer to this table.

Sample Characteristics Determine Your SPE Procedure:



### 3. Select Solvents

#### Commonly used solvents procedures for SPE tubes

	Normal Phase	Reverse Phase	Ion Exchange	
Packing Type	Silica, Florisil, $NH_2$ , CN, Diol	Silica C18, C8, C4, $NH_2$ , CN, PHE, PSD, HLB	Anion Exchange	Cation Exchange
Packing Polarity	Strong	Weak	Strong	
Sample Matrix	Organic Solvent	Organic Solvent, Water Solution(Buffer)	Organic Solvent, Water Solution (Buffer)	
Analyte of Interest	Mid-polar, Neutral	Non-polar, Neutral	Acidic	Basic
Condition the Packing	Organic Extract Solvent or Methanol	Water-Organic Mixed Solvent ex. Methanol	Water-Organic Mixed Solvent ex. Methanol or Water Solution	
Add the Sample	Dissolve the Sample in Weak-Polar Organic Solvent ex. Methyl cyanide, Methylbenzene, Dichloromethane	Dissolve the Sample in Strong-Polar Organic Solvent ex. Methanol/Water, Methyl cyanide/Water	Dissolve the Sample in Strong-Polar Organic Solvent ex. Water, Buffer	
Wash the Packing	Non-polar Solvent(5% Polar Solvent can be considered to add)	Water Solution /Buffer or Polar Solvent ex. Water/ Methanol	Water Solution(Organic Solvent can be considered to Include) ex. Water/ Methanol	
Elute the Compounds of Interest	Non-polar and Polar Mixed Solvent(5-50% Polar Solvent) ex. Hexane contain 10% Polar Solvent	Non-polar or Polar Organic Solvent(Water or Buffer can be considered to Include) ex. Methanol, Methyl cyanide	Polar Solvent(Acid or Alkalis can be considered to Include) ex. Water, Buffer	

As show in the table, three washing procedures are used correspond to different modes of compounds concentration that normal phase, reverse phase and ion exchange.

#### Characteristics of Solvents Commonly Used in SPE

Polarity			Solvent	Miscible in Water
Nonpolar	Strong Reversed Phase	Weak Normal Phase	Hexane	No
			Isooctane	No
			Carbon tetrachloride	No
			Chloroform	No
			Methylene chloride (dichloromethane)	No
			Tetrahydrofuran	Yes
			Diethyl ether	No
			Ethyl acetate	Poorly
			Acetone	Yes
			Acetonitrile	Yes
			Isopropanol	Yes
Methanol	Yes			
Water	Yes			
Polar	Weak Reversed Phase	Strong Normal Phase	Acetic acid	Yes

### 4. Selecting an SPE Tube or Disk: Size

Selecting SPE Tube Size If Your Sample Is...	Use Tube Size . . .
< 1mL	1mL
1mL to 250mL and the extraction speed is not critical	3mL
1mL to 250mL and a fast extraction procedure is required	6mL
10mL to 250mL and higher sample capacity is needed	12, 20, or 60mL
< 1 liter and extraction speed is not critical	12, 20, or 60mL
Selecting SPE Disk Size If Your Sample Is . . .	Use Disk Size . . .
100mL to 1 liter	47mm
>1 liter and higher sample capacity is needed	90mm

### 5. Selecting an SPE Tube: Bed Weight

#### Reversed Phase, Normal Phase, and Adsorption-Type Procedures:

The mass of the compounds to be extracted should not be more than 5% of the mass of the packing in the tube. In other words, if you are using a 100mg/1mL SPE tube, do not load more than 5mg of analytes.

#### Ion Exchange Procedures:

- You must consider ion exchange capacity.
- SAX and SCX tubes have ~0.2meq/gram of sorbent capacity (1 meq = 1mmole of [+1] or [-1] charged species).
- $NH_2$  and WCX tubes: ion exchange capacities should be determined for your own application.

#### STEP TWO: Condition the SPE tube packing

To condition the SPE tube packing, rinse it with up to one tube-full of solvent before extracting the sample. For disks, use a volume of 5-10mL. Reversed phase type silicas and nonpolar adsorption media usually are conditioned with a water-miscible organic solvent such as methanol, followed by water or an aqueous buffer. Methanol wets the surface of the sorbent and penetrates bonded alkyl phases, allowing water to wet the silica surface efficiently. Sometimes a pre-conditioning solvent is used before the methanol step. This solvent is usually the same as the elution solvent (see step 5), and is used to remove any impurities on the SPE tube that could interfere with the analysis, and may be soluble only in a strong elution solvent. Normal phase type SPE silicas and polar adsorption media usually are conditioned in the organic solvent in which the sample exists. Ion exchange packings that will be used for samples in nonpolar, organic solvents should be conditioned with the sample solvent. For samples in polar solvents, use a watermiscible organic solvent, then an aqueous solution with the proper pH, organic solvent content, and salt concentration. To ensure that the SPE packing does not dry between conditioning and sample addition, allow about 1mm of the last conditioning solvent to remain above the top tube frit or above the surface of the disk. If the sample is to be introduced from a reservoir or filtration tube, add an additional 0.5mL of the final conditioning solution to a 1mL SPE tube, 2mL to a 3mL tube, 4mL to a 6mL tube, and so on. This prevents the tube from drying out before the sample actually reaches the tube. If the packing dries before the sample is added, repeat the conditioning procedure. Flush buffer salts from the tube with water before reintroducing organic solvents. If appropriate, attach the sample reservoir at this time using a tube adapter.

#### STEP THREE: Add the Sample

Accurately transfer the sample to the tube or reservoir, using a volumetric pipette or micropipette. The sample must be in a form that is compatible with SPE. Total sample volume can range from microliters to liters (see step 1). When excessive volumes of aqueous solutions are extracted, reversed phase silica packings gradually lose the solvent layer acquired through the conditioning process. This reduces extraction efficiency and sample recovery. For samples >250mL, add small amounts of water-miscible solvents (up to 10%) to maintain proper wetting of reversed phase packings. Maximum sample capacity is specific to each application and the conditions used. If recoveries are low or irreproducible, test for analyte breakthrough using the following technique: Attach two

# Solid phase extraction

conditioned SPE tubes of the same packing together using an adapter. Pass the sample through both tubes. When finished, detach each tube and elute it separately. If the analyte is found in the extract of the bottom tube, the sample volume is too great or bed weight is too small, resulting in analyte breakthrough. To enhance retention of appropriate compounds on the packing, and elution or precipitation of unwanted compounds, adjust the pH, salt concentration, and/or organic solvent content of the sample solution. To avoid clogging SPE tube frits or the SPE disk, pre-filter or centrifuge samples prior to extraction if possible. Slowly pass the sample solution through the extraction device, using either vacuum or positive pressure. The flow rate can affect the retention of certain compounds. Generally, the flow rate should not exceed 2mL/min for ion exchange SPE tubes, 5mL/min for other SPE tubes, and may be up to 50mL/min for disks. Dropwise flow is best, when time is not a factor. For some difficult sample matrices, additional pretreatment may be necessary. See SamplePretreatment on the next page.

## STEP FOUR: Wash the Packing

If compounds of interest are retained on the packing, wash off unwanted, unretained materials using the same solution in which the sample was dissolved, or another solution that will not remove the desired compounds. Usually no more than a tube volume of wash solution is needed, or 5-10mL for SPE disks.

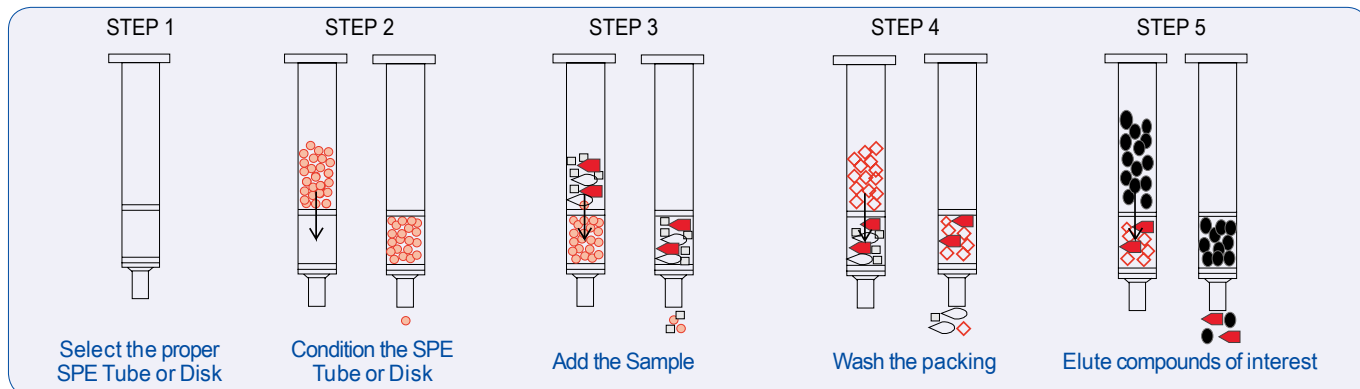
To remove unwanted, weakly retained materials, wash the packing with solutions that are stronger than the sample matrix, but weaker than needed to remove compounds of interest. A typical solution may contain less organic or inorganic salt than the final eluant. It also may be adjusted to a different pH. Pure solvents or mixtures of solvents differing sufficiently in polarity from the final eluant may be useful wash solutions. If you are using a procedure by which compounds of interest are not retained on the packing, use about one tube volume of the sample solvent to remove any residual, desired components from the tube, or 5-10mL to remove the material from a disk. This rinse serves as the elution step to complete the extraction process in this case.

## STEP FIVE: Rinse the packing

Rinse the packing with a small volume (typically 200uL to 2mL depending on the tube size, or 5-10mL depending on the disk size) of a solution that removes compounds of interest, but leaves behind any impurities not removed in the wash step. Collect the eluate and further prepare as appropriate.

Two small aliquots generally elute compounds of interest more efficiently than one larger aliquot. Recovery of analytes is best when each aliquot remains in contact with the tube packing or disk for 20 seconds to 1 minute. Slow or dropwise flow rates in this step are beneficial.

Rinse the packing



## Technique Service of ANPEL

### SPE Method development Information Table

<b>Analyte</b>	
Name of Analyte	
CAS of Analyte	
Structure of Analyte (Main Function Group)	
pKa of Analyte	
Approximate Concentration of Analyte in Sample Matrix	
Which solvents is your Analyte more soluble in	
Approximate Loading Sample volume	
Maximum Concentration Permitted	
pH Stability of Analyte	
Thermal Stability and volatility of Analyte	
Is Derivatization Needed	
<b>Sample Matrix</b>	
Description of Sample Matrix	
pH of Sample Matrix	
Ion Strength of Sample Matrix	
Main disturbance and other components in Sample Matrix	
<b>Analytic Method</b>	
Instrument (GC/GC-MS/HPLC/LC-MS)	
the Minimum Concentration of Analytes Detectable	
HPLC: Column and Mobile Phase	
Gradient Elution Procedures	
Internal Standard	

ANPEL can provide technical service for method development, you can call technique service department(021-54890099-697) or fill the above table and send to [techservice@anpel.com.cn](mailto:techservice@anpel.com.cn), we can provide method development for your experiment.

