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Bridging Separation Techniques



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Welchrom® Introduction of SPE Technology

Overview

Solid Phase Extraction (SPE) is a widely used and increasingly popular sample pretreatment technology. It's commonly used to process liquid samples, extract, concentrate and purify semi-volatile and non-volatile compounds. It can also be used for solid samples, but the solid samples must be processed into liquid first. At present, it is mainly used in the field of food safety, such as the residue analysis of various antibiotics and antibacterial drugs in various kinds of food, analysis of pesticide residues in agricultural products, analysis of legal and illegal additives in various kinds of food, etc. In the field of drug research, it is widely used in pharmacokinetic analysis, and traditional medicine analysis.

In the field of environmental protection, it is applied to analyze environmental polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs) and various pesticides. Organic matter analysis of drinking water, groundwater and sewage. Relying on core technology and strong new product development capability in chromatographic packing materials manufacturing, Welch has launched Welchrom® series of SPE products which can greatly meet your experimental needs.

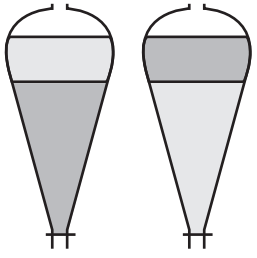
Principle of SPE

Solid phase extraction (SPE) is a sample pretreatment technique developed based on the combination of liquid-solid extraction and liquid chromatography since the mid-1980s. The separation, purification and enrichment of samples are realized mainly through the selective absorption and desorption process of packing materials to sample components. The main purpose is to reduce the matrix interference and improve the detection sensitivity. When complex sample solution through adsorbent, adsorbent will selectively retain target compounds and a small amount of interfering substance which is similar with the nature of target compounds through polar and nonpolar interaction or ion exchange reaction. Other components will flow out of the column through adsorbents, then use another kind of solvent with strong ability to selectively elute target substances down, so as to realize the separation, purification and enrichment of complex samples. The interaction mechanism of SPE is the same as that of liquid chromatography. However, due to special selection of solvent system by the former, the separation effect of SPE and liquid chromatography is different.

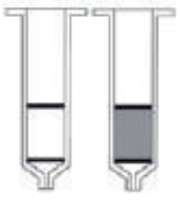
Solid phase extraction (SPE) uses liquid chromatography separation principle of selective adsorption and selective elution. The commonly used method is to make the liquid sample through an adsorbent, retain the tested substance, then select the appropriate strength of the solvent to wash away the impurities. Elute the measured substance with a small volume of solvent, so as to achieve the purpose of rapid separation, purification and concentration. You can also selectively adsorb interfering impurities and let the measured substances out or adsorb both the impurities and the tested substance, then elute the tested substance selectively with an appropriate solvent.

1. Advantages of SPE Compared over Traditional Liquid-liquid Extraction

- More samples are processed per unit time
- Good purification effect without emulsification
- Enrichment of analytes can be achieved
- Improve recovery and reproducibility
- Save solvent, safer for the environment and operators
- Easy to realize automation



Liquid-liquid Extration



SPE

2. Effect of SPE

Specifically, SPE has the following three functions:

Enrichment: Enrichment of target compounds is a necessary process in trace analysis or preparation. For example, if analyze PAHs in water, 1000 mL of water sample can be added to the SPE column, PAHs can be kept in the column, and then elute with a small amount of solvent (such as 2 mL), thus PAHs can be condensed 500 times, which means that the method detection limit of the analytes is only 1/500 of that before treatment under the same detection conditions.

Purification: The interfering substances should be removed before the apparatus analysis, which, on the one hand, avoids the interference to the target compounds and improves the analysis sensitivity, on the other hand, avoids the damage of the interfering substances to the apparatus.

Solvents for conversion: Some analytical apparatus have special requirements for the solvent of the sample solution and can be converted by means of an SPE column. For example, if inject samples directly when using GC method to analyze semi-volatile pollutants in water, water content will affect the separation and damage the GC column, therefore the solvent needs to be converted. Add water sample to reversed-phase extraction column, the target compounds will be retained in the column and separated from the water, then elute with a highly soluble and volatile organic solvent for the target substance. Finally, dry and concentrate it for analysis.

3. Composition of SPE

Common extraction column consists of three parts: column tube, frit and adsorbent.