### SPE Trouble Shooting

Analyte recovery is low All or parts of analyte not retained by sorbent(If analyte and sample matrix pass through the SPE tube together )	<ol style="list-style-type: none"> <li>1. SPE tubes haven't been pre-treated properly</li> <li>2. Polarity of SPE tubes is improper</li> <li>3. Analyte's affinity to sample solvent is stronger than to SPE tubes.</li> <li>4. When large volume water pass through SPE tubes, reverse phase packing lost methanol used in tubes pre-treatment</li> <li>5. Load speed is too fast</li> </ol>	<ol style="list-style-type: none"> <li>1. Reverse phase tubes: Treat tubes with methanol, isopropanol or ethanol, then treat with diluted sample solvent. Caution, don't let the tubes become dry.</li> <li>2. Select SPE packings have obvious selectivity of analyte</li> <li>3. Change the polarity or pH of sample to reduce the affinity of analyte in sample.</li> <li>4. Add 1%-2% methanol, isopropanol or methyl cyanide to sample solvent</li> <li>5. Load sample about 1drop/s to slow ion exchange rate</li> </ol>
Analyte recovery is low Analyte don't be eluted from SPE tubes	<ol style="list-style-type: none"> <li>1. Improper polarity of SPE tubes</li> <li>2. Elute solvent is not strong enough that can't elute the analytes from SPE tubes</li> <li>3. The volume of elute solvent is too small</li> <li>4. Analytes are irreversibly adsorbed on the SPE support. The strength of support is too high (Secondary interactions is too strong)</li> <li>5. Elute speed is too fast</li> </ol>	<ol style="list-style-type: none"> <li>1. Select other SPE tubes have weak polarity or selectivity</li> <li>2. Change pH of the elute solvent to increase the affinity of analyte in sample</li> <li>3. Increase solvent volume</li> <li>4. Select end-capped packings</li> <li>5. Elute about 1drop/s to slow ion exchange rate</li> </ol>
Poor Extraction Reproducibility	<ol style="list-style-type: none"> <li>1. The SPE tubes have been dried before loading sample</li> <li>2. Exceed the SPE tubes' capacity</li> <li>3. The speed sample pass through the tubes is too fast</li> <li>4. Elute speed is too fast</li> <li>5. Analytes' solubility in sample solvent is too big, analytes don't retain in the packings</li> <li>6. SPE tubes are treated with polar solvent, but elute solvent is incompatible non-polar solvent</li> <li>7. The strength of elute solvent is too strong, and part of analytes are eluted together with impurities. The loss of analytes in this step depends on the flow speed of elute solvent, characteristics SPE and volume of elute solvent</li> <li>8. The volume of elute solvent is too small</li> </ol>	<ol style="list-style-type: none"> <li>1. Pre-treat the SPE tubes again</li> <li>2. Reduce sample volume or select SPE tubes have big volume</li> <li>3. Slow the flow rate, especially for ion exchange, the flow rate should be less than 5mL/min</li> <li>4. Let elute solvent permeate the SPE tubes before use external force. Elute with 500mL solvent twice may be better than elute with 1000mL once</li> <li>5. Change polarity or pH of sample to change the analyte's solubility</li> <li>6. Dry the SPE tubes before using non-polar solvent</li> <li>7. Reduce the strength of elute solvent</li> <li>8. Increase elute solvent volume</li> </ol>

If low recovery or poor reproducibility appear in your experiment, or the removal of impurities is not satisfied, you can analyze the cause refer to the table above or you call technique service department (021-54890099-697) for consultation. If the packing type selection is improper, we can provide free samples for further trial.



# Solid phase extraction

## Customization Service and Free Sample Trial of ANPEL

ANPEL can provide customization service of SPE tubes, please give the information include packing types, bed weight, and tube material and specifications to our sales representative. We'll provide proper products according to your requirement.

We can also provide free samples for your test: please fill the table below and provide experimental chromatogram and data after trial, in order to help us provide better service! Thank you for your support !

### Trial Feedback Table of SPE Tubes

Trial information:

Name			
Company			
Address			
Telephone			
Mobile phone			
E-mail			
Trial date			
Do you want to Purchase after Trial	<input type="checkbox"/> Yes	<input type="checkbox"/> No(Please specify the reason):	<input type="checkbox"/> Other (Please specify) :
Remarks			

SPE Tube Information:

Cat. No.	
Description	
Packaging	
Quantity	

Trial Feedback:

Analyte				
Sample Matrix				
Sample Source(e.g. extraction or synthesis from drinks, plants, bloods)				
Main disturbance and other components in Sample Matrix				
Analytic Method (Reference Standard)				
Operation Steps		Solvent	Volume	Flow Rate
	Activation			
	Condition			
	Load the Sample			
	Wash the Packing			
	Elute the Compounds of Interest			
After				
Instrument (GC/GC-MS/HPLC/LC-MS)				
Chromatography Condition	Column			
	GC (Temperature-Programming, Carrier Gas, etc.)/LC(Column Temperature, Mobile Phase Condition, etc.)			
	Detector (Condition)			
	Inject Volume			
Trial Effect	<input type="checkbox"/> Meet the test requirement	<input type="checkbox"/> Can't meet the test requirement:	<input type="checkbox"/> Other (Please specify) :	
Comments and Suggestions				

Appendix: Experimental Chromatogram

Experimental data

## SPE Columns

### Adsorption SPE Columns

#### CNWBOND Si (Silica)

CNWBOND Silica is the most polar sorbent presenting a slightly acidic character, it is often used to extract various compounds from non-polar solvents using hydrogen bonding, then accomplishing the elution successively with increasing the solvent polarity.



Technical parameters

Particle size	Pore size	Endcapped / Non-endcapped
40-63µm	60Å	Non-endcapped

CNWBOND Si SPE Cartridge

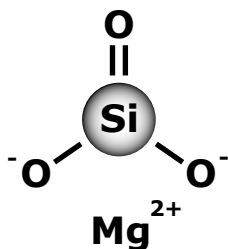
Description	Packaging	Cat. No.
50mg, 1mL	100 pcs. per box	2.CA1350.0001
100mg, 1mL	100 pcs. per box	2.CA1351.0001
200mg, 3mL	50 pcs. per box	2.CA1352.0001
500mg, 3mL	50 pcs. per box	2.CA1353.0001
500mg, 6mL	30 pcs. per box	2.CA1354.0001
1g, 6mL	30 pcs. per box	2.CA1355.0001
2g, 6mL	30 pcs. per box	2.CA1356.0001
1g, 10mL	20 pcs. per box	2.CA1357.0001
2g, 10mL	20 pcs. per box	2.CA1358.0001
5g, 35mL	20 pcs. per box	2.CA1359.0001
10g, 35mL	20 pcs. per box	2.CA1360.0001
10g, 60mL	16 pcs. per box	2.CA1361.0001
20g, 60mL	16 pcs. per box	2.CA1362.0001

CNWBOND Si SPE Bulk Packing

Description	Packaging	Cat. No.
40-63µm, 60Å	100 g. per box	2.CA1301.0001

#### CNWBOND Florisil

CNWBOND Florisil is a magnesia-loaded silica gel, which is a polar sorbent presenting slightly basic character used to extract polar to moderately polar compounds from non-polar matrices. It is utilized for the separation of chlorinated pesticides, amines, herbicides, PCBs, ketones, organic acids and phenols.



Technical parameters

Mesh	Surface area
100-200 mesh	289 m <sup>2</sup> /g

CNWBOND Florisil SPE Cartridge

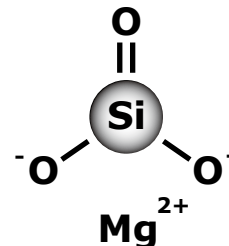
Description	Packaging	Cat. No.
50mg, 1mL	100 pcs. per box	2.CA1550.0001
100mg, 1mL	100 pcs. per box	2.CA1551.0001
200mg, 3mL	50 pcs. per box	2.CA1552.0001
500mg, 3mL	50 pcs. per box	2.CA1553.0001
500mg, 6mL	30 pcs. per box	2.CA1554.0001
1g, 6mL	30 pcs. per box	2.CA1555.0001
2g, 6mL	30 pcs. per box	2.CA1556.0001
1g, 10mL	20 pcs. per box	2.CA1557.0001
2g, 10mL	20 pcs. per box	2.CA1558.0001
5g, 35mL	20 pcs. per box	2.CA1559.0001
10g, 35mL	20 pcs. per box	2.CA1560.0001
10g, 60mL	16 pcs. per box	2.CA1561.0001
20g, 60mL	16 pcs. per box	2.CA1562.0001

CNWBOND Florisil SPE Bulk Packing

Description	Packaging	Cat. No.
100-200 mesh, 289 m <sup>2</sup> /g	100 g. per box	2.CA1501.0001

#### CNWBOND Florisil PR

CNWBOND Florisil PR is utilized for the separation of chlorinated pesticides, amines, herbicides, PCBs, ketones, organic acids and phenols. It has bigger particle size, and is suitable for US method EPA 608.



Technical parameters

Mesh
60-100 mesh

CNWBOND Florisil SPE Cartridge

Description	Packaging	Cat. No.
50mg, 1mL	100 pcs. per box	2.CA3750.0001
100mg, 1mL	100 pcs. per box	2.CA3751.0001
200mg, 3mL	50 pcs. per box	2.CA3752.0001
500mg, 3mL	50 pcs. per box	2.CA3753.0001
500mg, 6mL	30 pcs. per box	2.CA3754.0001
1g, 6mL	30 pcs. per box	2.CA3755.0001
2g, 6mL	30 pcs. per box	2.CA3756.0001
1g, 10mL	20 pcs. per box	2.CA3757.0001
2g, 10mL	20 pcs. per box	2.CA3758.0001
5g, 35mL	20 pcs. per box	2.CA3759.0001
10g, 35mL	20 pcs. per box	2.CA3760.0001
10g, 60mL	16 pcs. per box	2.CA3761.0001
20g, 60mL	16 pcs. per box	2.CA3762.0001

CNWBOND Florisil PR SPE Bulk Packing

Description	Packaging	Cat. No.
60-100 mesh	100 g. per box	2.CA3701.0001

#### CNWBOND Alumina-A

Alumina-A has a slightly cationic nature through pretreatment with acidic solutions, so it is suitable for retention of neutral and anionic species.



Technical parameters

Mesh	pH	Activity
100-300 Mesh	pH-4.5	Brockman Act. I

#### Test Method of the Activity of Alumina

##### 1 Definition of Activity

According to different water content, Alumina-N can be divided into five activity levels. Brockmann defines the alumina firing at 450 °C for 12h as I class, and II, III, IV, V class alumina are made of I class alumina mixed with 3%, 6%, 10%, 15% water.

##### 2 Testing

2.1 Chromatography Column: Glass chromatography column, φ15 mm×H150 mm, put a few of cotton wool on the bottom, load alumina for 50mm height, and knocked.

2.2 Solvent: Benzene + petroleum ether.

2.3 The preparation of activity testing solution: Follow the combination mode below, take each azo dyes 20g, and use solution(B.2.2) to constant volume to 50mL, then get the mixed dye solution.

# Solid phase extraction

First pair (I): azobenzene, AB and p-methoxyazobenzene, MAB;

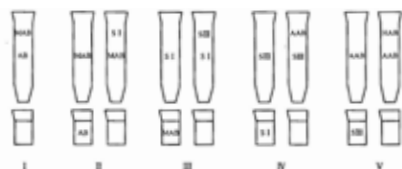
Second pair (II): MAB and Sudan I, S I;

Third pair (III): Sudan III and S III;

Fourth pair (IV): Sudan III and p-aminoazobenzene, AAB;

Fifth pair (V): AAB and p-hydroxyazobenzene, HAB

2.4 Load 10mL each mixed dye solution to five pieces of alumina chromatography column, add 20mL solution (B.2.2) after mixed dye solution drain away. Check the migration of coloured dyes in column after all solution drain away to define the activity of alumina, as shown in the following figure. If the first pair of dye solution is completely absorbed in the column, the activity of alumina is I class. If MAB in the first pair of dye solution is absorbed in the column, but AB flow out, while two compounds in the second pair of dye solution are absorbed in the column, the activity of alumina is II class. If MAB in the second pair of dye solution flow out, while two compounds in the third pair of dye solution are absorbed in the column, the activity of alumina is III class. And so on.



## CNWBOND Alumina-A SPE Cartridge

Description	Packaging	Cat. No.
50mg, 1mL	100 pcs. per box	2.CA1750.0001
100mg, 1mL	100 pcs. per box	2.CA1751.0001
200mg, 3mL	50 pcs. per box	2.CA1752.0001
500mg, 3mL	50 pcs. per box	2.CA1753.0001
500mg, 6mL	30 pcs. per box	2.CA1749.0001
1g, 6mL	30 pcs. per box	2.CA1754.0001
2g, 6mL	30 pcs. per box	2.CA1755.0001
1g, 10mL	20 pcs. per box	2.CA1756.0001
2g, 10mL	20 pcs. per box	2.CA1757.0001
5g, 35mL	20 pcs. per box	2.CA1758.0001
10g, 35mL	20 pcs. per box	2.CA1759.0001
10g, 60mL	16 pcs. per box	2.CA1760.0001
20g, 60mL	16 pcs. per box	2.CA1761.0001

## CNWBOND Alumina-A SPE Bulk Packing

Description	Packaging	Cat. No.
100-300 Mesh, pH~4.5, Brockman Act. I	100 g. per box	2.CA1701.0001

## CNWBOND Alumina-N

CNWBOND Alumina-N is an extremely polar sorbent which is similar to silica, but Alumina-N is more stable under high pH conditions than unbonded silica. It is utilized for removing aromatic species and aliphatic amines.



### Technical parameters

Mesh	pH	Activity
100-300 Mesh	pH~7.0	Brockman Act. I

## CNWBOND Alumina-N SPE Cartridge

Description	Packaging	Cat. No.
50mg, 1mL	100 pcs. per box	2.CA1850.0001
100mg, 1mL	100 pcs. per box	2.CA1851.0001
200mg, 3mL	50 pcs. per box	2.CA1852.0001
500mg, 3mL	50 pcs. per box	2.CA1853.0001
500mg, 6mL	30 pcs. per box	2.CA1854.0001

Description	Packaging	Cat. No.
1g, 3mL	30 pcs. per box	2.CA1849.0001
1g, 6mL	30 pcs. per box	2.CA1855.0001
2g, 6mL	30 pcs. per box	2.CA1856.0001
1g, 10mL	20 pcs. per box	2.CA1857.0001
2g, 10mL	20 pcs. per box	2.CA1858.0001
5g, 35mL	20 pcs. per box	2.CA1859.0001
10g, 35mL	20 pcs. per box	2.CA1860.0001
10g, 60mL	16 pcs. per box	2.CA1861.0001
20g, 60mL	16 pcs. per box	2.CA1862.0001

## CNWBOND Alumina-N SPE Cartridge for Sudan Dye

Description	Packaging	Cat. No.
1g, 3mL	50 pcs. per box	2.CA1808.0001

## CNWBOND Alumina-N SPE Bulk Packing

Description	Packaging	Cat. No.
100-300 Mesh, pH~7.0, Brockman Act. I	100 g. per box	2.CA1801.0001

## CNWBOND Alumina-B

The surface of Alumina-B has a slightly anionic nature, so it is suitable for retention of neutral and cationic compounds. Strong hydrogen bonding on Alumina-B is also effective for polar cations.



### Technical parameters

Mesh	pH	Activity
100-300 Mesh	pH~9.5	Brockman Act. I

## CNWBOND Alumina-B SPE Cartridge

Description	Packaging	Cat. No.
50mg, 1mL	100 pcs. per box	2.CA1950.0001
100mg, 1mL	100 pcs. per box	2.CA1951.0001
200mg, 3mL	50 pcs. per box	2.CA1952.0001
500mg, 3mL	50 pcs. per box	2.CA1953.0001
1g, 3mL	30 pcs. per box	2.CA1949.0001
500mg, 6mL	30 pcs. per box	2.CA1954.0001
1g, 6mL	30 pcs. per box	2.CA1955.0001
2g, 6mL	30 pcs. per box	2.CA1956.0001
1g, 10mL	20 pcs. per box	2.CA1957.0001
2g, 10mL	20 pcs. per box	2.CA1958.0001
5g, 35mL	20 pcs. per box	2.CA1959.0001
10g, 35mL	20 pcs. per box	2.CA1960.0001
10g, 60mL	16 pcs. per box	2.CA1961.0001
20g, 60mL	16 pcs. per box	2.CA1962.0001

## CNWBOND Alumina-B SPE Bulk Packing

Description	Packaging	Cat. No.
100-300 Mesh, pH~9.5, Brockman Act. I	100 g per box	2.CA1901.0001

## CNWBOND Celite545

CNWBOND Celite545 is a filter aid, treated with sodium carbonate, calcined diatomaceous silica. It is usually prepared for chromatography and other laboratory applications.



### Technical parameters

Particle size	pH
≤125µm	pH>8.5

## CNWBOND Celite545 SPE Cartridge

Description	Packaging	Cat. No.
4g, 12mL	20 pcs. per box	2.CA4099.0001

## CNWBOND Celite 545/Na<sub>2</sub>SO<sub>4</sub> SPE Cartridge

Description	Packaging	Cat. No.
4g/2g, 12mL	20 pcs. per box	2.CA5489.0001

## CNWBOND Celite545 SPE Bulk Packing

Description	Packaging	Cat. No.
≤125μm, pH>8.5	100 g per box	2. CA4001.0001

## CNWBOND Coconut Charcoal

CNWBOND Coconut Charcoal is a activated coconut charcoal which is developed specifically for EPA Method 521 (Determination of Nitrosamines in Drinking Water) and EPA Method 522 (Determination of 1,4-Dioxane in Drinking Water)

### Technical parameters

Mesh
80-120 mesh

## CNWBOND Coconut Charcoal SPE Cartridge

Description	Packaging	Cat. No.
2g, 6mL	30 pcs. per box	2.CA4256.0001

## CNWBOND Coconut Charcoal SPE Bulk Packing

Description	Packaging	Cat. No.
80-120 mesh	100 g per box	2. CA4201.0001

## CNWBOND Carbon-GCB

CNWBOND Carbon-GCB is the type of graphitized non-porous carbon, which surface comprises of hexagonal ring structures, interconnected and layered into graphitic sheets. It has extreme affinity for organic polar and non-polar compounds from both non-polar and polar matrices when used under reversed-phase conditions, while its special structure has a strong retention towards planar molecules. As its special character, it is widely utilized for replacement of C8 and C18 coated on silica when extraction for polar pesticides in water, those C8 and C18 have shown very poor efficiency of polar compounds even lower than that of technique of liquid/liquid extraction. Furthermore, non-porous nature of the carbon-GCB allows for rapid processing because of adsorption does not require analyte dispersion into solid phase pores. Its typical application includes isolation/removal of pigments, sterols, phenols, chloroanilines, organochlorine pesticides, Carbamates, Triazine, Herbicides and Chloroanilines from various matrices like ground water, fruits and vegetables etc.

### Technical parameters

Mesh	surface area
120-400 mesh	100 m <sup>2</sup> /g

## CNWBOND Carbon-GCB SPE Cartridge

Description	Packaging	Cat. No.
50mg, 1mL	100 pcs. per box	2.CA1650.0001
100mg, 1mL	100 pcs. per box	2.CA1651.0001
250mg, 3mL	50 pcs. per box	2.CA1663.0001
250mg, 6mL	30 pcs. per box	2.CA1664.0001
500mg, 6mL	30 pcs. per box	2.CA1654.0001

Description	Packaging	Cat. No.
1g, 10mL	20 pcs. per box	2.CA1657.0001
2g, 10mL	20 pcs. per box	2.CA1658.0001
2g, 35mL	20 pcs. per box	2.CA1665.0001
5g, 35mL	20 pcs. per box	2.CA1659.0001
10g, 60mL	16 pcs. per box	2.CA1661.0001
20g, 60mL	16 pcs. per box	2.CA1662.0001

## CNWBOND Carbon-GCB SPE Bulk Packing

Description	Packaging	Cat. No.
120-400 mesh, 100 m <sup>2</sup> /g	50 g per box	2. CA1600.0001

## Reverse phase SPE Columns

### CNWBOND C1



CNWBOND C1 has the lowest hydrophobicity of all alkyl group bonded phases. Due to the single carbon functional group, the sorbent is useful in the separation of large biomolecules that have extensive hydrophobic regions, and polar compounds that are easier to be retained and eluted.

### Technical parameters

Particle Size	Mean Pore Size	Carbon Loading	Endcapped/Non-endcapped
40-63μm	60Å	5%	Endcapped

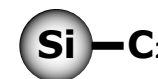
## CNWBOND C1 SPE Cartridge

Description	Packaging	Cat. No.
50mg, 1mL	100 pcs. per box	2.CA0150.0001
100mg, 1mL	100 pcs. per box	2.CA0151.0001
200mg, 3mL	50 pcs. per box	2.CA0152.0001
500mg, 3mL	50 pcs. per box	2.CA0153.0001
500mg, 6mL	30 pcs. per box	2.CA0154.0001
1g, 6mL	30 pcs. per box	2.CA0155.0001
2g, 6mL	30 pcs. per box	2.CA0156.0001
1g, 10mL	20 pcs. per box	2.CA0157.0001
2g, 10mL	20 pcs. per box	2.CA0158.0001
5g, 35mL	20 pcs. per box	2.CA0159.0001
10g, 35mL	20 pcs. per box	2.CA0160.0001
10g, 60mL	16 pcs. per box	2.CA0161.0001
20g, 60mL	16 pcs. per box	2.CA0162.0001

## CNWBOND C1 SPE Bulk Packing

Description	Packaging	Cat. No.
40-63μm, 60Å	100 g. per box	2.CA0101.0001

### CNWBOND C2-ne



CNWBOND C2-ne is a non-polar sorbent with low hydrophobicity which can be used to replace C18 and C8 when compounds are retained too strongly on the C18 and C8. It is popular for the extraction of drugs from plasma and serum.