Column tube: carrier of an adsorbent, made of polypropylene, usually in the shape of a syringe.

Welch also provides glass column tubes for special analysis (such as PAEs analysis). The size of the lower outlet of the column has been standardized to match the SPE devices and apparatuses of different manufacturers.

Frit: fix the adsorbent and filter the solution.

Polyethylene is a common frit material, and for special analysis, teflon, stainless steel sheet or glass can also be used.

Adsorbent: substance that acts as a separator in SPE columns is the core of SPE products.

Adsorbents such as Florisil and graphitized carbon black, which were widely used in column chromatography in the early stage, were still used in SPE. At present, the most common adsorbent is the silica gel bonded adsorbent, which is prepared by spherical silica particles bond various functional groups. Organic polymer adsorbents developed in recent years, such as polyvinyl phenyl-N-vinylpyrrolidone, have replaced silica bonded adsorbents in many applications due to their advantages of good reproducibility, wide pH range, and wide applicability.

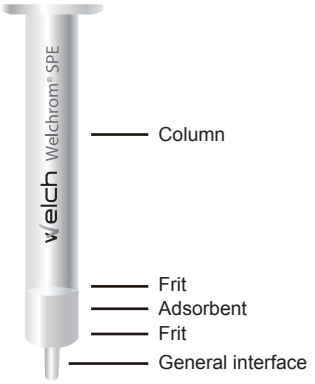
Supporting equipment:

SPE Manifold: used to support SPE column, provide pressure and collect waste liquid, etc.

Large capacity injector: used to increase the volume of the container above the column tube to increase the injecting volume at one time.

Adapter: used to connect column tubes and sample reservoir for easy sample loading.





4. Common Technical Terms and Interation of SPE Technology

Target compound: compounds which need to be separated from a complex sample matrix.

Matrix: the sample environment in which the target compounds exist. The matrix usually contains a large number of interfering substances.

Interfering substances: any compound that affects the analysis of target compounds or is capable of causing damage to analytical instrument, usually a general term for all compounds in the matrix except the target compound.

Adsorbent: packing materials in a SPE column capable of selectively extracting certain compounds from the sample solution.

Adsorption capacity: The total mass of a compound (including a target compound and some interferences) that can be retained by a certain adsorbents under a given condition.

Selectivity: the ability of the adsorbent to discriminate between the target compound and all other sample components, that is, to retain the target compound and exclude other components. High selectivity will achieve better purification effect.

pH: the negative logarithm of the concentration of protons (H+) in the solution. The smaller the value is, the higher the concentration of protons in the solution is.

pKa: the negative logarithm of the dissociation constant (Ka) of the acid compound. The smaller the value, the stronger the dissociation of the acid compound is. When the pH value of the sample solution is equal to the pKa, the concentration of the undissociated compound and the dissociated compound is equal. PKa is commonly used by analysts to represent the dissociation of basic compounds, but the pKa at this time represents the negative log of the dissociation constant of the conjugate acid of the basic compound. The larger the pKa value is, the stronger the ability of the basic compound to bind protons is, the stronger the alkalinity is.

Interaction: the attraction or repulsion between two chemical substances (e.g., between the target compound and the adsorbent, or between the target compound and the solvent molecule) in a given chemical environment.

Non-polar interaction: the interaction between the non-polar functional group and the non-polar adsorbent on the target compound, which can be well reflected in the polar solvent environment, especially in the water environment. Therefore, it is also known as the hydrophobic interaction, such as the interaction between phthalates and C18 in the water environment.

Polar interaction: the interaction between the polar functional group on the target compound and the polar functional group on the adsorbent, which can be well reflected in the weak polar or non-polar solvent environment.

Ion interaction: the Coulomb force between an ionic functional group on an ionic target compound and a functional group on an adsorbent with an opposite charge.

Secondary interactions: for the reversed-phase silicon bonded adsorbents, residual surface Si-OH will interact with polar compounds, and part of silicon hydroxyl will have ion interaction with alkaline compound after the dissociation. Compare with the nonpolar interactions, these interactions are in a secondary position, so is called secondary interactions. Secondary interactions are not expected with reversed-phase silica gel adsorbents but they can be eliminated by end-capping techniques.