### Technical parameters

Particle Size	Mean Pore Size	Carbon Loading	Endcapped/Non-endcapped
40-63μm	60Å	6%	Non-endcapped

## CNWBOND C2-ne SPE Cartridge

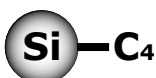
Description	Packaging	Cat. No.
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100mg, 1mL	100 pcs. per box	2.CA0251.0001

Description	Packaging	Cat. No.
200mg, 3mL	50 pcs. per box	2.CA0252.0001
500mg, 3mL	50 pcs. per box	2.CA0253.0001
500mg, 6mL	30 pcs. per box	2.CA0254.0001
1g, 6mL	30 pcs. per box	2.CA0255.0001
2g, 6mL	30 pcs. per box	2.CA0256.0001
1g, 10mL	20 pcs. per box	2.CA0257.0001
2g, 10mL	20 pcs. per box	2.CA0258.0001
5g, 35mL	20 pcs. per box	2.CA0259.0001
10g, 35mL	20 pcs. per box	2.CA0260.0001
10g, 60mL	16 pcs. per box	2.CA0261.0001
20g, 60mL	16 pcs. per box	2.CA0262.0001

#### CNWBOND C2-ne SPE Bulk Packing

Description	Packaging	Cat. No.
40-63µm, 60Å	100 g. per box	2.CA0201.0001

### CNWBOND C4



CNWBOND C4 has moderate hydrophobicity which is used to extract large biomolecules like proteins/peptides in aqueous samples. It works best for molecules with a large hydrophilic region or in case where the hydrophobic region is buried with the 3D structure.

#### Technical parameters

Particle Size	Mean Pore Size	Carbon Loading	Endcapped/ Non- endcapped
40-63µm	60Å	8%	Endcapped

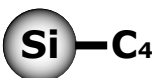
#### CNWBOND C4 SPE Cartridge

Description	Packaging	Cat. No.
50mg, 1mL	100 pcs. per box	2.CA0350.0001
100mg, 1mL	100 pcs. per box	2.CA0351.0001
200mg, 3mL	50 pcs. per box	2.CA0352.0001
500mg, 3mL	50 pcs. per box	2.CA0353.0001
500mg, 6mL	30 pcs. per box	2.CA0354.0001
1g, 6mL	30 pcs. per box	2.CA0355.0001
2g, 6mL	30 pcs. per box	2.CA0356.0001
1g, 10mL	20 pcs. per box	2.CA0357.0001
2g, 10mL	20 pcs. per box	2.CA0358.0001
5g, 35mL	20 pcs. per box	2.CA0359.0001
10g, 35mL	20 pcs. per box	2.CA0360.0001
10g, 60mL	16 pcs. per box	2.CA0361.0001
20g, 60mL	16 pcs. per box	2.CA0362.0001

#### CNWBOND C4 SPE Bulk Packing

Description	Packaging	Cat. No.
40-63µm, 60Å	100 g. per box	2.CA0301.0001

### CNWBOND C4-ne



Due to shorter alkyl chains and non-endcapped the silica surface is not completely shielded, CNWBOND C4-ne is similar to C4 but more polar so as to enhance retention of basic and polar compounds.

#### Technical parameters

Particle Size	Mean Pore Size	Carbon Loading	Endcapped/ Non- endcapped
40-63µm	60Å	8%	Non- endcapped

#### CNWBOND C4-ne SPE Cartridge

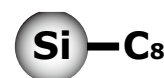
Description	Packaging	Cat. No.
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100mg, 1mL	100 pcs. per box	2.CA0451.0001

Description	Packaging	Cat. No.
200mg, 3mL	50 pcs. per box	2.CA0452.0001
500mg, 3mL	50 pcs. per box	2.CA0453.0001
500mg, 6mL	30 pcs. per box	2.CA0454.0001
1g, 6mL	30 pcs. per box	2.CA0455.0001
2g, 6mL	30 pcs. per box	2.CA0456.0001
1g, 10mL	20 pcs. per box	2.CA0457.0001
2g, 10mL	20 pcs. per box	2.CA0458.0001
5g, 35mL	20 pcs. per box	2.CA0459.0001
10g, 35mL	20 pcs. per box	2.CA0460.0001
10g, 60mL	16 pcs. per box	2.CA0461.0001
20g, 60mL	16 pcs. per box	2.CA0462.0001

#### CNWBOND C4-ne SPE Bulk Packing

Description	Packaging	Cat. No.
40-63µm, 60Å	100 g. per box	2.CA0401.0001

### CNWBOND C8



CNWBOND C8 has moderate hydrophobicity that works well for separating a wide range of compounds and to be used instead of C18 when too strongly retention on C18. The C8 is widely utilized in the simultaneous extraction of fat- and water-soluble vitamins from human serum and herbicides, fungicides, pesticides from waste material.

#### Technical parameters

Particle Size	Mean Pore Size	Carbon Loading	Endcapped/ Non- endcapped
40-63µm	60Å	12%	Endcapped

#### CNWBOND C8 SPE Cartridge

Description	Packaging	Cat. No.
50mg, 1mL	100 pcs. per box	2.CA0550.0001
100mg, 1mL	100 pcs. per box	2.CA0551.0001
200mg, 3mL	50 pcs. per box	2.CA0552.0001
500mg, 3mL	50 pcs. per box	2.CA0553.0001
500mg, 6mL	30 pcs. per box	2.CA0554.0001
1g, 6mL	30 pcs. per box	2.CA0555.0001
2g, 6mL	30 pcs. per box	2.CA0556.0001
1g, 10mL	20 pcs. per box	2.CA0557.0001
2g, 10mL	20 pcs. per box	2.CA0558.0001
5g, 35mL	20 pcs. per box	2.CA0559.0001
10g, 35mL	20 pcs. per box	2.CA0560.0001
10g, 60mL	16 pcs. per box	2.CA0561.0001
20g, 60mL	16 pcs. per box	2.CA0562.0001

#### CNWBOND C8 SPE Bulk Packing

Description	Packaging	Cat. No.
40-63µm, 60Å	100 g. per box	2.CA0501.0001

### CNWBOND C8-ne



CNWBOND C8-ne is similar to C8 but is non-endcapped, which has enhanced retention of more polar and basic compounds at the same time.

#### Technical parameters

Particle Size	Mean Pore Size	Carbon Loading	Endcapped/ Non- endcapped
40-63µm	60Å	12%	Non- endcapped

#### CNWBOND C8-ne SPE Cartridge

Description	Packaging	Cat. No.
50mg, 1mL	100 pcs. per box	2.CA0650.0001



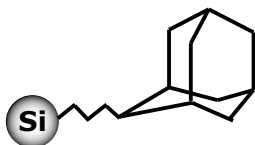
Description	Packaging	Cat. No.
100mg, 1mL	100 pcs. per box	2.CA0651.0001
200mg, 3mL	50 pcs. per box	2.CA0652.0001
500mg, 3mL	50 pcs. per box	2.CA0653.0001
500mg, 6mL	30 pcs. per box	2.CA0654.0001
1g, 6mL	30 pcs. per box	2.CA0655.0001
2g, 6mL	30 pcs. per box	2.CA0656.0001
1g, 10mL	20 pcs. per box	2.CA0657.0001
2g, 10mL	20 pcs. per box	2.CA0658.0001
5g, 35mL	20 pcs. per box	2.CA0659.0001
10g, 35mL	20 pcs. per box	2.CA0660.0001
10g, 60mL	16 pcs. per box	2.CA0661.0001
20g, 60mL	16 pcs. per box	2.CA0662.0001

### CNWBOND C8-ne SPE Bulk Packing

Description	Packaging	Cat. No.
40-63µm, 60Å	100 g. per box	2.CA0601.0001

### CNWBOND C12

CNWBOND C12 has a polarity similar to C18 with additional steric bulk to provide additional separation characteristics.



#### Technical parameters

Particle Size	Mean Pore Size	Carbon Loading	Endcapped/Non-endcapped
40-63µm	60Å	16%	Endcapped

### CNWBOND C12 SPE Cartridge

Description	Packaging	Cat. No.
50mg, 1mL	100 pcs. per box	2.CA0750.0001
100mg, 1mL	100 pcs. per box	2.CA0751.0001
200mg, 3mL	50 pcs. per box	2.CA0752.0001
500mg, 3mL	50 pcs. per box	2.CA0753.0001
500mg, 6mL	30 pcs. per box	2.CA0754.0001
1g, 6mL	30 pcs. per box	2.CA0755.0001
2g, 6mL	30 pcs. per box	2.CA0756.0001
1g, 10mL	20 pcs. per box	2.CA0757.0001
2g, 10mL	20 pcs. per box	2.CA0758.0001
5g, 35mL	20 pcs. per box	2.CA0759.0001
10g, 35mL	20 pcs. per box	2.CA0760.0001
10g, 60mL	16 pcs. per box	2.CA0761.0001
20g, 60mL	16 pcs. per box	2.CA0762.0001

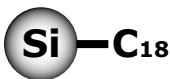
### CNWBOND C12 SPE Bulk Packing

Description	Packaging	Cat. No.
40-63µm, 60Å	100 g. per box	2.CA0701.0001

### CNWBOND HC-C18

CNWBOND HC-C18 is the traditional matrix for reversed-phase chromatography. It is widely used as the most hydrophobic silica-based sorbent for nonpolar compounds. Considered as the least selective phase since it retains most organic analytes from aqueous matrices, offer a benefit when the compounds of interest vary widely in structure. C18 can also be utilized for desalting aqueous matrices prior to ion exchange because salts pass through it without retained. The high loading of HC-C18 provides the highest degree of hydrophobicity which increases binding capacities and higher recoveries, higher carbon loading also offer greater resistance to extreme pH conditions.

C18 is utilized for cleaning, extracting and concentrating pollutants



from aqueous environmental samples, herbicides, fungicides and pesticides from waste material, foods and beverages, typically drugs and metabolites from physiological fluids.

#### Technical parameters

Particle Size	Mean Pore Size	Carbon Loading	Endcapped/Non-endcapped
40-63µm	60Å	17%	Endcapped

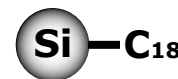
### CNWBOND HC-C18 SPE Cartridge

Description	Packaging	Cat. No.
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100mg, 1mL	100 pcs. per box	2.CA0851.0001
200mg, 3mL	50 pcs. per box	2.CA0852.0001
500mg, 3mL	50 pcs. per box	2.CA0853.0001
500mg, 6mL	30 pcs. per box	2.CA0854.0001
1g, 6mL	30 pcs. per box	2.CA0855.0001
2g, 6mL	30 pcs. per box	2.CA0856.0001
1g, 10mL	20 pcs. per box	2.CA0857.0001
2g, 10mL	20 pcs. per box	2.CA0858.0001
5g, 35mL	20 pcs. per box	2.CA0859.0001
10g, 35mL	20 pcs. per box	2.CA0860.0001
10g, 60mL	16 pcs. per box	2.CA0861.0001
20g, 60mL	16 pcs. per box	2.CA0862.0001

### CNWBOND HC-C18 SPE Bulk Packing

Description	Packaging	Cat. No.
40-63µm, 60Å	100 g. per box	2.CA0801.0001

### CNWBOND LC-C18



CNWBOND LC-C18 has lower carbon loading than HC-C18, which gives unique selectivities. It is also a highly retentive nonpolar silica-based sorbent due to the long hydrocarbon chain, the lower percent carbon loading has been optimized for polar analytes and very strong nonpolar compounds which is too strongly retained on high carbon loading C18. Its typical sample types are nonpolar compounds from water and aqueous biological fluids.

#### Technical parameters

Particle Size	Mean Pore Size	Carbon Loading	Endcapped/Non-endcapped
40-63µm	60Å	11%	Endcapped

### CNWBOND LC-C18 SPE Cartridge

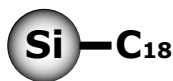
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500mg, 3mL	50 pcs. per box	2.CA0953.0001
500mg, 6mL	30 pcs. per box	2.CA0954.0001
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5g, 35mL	20 pcs. per box	2.CA0959.0001
10g, 35mL	20 pcs. per box	2.CA0960.0001
10g, 60mL	16 pcs. per box	2.CA0961.0001
20g, 60mL	16 pcs. per box	2.CA0962.0001

### CNWBOND LC-C18 SPE Bulk Packing

Description	Packaging	Cat. No.
40-63µm, 60Å	100 g. per box	2.CA0901.0001

# Solid phase extraction

## CNWBOND C18-ne



CNWBOND C18-ne is a non-encapped octadecyl bonded phase that enables the silica surface to be more active. The silanol activity permits fractionation of metabolites and enhances retention of basic compounds compared with encapped C18. So its retention mechanism includes moderately nonpolar and polar secondary interactions, typically it is used for extracting compounds from biological matrices and aqueous samples.

Technical parameters

Particle Size	Mean Pore Size	Carbon Loading	Encapped/ Non-encapped
40-63µm	60Å	17%	Non-encapped

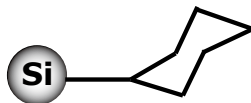
CNWBOND C18-ne SPE Cartridge

Description	Packaging	Cat. No.
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500mg, 3mL	50 pcs. per box	2.CA1053.0001
500mg, 6mL	30 pcs. per box	2.CA1054.0001
1g, 6mL	30 pcs. per box	2.CA1055.0001
2g, 6mL	30 pcs. per box	2.CA1056.0001
1g, 10mL	20 pcs. per box	2.CA1057.0001
2g, 10mL	20 pcs. per box	2.CA1058.0001
5g, 35mL	20 pcs. per box	2.CA1059.0001
10g, 35mL	20 pcs. per box	2.CA1060.0001
10g, 60mL	16 pcs. per box	2.CA1061.0001
20g, 60mL	16 pcs. per box	2.CA1062.0001

CNWBOND C18-ne SPE Bulk Packing

Description	Packaging	Cat. No.
40-63µm, 60Å	100 g. per box	2.CA1001.0001

## CNWBOND CYH(Cyclohexyl)



CNWBOND CYH (Cyclohexyl) is a sorbent of medium polarity used in reversed-phase chromatography. The properties of CH functional groups have ability to retain polar analytes such as phenol from aqueous matrices, because it has a different selectivity than the other nonpolar sorbent like C18, C8, C4 and Phenyl, it is usually used when those nonpolar sorbents fail to provide the desired selectivity.

Technical parameters

Particle Size	Mean Pore Size	Carbon Loading	Encapped/ Non-encapped
40-63µm	60Å	10%	Encapped

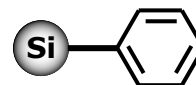
CNWBOND CYH SPE Cartridge

Description	Packaging	Cat. No.
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200mg, 3mL	50 pcs. per box	2.CA1152.0001
500mg, 3mL	50 pcs. per box	2.CA1153.0001
500mg, 6mL	30 pcs. per box	2.CA1154.0001
1g, 6mL	30 pcs. per box	2.CA1155.0001
2g, 6mL	30 pcs. per box	2.CA1156.0001
1g, 10mL	20 pcs. per box	2.CA1157.0001
2g, 10mL	20 pcs. per box	2.CA1158.0001
5g, 35mL	20 pcs. per box	2.CA1159.0001
10g, 35mL	20 pcs. per box	2.CA1160.0001
10g, 60mL	16 pcs. per box	2.CA1161.0001
20g, 60mL	16 pcs. per box	2.CA1162.0001

CNWBOND CYH SPE Bulk Packing

Description	Packaging	Cat. No.
40-63µm, 60Å	100 g. per box	2.CA1101.0001

## CNWBOND PHE (Phenyl)



CNWBOND PHE (Phenyl) sorbent has medium polarity used in nonpolar extractions. It has similar retention to C8 but with a different selectivity especially for planar and conjugated molecules containing aromatics and fatty acids because of its electron density of aromatic ring.

Technical parameters

Particle Size	Mean Pore Size	Carbon Loading	Encapped/ Non-encapped
40-63µm	60Å	9%	Encapped

CNWBOND PHE SPE Cartridge

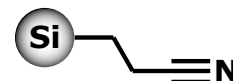
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100mg, 1mL	100 pcs. per box	2.CA1251.0001
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500mg, 3mL	50 pcs. per box	2.CA1253.0001
500mg, 6mL	30 pcs. per box	2.CA1254.0001
1g, 6mL	30 pcs. per box	2.CA1255.0001
2g, 6mL	30 pcs. per box	2.CA1256.0001
1g, 10mL	20 pcs. per box	2.CA1257.0001
2g, 10mL	20 pcs. per box	2.CA1258.0001
5g, 35mL	20 pcs. per box	2.CA1259.0001
10g, 35mL	20 pcs. per box	2.CA1260.0001
10g, 60mL	16 pcs. per box	2.CA1261.0001
20g, 60mL	16 pcs. per box	2.CA1262.0001

CNWBOND PHE SPE Bulk Packing

Description	Packaging	Cat. No.
40-63µm, 60Å	100 g. per box	2.CA1201.0001

## Normal phase SPE Columns

### CNWBOND CN(Cyano)



CNWBOND CN (Cyano) can be used both in normal and reversed-phase chromatography as its less polar compared to silica and less hydrophobic compared to C18 and C8. The sorbent is usually used to extract acidic, neutral, and basic compounds from aqueous solutions.

Technical parameters

Particle Size	Mean Pore Size	Carbon Loading	Encapped/ Non-encapped
40-63µm	60Å	7%	Encapped

CNWBOND CN SPE Cartridge

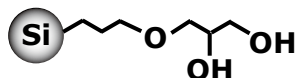
Description	Packaging	Cat. No.
50mg, 1mL	100 pcs. per box	2.CA1450.0001
100mg, 1mL	100 pcs. per box	2.CA1451.0001
200mg, 3mL	50 pcs. per box	2.CA1452.0001
500mg, 3mL	50 pcs. per box	2.CA1453.0001
500mg, 6mL	30 pcs. per box	2.CA1454.0001
1g, 6mL	30 pcs. per box	2.CA1455.0001
2g, 6mL	30 pcs. per box	2.CA1456.0001
1g, 10mL	20 pcs. per box	2.CA1457.0001

Description	Packaging	Cat. No.
2g, 10mL	20 pcs. per box	2.CA1458.0001
5g, 35mL	20 pcs. per box	2.CA1459.0001
10g, 35mL	20 pcs. per box	2.CA1460.0001
10g, 60mL	16 pcs. per box	2.CA1461.0001
20g, 60mL	16 pcs. per box	2.CA1462.0001

#### CNWBOND CN SPE Bulk Packing

Description	Packaging	Cat. No.
40-63 $\mu$ m, 60Å	100 g. per box	2.CA1401.0001

#### CNWBOND Diol



CNWBOND Diol is used as polar sorbent in normal phase, which has the ability to form hydrogen bonds and the capacity to separate structural isomers like unbonded silica. However, it also has a different selectivity than bare silica gel and slight modifications in the composition of the solvent mixture may be necessary to obtain a similar retention. Usually, it is utilized for isolation of drugs and metabolites from physiological fluids.

#### Technical parameters

Particle Size	Mean Pore Size	Carbon Loading	Endcapped/Non-endcapped
40-63 $\mu$ m	60Å	7%	Non-endcapped

#### CNWBOND Diol SPE Cartridge

Description	Packaging	Cat. No.
50mg, 1mL	100 pcs. per box	2.CA2050.0001
100mg, 1mL	100 pcs. per box	2.CA2051.0001
200mg, 3mL	50 pcs. per box	2.CA2052.0001
500mg, 3mL	50 pcs. per box	2.CA2053.0001
500mg, 6mL	30 pcs. per box	2.CA2054.0001
1g, 6mL	30 pcs. per box	2.CA2055.0001
2g, 6mL	30 pcs. per box	2.CA2056.0001
1g, 10mL	20 pcs. per box	2.CA2057.0001
2g, 10mL	20 pcs. per box	2.CA2058.0001
5g, 35mL	20 pcs. per box	2.CA2059.0001
10g, 35mL	20 pcs. per box	2.CA2060.0001
10g, 60mL	16 pcs. per box	2.CA2061.0001
20g, 60mL	16 pcs. per box	2.CA2062.0001

#### CNWBOND Diol SPE Bulk Packing

Description	Packaging	Cat. No.
40-63 $\mu$ m, 60Å	100 g. per box	2.CA2001.0001

## Ion exchange SPE Columns

#### CNWBOND NH<sub>2</sub>



CNWBOND NH<sub>2</sub> is an aminopropyl phase that is very polar in nature utilizing both hydrogen bonding and anion exchange. Since the pKa of NH<sub>2</sub> is 9.8, when used at pH  $\leq$  7.8, the functional groups are positively charged. Therefore, it is a weaker anion exchanger for retention of very strong anions such as sulfonic acids which may be retained irreversibly on SAX.

Its typical application includes separation of peptides, drugs and metabolites from physiological fluids, and also it is used for extraction of mono- and polysaccharides, steroids, cholesterol and triglycerides.

#### Technical parameters

Particle Size	Mean Pore Size	Exchange Capacity	Endcapped/Non-endcapped
40-63 $\mu$ m	60Å	1.6 meq/g	Endcapped

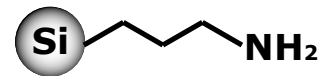
#### CNWBOND NH<sub>2</sub> SPE Cartridge

Description	Packaging	Cat. No.
50mg, 1mL	100 pcs. per box	2.CA2150.0001
100mg, 1mL	100 pcs. per box	2.CA2151.0001
200mg, 3mL	50 pcs. per box	2.CA2152.0001
500mg, 3mL	50 pcs. per box	2.CA2153.0001
500mg, 6mL	30 pcs. per box	2.CA2154.0001
1g, 6mL	30 pcs. per box	2.CA2155.0001
2g, 6mL	30 pcs. per box	2.CA2156.0001
1g, 10mL	20 pcs. per box	2.CA2157.0001
2g, 10mL	20 pcs. per box	2.CA2158.0001
5g, 35mL	20 pcs. per box	2.CA2159.0001
10g, 35mL	20 pcs. per box	2.CA2160.0001
10g, 60mL	16 pcs. per box	2.CA2161.0001
20g, 60mL	16 pcs. per box	2.CA2162.0001

#### CNWBOND NH<sub>2</sub> SPE Bulk Packing

Description	Packaging	Cat. No.
40-63 $\mu$ m, 60Å	100 g. per box	2.CA2101.0001

#### CNWBOND NH<sub>2</sub>-ne



CNWBOND NH<sub>2</sub>-ne is non-endcapped of CNWBOND NH<sub>2</sub>. Non-endcapped of is NH<sub>2</sub> similar to that with endcapped aminopropyl, and it has additional retention of polar and cationic compounds.

#### Technical parameters

Particle Size	Mean Pore Size	Exchange Capacity	Endcapped/Non-endcapped
40-63 $\mu$ m	60Å	1.6 meq/g	Non-endcapped

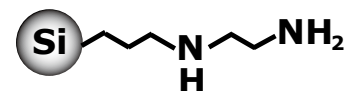
#### CNWBOND NH<sub>2</sub>-ne SPE Cartridge

Description	Packaging	Cat. No.
50mg, 1mL	100 pcs. per box	2.CA2150.0001
100mg, 1mL	100 pcs. per box	2.CA2151.0001
200mg, 3mL	50 pcs. per box	2.CA2152.0001
500mg, 3mL	50 pcs. per box	2.CA2153.0001
500mg, 6mL	30 pcs. per box	2.CA2154.0001
1g, 6mL	30 pcs. per box	2.CA2155.0001
2g, 6mL	30 pcs. per box	2.CA2156.0001
1g, 10mL	20 pcs. per box	2.CA2157.0001
2g, 10mL	20 pcs. per box	2.CA2158.0001
5g, 35mL	20 pcs. per box	2.CA2159.0001
10g, 35mL	20 pcs. per box	2.CA2160.0001
10g, 60mL	16 pcs. per box	2.CA2161.0001
20g, 60mL	16 pcs. per box	2.CA2162.0001

#### CNWBOND NH<sub>2</sub>-ne SPE Bulk Packing

Description	Packaging	Cat. No.
40-63 $\mu$ m, 60Å	100 g. per box	2.CA2101.0001

#### CNWBOND PSA



CNWBOND PSA is similar to CNWBOND NH<sub>2</sub> in terms of selectivity. As an anion exchange sorbent bonded with ethylenediamine-N-propyl, PSA has two amine groups

# Solid phase extraction

that offer much higher ionic capacity, and exhibits a pKa of 10.1 and 10.9. Therefore, PSA has strong affinity and high capacity for removing fatty acids, organic acids, and some polar pigments and sugars when conducting multi-residue pesticide analysis in foods, its functional group is a very good bidentate ligand making PSA an excellent sorbent for chelation.

Technical parameters

Particle Size	Mean Pore Size	Exchange Capacity	Endcapped/ Non- endcapped
40-63µm	60Å	1.4 meq/g	Endcapped

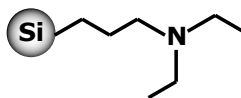
CNWBOND PSA SPE Cartridge

Description	Packaging	Cat. No.
50mg, 1mL	100 pcs. per box	2.CA2450.0001
100mg, 1mL	100 pcs. per box	2.CA2451.0001
200mg, 3mL	50 pcs. per box	2.CA2452.0001
500mg, 3mL	50 pcs. per box	2.CA2453.0001
500mg, 6mL	30 pcs. per box	2.CA2454.0001
1g, 6mL	30 pcs. per box	2.CA2455.0001
2g, 6mL	30 pcs. per box	2.CA2456.0001
1g, 10mL	20 pcs. per box	2.CA2457.0001
2g, 10mL	20 pcs. per box	2.CA2458.0001
5g, 35mL	20 pcs. per box	2.CA2459.0001
10g, 35mL	20 pcs. per box	2.CA2460.0001
10g, 60mL	16 pcs. per box	2.CA2461.0001
20g, 60mL	16 pcs. per box	2.CA2462.0001

CNWBOND PSA SPE Bulk Packing

Description	Packaging	Cat. No.
40-63µm, 60Å	100 g. per box	2.CA2401.0001

## CNWBOND WAX



CNWBOND WAX has some resemblance to CNWBOND NH<sub>2</sub> and CNWBOND PSA in its properties. It has a pKa of 10.5 because of diethylaminopropyl functional group, and is preferred over CNWBOND SAX when performing release of interest compounds which has strong ions. The additional carbon chains make WAX a more nonpolar character than NH<sub>2</sub>, and even less polar than C2 and CN.

Technical parameters

Particle Size	Mean Pore Size	Exchange Capacity	Endcapped/ Non- endcapped
40-63µm	60Å	1.2 meq/g	Endcapped

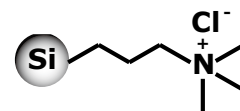
CNWBOND WAX SPE Cartridge

Description	Packaging	Cat. No.
50mg, 1mL	100 pcs. per box	2.CA2350.0001
100mg, 1mL	100 pcs. per box	2.CA2351.0001
200mg, 3mL	50 pcs. per box	2.CA2352.0001
500mg, 3mL	50 pcs. per box	2.CA2353.0001
500mg, 6mL	30 pcs. per box	2.CA2354.0001
1g, 6mL	30 pcs. per box	2.CA2355.0001
2g, 6mL	30 pcs. per box	2.CA2356.0001
1g, 10mL	20 pcs. per box	2.CA2357.0001
2g, 10mL	20 pcs. per box	2.CA2358.0001
5g, 35mL	20 pcs. per box	2.CA2359.0001
10g, 35mL	20 pcs. per box	2.CA2360.0001
10g, 60mL	16 pcs. per box	2.CA2361.0001
20g, 60mL	16 pcs. per box	2.CA2362.0001

CNWBOND WAX SPE Bulk Packing

Description	Packaging	Cat. No.
40-63µm, 60Å	100 g. per box	2.CA2301.0001

## CNWBOND SAX



CNWBOND SAX is a strongest anion exchange sorbent because of its quaternary amine functional group. The sorbent is always positive charged, which is good choice for retention of weaker anions such as carboxylic acids that may not retain strongly enough on WAX or NH<sub>2</sub> and PSA. Since the chloride counter ion is bound to the ammonium, it may be suited to activate the ion exchanger by conditioning it with appropriate buffers.

Technical parameters

Particle Size	Mean Pore Size	Exchange Capacity	Endcapped/ Non- endcapped
40-63µm	60Å	1.1 meq/g	Non- endcapped

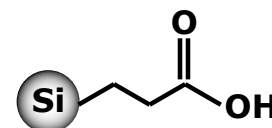
CNWBOND SAX SPE Cartridge

Description	Packaging	Cat. No.
50mg, 1mL	100 pcs. per box	2.CA2550.0001
100mg, 1mL	100 pcs. per box	2.CA2551.0001
200mg, 3mL	50 pcs. per box	2.CA2552.0001
500mg, 3mL	50 pcs. per box	2.CA2553.0001
500mg, 6mL	30 pcs. per box	2.CA2554.0001
1g, 6mL	30 pcs. per box	2.CA2555.0001
2g, 6mL	30 pcs. per box	2.CA2556.0001
1g, 10mL	20 pcs. per box	2.CA2557.0001
2g, 10mL	20 pcs. per box	2.CA2558.0001
5g, 35mL	20 pcs. per box	2.CA2559.0001
10g, 35mL	20 pcs. per box	2.CA2560.0001
10g, 60mL	16 pcs. per box	2.CA2561.0001
20g, 60mL	16 pcs. per box	2.CA2562.0001

CNWBOND SAX SPE Bulk Packing

Description	Packaging	Cat. No.
40-63µm, 60Å	100 g. per box	2.CA2501.0001

## CNWBOND WCX



CNWBOND WCX is a carboxy propyl functionalized silica which has a medium polarity. It is primarily used as a weak cation exchanger that does not require extreme basic conditions for elution because of its 4.5 pKa. CNWBOND WCX is often the best choice for cation exchange especially when dialing with very strong cations in case of making release of the compound of interest on SCX is difficult because of the strong interaction between the two strong ions.

Technical parameters

Particle Size	Mean Pore Size	Exchange Capacity	Endcapped/ Non- endcapped
40-63µm	60Å	1.4 meq/g	Endcapped

CNWBOND WCX SPE Cartridge

Description	Packaging	Cat. No.
50mg, 1mL	100 pcs. per box	2.CA2650.0001
100mg, 1mL	100 pcs. per box	2.CA2651.0001
200mg, 3mL	50 pcs. per box	2.CA2652.0001
500mg, 3mL	50 pcs. per box	2.CA2653.0001
500mg, 6mL	30 pcs. per box	2.CA2654.0001
1g, 6mL	30 pcs. per box	2.CA2655.0001
2g, 6mL	30 pcs. per box	2.CA2656.0001
1g, 10mL	20 pcs. per box	2.CA2657.0001
2g, 10mL	20 pcs. per box	2.CA2658.0001
5g, 35mL	20 pcs. per box	2.CA2659.0001
10g, 35mL	20 pcs. per box	2.CA2660.0001

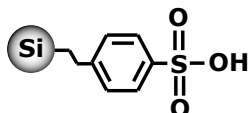


Description	Packaging	Cat. No.
10g, 60mL	16 pcs. per box	2.CA2661.0001
20g, 60mL	16 pcs. per box	2.CA2662.0001

#### CNWBOND WCX SPE Bulk Packing

Description	Packaging	Cat. No.
40-63 $\mu$ m, 60Å	100 g. per box	2.CA2601.0001

#### CNWBOND SCX



CNWBOND SCX is a strongest cation exchange sorbent because of its benzenesulfonic acid functional group. It has been optimized for use in organic applications, which will not dissolve in methanol or any other solvents. The presence of the benzene ring on its surface exhibits nonpolar character which is useful with compounds that has both cationic and nonpolar properties in aqueous solvent.

#### Technical parameters

Particle Size	Mean Pore Size	Exchange Capacity	Endcapped/Non-endcapped
40-63 $\mu$ m	60Å	0.8 meq/g	Endcapped

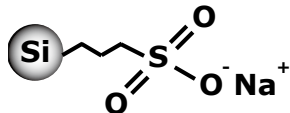
#### CNWBOND SCX SPE Cartridge

Description	Packaging	Cat. No.
50mg, 1mL	100 pcs. per box	2.CA2850.0001
100mg, 1mL	100 pcs. per box	2.CA2851.0001
200mg, 3mL	50 pcs. per box	2.CA2852.0001
500mg, 3mL	50 pcs. per box	2.CA2853.0001
500mg, 6mL	30 pcs. per box	2.CA2854.0001
1g, 6mL	30 pcs. per box	2.CA2855.0001
2g, 6mL	30 pcs. per box	2.CA2856.0001
1g, 10mL	20 pcs. per box	2.CA2857.0001
2g, 10mL	20 pcs. per box	2.CA2858.0001
5g, 35mL	20 pcs. per box	2.CA2859.0001
10g, 35mL	20 pcs. per box	2.CA2860.0001
10g, 60mL	16 pcs. per box	2.CA2861.0001
20g, 60mL	16 pcs. per box	2.CA2862.0001

#### CNWBOND SCX SPE Bulk Packing

Description	Packaging	Cat. No.
40-63 $\mu$ m, 60Å	100 g. per box	2.CA2801.0001

#### CNWBOND PRS



CNWBOND PRS is a strong cation exchange sorbent which is similar to CNWBOND SCX but slightly less acidic. It maintains a negative charge throughout the pH scale, so it is most effective for weaker cations such as pyridinium compounds. Its typical application includes malachite green and other basic molecules from water and biological samples.

#### Technical parameters

Particle Size	Mean Pore Size	Exchange Capacity	Endcapped/Non-endcapped
40-63 $\mu$ m	60Å	1.0 meq/g	Endcapped

#### CNWBOND PRS SPE Cartridge

Description	Packaging	Cat. No.
50mg, 1mL	100 pcs. per box	2.CA2750.0001
100mg, 1mL	100 pcs. per box	2.CA2751.0001
200mg, 3mL	50 pcs. per box	2.CA2752.0001

Description	Packaging	Cat. No.
500mg, 3mL	50 pcs. per box	2.CA2753.0001
500mg, 6mL	30 pcs. per box	2.CA2754.0001
1g, 6mL	30 pcs. per box	2.CA2755.0001
2g, 6mL	30 pcs. per box	2.CA2756.0001
1g, 10mL	20 pcs. per box	2.CA2757.0001
2g, 10mL	20 pcs. per box	2.CA2758.0001
5g, 35mL	20 pcs. per box	2.CA2759.0001
10g, 35mL	20 pcs. per box	2.CA2760.0001
10g, 60mL	16 pcs. per box	2.CA2761.0001
20g, 60mL	16 pcs. per box	2.CA2762.0001

#### CNWBOND PRS SPE Bulk Packing

Description	Packaging	Cat. No.
40-63 $\mu$ m, 60Å	100 g. per box	2.CA2701.0001

#### CNWBOND C8/SAX

CNWBOND C8/SAX sorbent contains both octyl (C8) and quaternary amine (SAX) bondings, which exhibits dual retention mechanism for isolating of neutral, basic, acidic and zwitterionic compounds. Its mixed-mode anion exchange character develops for superior selectivity of sample clean up when extracting acidic and neutral compounds from aqueous solutions, typically salicylic acid, ibuprofen, acetaminophen, drugs and metabolites from physiological fluids.

#### Technical parameters

Particle Size	Mean Pore Size	Endcapped/Non-endcapped
40-63 $\mu$ m	60Å	Endcapped

#### CNWBOND C8/SAX SPE Cartridge

Description	Packaging	Cat. No.
50mg, 1mL	100 pcs. per box	2.CA3050.0001
100mg, 1mL	100 pcs. per box	2.CA3051.0001
200mg, 3mL	50 pcs. per box	2.CA3052.0001
500mg, 3mL	50 pcs. per box	2.CA3053.0001
500mg, 6mL	30 pcs. per box	2.CA3054.0001
1g, 6mL	30 pcs. per box	2.CA3055.0001
2g, 6mL	30 pcs. per box	2.CA3056.0001
1g, 10mL	20 pcs. per box	2.CA3057.0001
2g, 10mL	20 pcs. per box	2.CA3058.0001
5g, 35mL	20 pcs. per box	2.CA3059.0001
10g, 35mL	20 pcs. per box	2.CA3060.0001
10g, 60mL	16 pcs. per box	2.CA3061.0001
20g, 60mL	16 pcs. per box	2.CA3062.0001

#### CNWBOND C8/SCX

CNWBOND C8/SCX sorbent contains both octyl (C8) and benzenesulfonic acid (SCX) bondings, which exhibits dual retention mechanism for isolating of neutral, basic, acidic and zwitterionic compounds. Its mixed-mode cation exchange character develops for superior selectivity of sample clean up when extracting basic and neutral compounds from aqueous solutions, typically drugs and metabolites from physiological fluids.

#### Technical parameters

Particle Size	Mean Pore Size	Endcapped/Non-endcapped
40-63 $\mu$ m	60Å	Endcapped

#### CNWBOND C8/SCX SPE Cartridge

Description	Packaging	Cat. No.
50mg, 1mL	100 pcs. per box	2.CA2950.0001
100mg, 1mL	100 pcs. per box	2.CA2951.0001



Description	Packaging	Cat. No.
200mg, 3mL	50 pcs. per box	2.CA2952.0001
500mg, 3mL	50 pcs. per box	2.CA2953.0001
500mg, 6mL	30 pcs. per box	2.CA2954.0001
1g, 6mL	30 pcs. per box	2.CA2955.0001
2g, 6mL	30 pcs. per box	2.CA2956.0001
1g, 10mL	20 pcs. per box	2.CA2957.0001
2g, 10mL	20 pcs. per box	2.CA2958.0001
5g, 35mL	20 pcs. per box	2.CA2959.0001
10g, 35mL	20 pcs. per box	2.CA2960.0001
10g, 60mL	16 pcs. per box	2.CA2961.0001
20g, 60mL	16 pcs. per box	2.CA2962.0001

## Poly-Sery SPE Columns

### Poly-Sery PSD(styrene/divinylbenzene copolymer)

Poly-Sery PSD is a highly crosslinked, neutral, specially cleaned styrene/divinylbenzene copolymer material that is used for retaining hydrophobic compounds which contain some hydrophilic functionality under reversed phase conditions. This material can resist extreme pH condition, it is typically used for aromatics and phenols from aqueous matrices. Phenols are sometimes difficult to retain on silica-based C18 under reversed phase conditions, mainly due to their greater solubility in water than in organic matrices.

Technical parameters

Particle Size	Mean Pore Size	Surface Area
80-160µm	110-175Å	900m <sup>2</sup> /g

Poly-Sery PSD SPE Cartridge

Description	Packaging	Cat. No.
50mg, 1mL	100 pcs. per box	2.CA3550.0001
100mg, 1mL	100 pcs. per box	2.CA3551.0001
200mg, 3mL	50 pcs. per box	2.CA3552.0001
500mg, 3mL	50 pcs. per box	2.CA3553.0001
500mg, 6mL	30 pcs. per box	2.CA3554.0001
1g, 6mL	30 pcs. per box	2.CA3555.0001
2g, 6mL	30 pcs. per box	2.CA3556.0001
1g, 10mL	20 pcs. per box	2.CA3557.0001
2g, 10mL	20 pcs. per box	2.CA3558.0001
5g, 35mL	20 pcs. per box	2.CA3559.0001
10g, 35mL	20 pcs. per box	2.CA3560.0001
10g, 60mL	16 pcs. per box	2.CA3561.0001
20g, 60mL	16 pcs. per box	2.CA3562.0001

Poly-Sery PSD Packing

Description	Packaging	Cat. No.
80-160µm, 110-175Å	50 g. per box	2.CA3500.0001

### Poly-Sery XAD2(styrene-divinylbenzene matrix)

Poly-Sery XAD2 is a polyaromatic adsorbent resin which is nonionic macroreticular styrene-divinylbenzene matrix usually used for adsorbing and releasing ionic species through hydrophobic and polar interactions under isocratic conditions. Its typical application is hydrophobic compounds up to MW 20,000 like phenols, organic removal, surfactants, aroma compounds, antibiotic recovery and sometimes used as support for catalyst or metals removal.

Technical parameters

Particle Size	Mean Pore Size	Surface Area
20-60µm	90Å	300m <sup>2</sup> /g

Poly-Sery XAD2 SPE Cartridge

Description	Packaging	Cat. No.
300mg, 3mL	50 pcs. per box	2.CA3686.0001

Poly-Sery XAD2 Packing

Description	Packaging	Cat. No.
20-60µm, 90Å	100 g. per box	2.CA3601.0001

### Poly-Sery HLB

Poly-Sery HLB is used for nearly all the acidic, basic, and neutral compounds, and is a hydrophilic modified copolymer which developed for a broad range of compounds from aqueous samples under reversed phase condition. Compared with conventional silica, there're hydrophilic and hydrophobic group on the surface of HLB polymer, it has good wettability and is stable in pH range 1-14. So it has properties of retention for various different analytes, especially for polar compounds, the relative retention capacity is three times higher than conventional silica SPE.

Technical parameters

Particle Size	Mean Pore Size	Surface Area
60µm	180Å	710m <sup>2</sup> /g

Poly-Sery HLB SPE Cartridge

Description	Packaging	Cat. No.
10mg, 1mL	100 pcs. per box	2.CA3177.0001
30mg, 1mL	100 pcs. per box	2.CA3178.0001
60mg, 3mL	50 pcs. per box	2.CA3179.0001
30mg, 3mL	50 pcs. per box	2.CA3180.0001
200mg, 6mL	30 pcs. per box	2.CA3185.0001
500mg, 6mL	30 pcs. per box	2.CA3154.0001
500mg, 10mL	20 pcs. per box	2.CA3182.0001
1g, 10mL	20 pcs. per box	2.CA3157.0001
1g, 35mL	20 pcs. per box	2.CA3183.0001
6g, 35mL	20 pcs. per box	2.CA3184.0001

Poly-Sery HLB Packing

Description	Packaging	Cat. No.
60µm, 180Å	50 g. per box	2.CA3100.0001

### Poly-Sery PWAX

Poly-Sery PWAX is mixed weak anion exchange SPE column, it has excellent selectivity for strong acid compounds. Differ from conventional silica SPE columns, PWAX is a modified styrene-divinylbenzene copolymer, there' re hydrophilic and hydrophobic group on its surface, it is stable in pH range 1-14, and has excellent wettability. So it has special selectivity for various analytes. Poly-Sery PWAX is widely used for the purification of different matrixes such as plasma, urine, or acid compounds in foods.

Technical parameters

Particle Size	Mean Pore Size	Surface Area
40µm	120Å	900m <sup>2</sup> /g

Poly-Sery PWAX SPE Cartridge

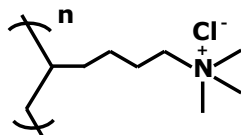
Description	Packaging	Cat. No.
60mg, 3mL	50 pcs. per box	2.CA3879.0001
150mg, 6mL	30 pcs. per box	2.CA3881.0001
500mg, 6mL	30 pcs. per box	2.CA3854.0001

Poly-Sery PWAX Packing

Description	Packaging	Cat. No.
40µm, 120Å	50 g per box	2.CA3800.0001

## Poly-Sery MAX

Poly-Sery MAX is a mixed-mode anion exchange and reversed phase sorbent, which has high selectivity and sensitivity for acidic and neutral compounds. Unlike traditional silica-based sorbent, its modified styrene divinylbenzene polymeric surface has hydrophilic and hydrophobic mechanisms, which is stable in pH ranges 0 to 14 and is water-wettable, therefore, it exhibits unique selectivity to cover a diverse spectrum of analytes, simplify the method development process for fast and efficient sample preparation and completely eliminate recovery or reproducibility problems. The strong anion exchange mechanism gives consistent and extremely cleaning up of acidic compounds and fractionation of bases from basic and neutral impurities. The Poly-Sery MAX is widely utilized in separation of clean acidic extracts from different matrices such as plasma, urine, plastic products and food.



Technical parameters

Particle Size	Mean Pore Size	Surface Area	Ion Exchange Capacity
40µm or 100µm	100Å	600m <sup>2</sup> /g	0.3 meq/g

Poly-Sery MAX SPE Cartridge

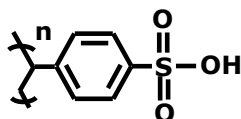
Description	Packaging	Cat. No.
40µm, 10mg, 1mL	100 pcs. per box	2.CA3377.0001
40µm, 30mg, 1mL	100 pcs. per box	2.CA3378.0001
40µm, 60mg, 3mL	50 pcs. per box	2.CA3379.0001
40µm, 30mg, 3mL	50 pcs. per box	2.CA3380.0001
40µm, 150mg, 6mL	30 pcs. per box	2.CA3381.0001
100µm, 500mg, 6mL	30 pcs. per box	2.CA3354.0001
100µm, 500mg, 10mL	20 pcs. per box	2.CA3382.0001
100µm, 1g, 10mL	20 pcs. per box	2.CA3357.0001
100µm, 1g, 35mL	20 pcs. per box	2.CA3383.0001
100µm, 6g, 35mL	20 pcs. per box	2.CA3384.0001

Poly-Sery MAX Packing

Description	Packaging	Cat. No.
40µm, 100Å	50 g per box	2.CA3300.0001
100µm, 100Å	50 g per box	2.CA3310.0001

## Poly-Sery MCX

Poly-Sery MCX is a mixed-mode cation exchange and reversed phase sorbent, which has high selectivity and sensitivity for basic and neutral compounds. Unlike traditional silica-based sorbent, its modified styrene divinylbenzene polymeric surface has hydrophilic and hydrophobic mechanisms, which is stable in pH ranges 0 to 14 and is water-wettable, therefore, it exhibits unique selectivity to cover a diverse spectrum of analytes, simplify the method development process for fast and efficient sample preparation and completely eliminate recovery or reproducibility problems. The strong cation exchange mechanism gives consistent and extremely cleaning up of basic compounds and fractionation of bases from acidic and neutral impurities. The Poly-Sery MCX is widely utilized in separation of clean basic extracts from different matrices such as plasma, urine, plastic products and food.



Technical parameters

Particle Size	Mean Pore Size	Surface Area	Ion Exchange Capacity
40µm or 100µm	100Å	600m <sup>2</sup> /g	0.8 meq/g

Poly-Sery MCX SPE Cartridge

Description	Packaging	Cat. No.
40µm, 10mg, 1mL	100 pcs. per box	2.CA3277.0001
40µm, 30mg, 1mL	100 pcs. per box	2.CA3278.0001
40µm, 60mg, 3mL	50 pcs. per box	2.CA3279.0001
40µm, 30mg, 3mL	50 pcs. per box	2.CA3280.0001
40µm, 150mg, 6mL	30 pcs. per box	2.CA3281.0001
100µm, 500mg, 6mL	30 pcs. per box	2.CA3254.0001
100µm, 500mg, 10mL	20 pcs. per box	2.CA3282.0001
100µm, 1g, 10mL	20 pcs. per box	2.CA3257.0001
100µm, 1g, 35mL	20 pcs. per box	2.CA3283.0001
100µm, 6g, 35mL	20 pcs. per box	2.CA3284.0001

Poly-Sery MCX Packing

Description	Packaging	Cat. No.
40µm, 100Å	50 g per box	2.CA3200.0001
100µm, 100Å	50 g per box	2.CA3210.0001

## Dual Layer SPE Columns

### CNWBOND GCB/NH<sub>2</sub>



CNWBOND GCB/NH<sub>2</sub> dual layer SPE columns combine the advantages with both GCB and NH<sub>2</sub> sorbents. Similar to GCB/PSA, GCB/NH<sub>2</sub> offers superior clean up of pigments, sterols, fatty acids and organic acids in food matrices, and is suitable for the analysis of multi-residue pesticide in food like meats, fruits, vegetables etc.

CNWBOND GCB/NH<sub>2</sub> SPE Cartridge

Description	Packaging	Cat. No.
200mg/200mg, 3mL	50 pcs. per box	2.CA5066.0001
250mg/500mg, 3mL	50 pcs. per box	2.CA5048.0001
200mg/200mg, 6mL	30 pcs. per box	2.CA5067.0001
300mg/600mg, 6mL	30 pcs. per box	2.CA5068.0001
500mg/500mg, 6mL	30 pcs. per box	2.CA5069.0001
500mg/300mg, 6mL	30 pcs. per box	2.CA5070.0001
1g/500mg, 6mL	30 pcs. per box	2.CA5071.0001
1g/500mg, 10mL	20 pcs. per box	2.CA5072.0001
500mg/500mg, 10mL	20 pcs. per box	2.CA5073.0001
1g/500mg, 35mL	20 pcs. per box	2.CA5074.0001
500mg/500mg, 35mL	20 pcs. per box	2.CA5075.0001
1g/1g, 35mL	20 pcs. per box	2.CA5076.0001

### CNWBOND GCB/PSA



CNWBOND GCB/PSA is a dual layer SPE cartridge that combines advantages with both GCB and PSA sorbents. Similar to GCB/NH<sub>2</sub>, Carbon-GCB offers superior clean up of pigments, sterols, fatty acids and organic acids in food matrices, and is suitable for the analysis of multi-residue pesticide in food like fruits, vegetables, meats, aquatic products, grains and dairy products etc.

Both PSA and NH<sub>2</sub> can effectively retain interferences in the analysis of multi-residue pesticide, such as fatty acids (include oleic acid, palmitic acid, linoleic acid etc.), organic acids, some polar dyes and sugars etc. PSA can retain more than 99% fatty acids, which greatly reduce signal interference caused by the matrix system in the GC analysis.

CNWBOND GCB/ PSA SPE Cartridge

Description	Packaging	Cat. No.
200mg/200mg, 3mL	50 pcs. per box	2.CA5166.0001
250mg/500mg, 3mL	50 pcs. per box	2.CA5148.0001

Description	Packaging	Cat. No.
200mg/200mg, 6mL	30 pcs. per box	2.CA5167.0001
300mg/600mg, 6mL	30 pcs. per box	2.CA5168.0001
500mg/500mg, 6mL	30 pcs. per box	2.CA5169.0001
500mg/300mg, 6mL	30 pcs. per box	2.CA5170.0001
1g/500mg, 6mL	30 pcs. per box	2.CA5171.0001
1g/500mg, 10mL	20 pcs. per box	2.CA5172.0001
500mg/500mg, 10mL	20 pcs. per box	2.CA5173.0001
1g/500mg, 35mL	20 pcs. per box	2.CA5174.0001
500mg/500mg, 35mL	20 pcs. per box	2.CA5175.0001
1g/1g, 35mL	20 pcs. per box	2.CA5176.0001

## CNWBOND GCB/SAX

CNWBOND GCB/SAX is a dual layer SPE cartridge that can effectively retain pigments and acid compounds from the matrix, and is widely used in the analysis of multi-residue pesticide in food.

CNWBOND GCB/SAX SPE Cartridge

Description	Packaging	Cat. No.
250mg/500mg, 6mL	30 pcs. per box	2.CA5388.0001

## CNWBOND SAX/PSA

CNWBOND SAX/PSA is a dual layer SPE cartridge that contains CNWBOND SAX (upper layer) and CNWBOND PSA (lower layer) SPE sorbents. It combines advantages with both SAX and PSA sorbents, SAX has a strong affinity towards nearly all the acidic compounds in different matrices, while PSA can effectively retains fatty acids, organic acids, some polar pigments and sugars in food matrices. Therefore, CNWBOND SAX/PSA offers superior removing of matrix interference and enhancement of multi-residue pesticide from food for analysis.

CNWBOND SAX/PSA SPE Cartridge

Description	Packaging	Cat. No.
200mg/200mg, 3mL	50 pcs. per box	2.CA5266.0001
200mg/200mg, 6mL	30 pcs. per box	2.CA5267.0001
300mg/600mg, 6mL	30 pcs. per box	2.CA5268.0001
500mg/500mg, 6mL	30 pcs. per box	2.CA5269.0001
500mg/300mg, 6mL	30 pcs. per box	2.CA5270.0001
1g/500mg, 6mL	30 pcs. per box	2.CA5271.0001
1g/500mg, 10mL	20 pcs. per box	2.CA5272.0001
500mg/500mg, 10mL	20 pcs. per box	2.CA5273.0001
1g/500mg, 35mL	20 pcs. per box	2.CA5274.0001
500mg/500mg, 35mL	20 pcs. per box	2.CA5275.0001
1g/1g, 35mL	20 pcs. per box	2.CA5276.0001

## CNWBOND Na<sub>2</sub>SO<sub>4</sub>/Florisol

CNWBOND Na<sub>2</sub>SO<sub>4</sub>/Florisol is a dual layer SPE cartridge that contains Na<sub>2</sub>SO<sub>4</sub> (upper layer) and Florisol (lower layer). Na<sub>2</sub>SO<sub>4</sub> layer aids in removing aqueous sample residues that may hinder Florisol performance and/or subsequent GC analysis. It is Suitable for the determination of the hydrocarbon oil index in water (surface, waste, and sewage treatment plants) by GC-FID analysis.

CNWBOND Na<sub>2</sub>SO<sub>4</sub>/Florisol SPE Cartridge

Description	Packaging	Cat. No.
2g/2g, 6mL	30 pcs. per box	2.CA5595.0001

## CNWBOND GCB/NH<sub>2</sub>/Si

CNWBOND GCB/NH<sub>2</sub>/Si is a tri-layer SPE cartridge that combines advantages with all the three sorbents, it offers superior clean up of multi-residue pesticide from food like meats, fruits, vegetables etc.

CNWBOND GCB/NH<sub>2</sub>/Si SPE Cartridge

Description	Packaging	Cat. No.
500mg/500mg/500mg, 10mL	20 pcs. per box	2.CA6190.0001
500mg/400mg/600mg, 10mL	20 pcs. per box	2.CA6191.0001
500mg/500mg/500mg, 35mL	20 pcs. per box	2.CA6192.0001
500mg/400mg/600mg, 35mL	20 pcs. per box	2.CA6193.0001

## CNWBOND GCB/SAX/PSA

CNWBOND GCB/SAX/PSA is a tri-layer SPE cartridge that combines advantages with all the three sorbents, it offers superior clean up of multi-residue pesticide from food like meats, fruits, vegetables etc.

CNWBOND GCB/SAX/PSA SPE Cartridge

Description	Packaging	Cat. No.
500mg/500mg/500mg, 10mL	20 pcs. per box	2.CA6090.0001
500mg/400mg/600mg, 10mL	20 pcs. per box	2.CA6091.0001
500mg/500mg/500mg, 35mL	20 pcs. per box	2.CA6092.0001