Activation: also called solvation, the addition of a suitable solvent to uncoil the functional groups on the adsorbent and remove possible interfering substance on the adsorbent. For reversed-phase adsorbents, medium polar solvents (such as methanol) are often used; for positive phase adsorbents, weak polar or non-polar solvents (such as hexane) are often used.

Equilibrium: remove the active solvent to create a suitable solvent environment for loading sample. The solvent used is usually the same as the solvent used in the sample solution. For the ion exchange column, if the sample is an alkaline compound equilibrium solution, it is often necessary to add acid, if the sample is an acidic compound equilibrium solution, it is often necessary to add the alkali.

Retention: when the sample solution passes through an adsorbent and the force exerted by the adsorbent on some compounds exceeds the force exerted by the latter on the solvent, the compounds will be immobilized by the adsorbent. This process is called retention.

Washing: After loading sample, some distractors and the target compounds are preserved at the same time, so it needs to add the appropriate solution to remove the distractors without affecting the retention of target compounds. Usually using sample solvent chose for loading samples will not affect the recovery rate, but solvent with stronger elution intensity can remove interfering substance to the maximum extent. When choosing eluent, the equilibrium between recovery rate and purification efficiency should be found

Penetration: when the retention capacity of the adsorbent is weak or the mass of the compound exceeds the capacity of the adsorbent, The phenomenon that part or all of the target compounds are not retained during the loading process or even flow out of the column is an operational accident and should be avoided.

5. Interaction of SPE

In the SPE process, the retention and elution of compounds on the adsorbent are controlled by the interactions between the adsorbent an compound or between solvent and compound. When the interaction of the adsorbent on the compound is stronger than that of the solvent, the compound will be retained by the adsorbent, otherwise it will be eluted. Grasping the interaction between adsorbents, compounds and solvents is of great guiding significance for the establishment and optimization of SPE methods, so this part will be the core part of SPE technical data.

The interactions involved in SPE can be classified into four categories: nonpolar, polar, ion-exchange, and covalent bond. Each adsorbent has more than one interactions between the target compounds.

Nonpolar interaction

Nonpolar interactions are the forces that occur between hydrocarbon groups (on the adsorbent) and hydrocarbon groups (on the target compound). These groups are nonpolar or weakly polar, and there is only one interaction between them called the dispersion force (a type of Van DerWaals force). Since most organic compound molecules contain more or less nonpolar groups, nonpolar interactions keep these compounds on adsorbents which contain nonpolar functional groups. The unbonded silica gel does not show non-polar interaction, but the adsorbent obtained after silica gel matrix bond the chain functional groups will show non-polarity to a certain extent, making the bonded silica gel phase have non-polar interaction. C18E (silica gel bonded octyl group, end-capped) is a true non-polar adsorbent, and only non-polar interaction exists between it and the target compound. The non-polarity of C8 (silica gel bonded octyl) and PH (silica gel bonded phenyl) is weaker than that of C18, but the non-polarity interaction is still the main force of these adsorbents, other forces between them and the target compound can be ignored. The carbon chains of C2 (silica gel bonded ethyl) and CN(silica gel bonded cyanopropyl) are shorter. C2 and CN have both non-polar interaction and polar interaction, but the non-polar interaction is still dominant. Adsorbents that bonded polar groups and ionic groups (NH_2, PSA, SCX, SAX, etc.) have strong polarity, and the nonpolar interaction between them and the target compound is negligible.

For adsorbents of polymer matrix, such as BRP, P-SCX, P-SAX, P-WAX, etc., which are based on polystyrene/divinylbenzene copolymer, phenyl and vinyl group in the adsorbent are non-polar groups. Non-polar interaction is an important force between these adsorbents and the target compound. P-SCX, P-SAX, P-WAX and other ionic compounds also have strong ion exchange interaction, which is another important force.

The strength of the interaction between the adsorbent and the target compound is also affected by the solvent environment. In general, strong polar solvent environment can promote the non-polar interaction between the non-polar adsorbent and the target compound. Besides, in the polar environment, even if the target compound contains polar groups, the non-polar part will also have non-polar interaction with the non-polar adsorbent. Thus, when using nonpolar adsorbents or those with weak polarity, the best sample solvent is pure water, which increases nonpolar interactions and promotes retention of the target compound. Organic solvents with weak polarity, on the other hand, have certain solubility to target compounds, which can destroy the target compounds and nonpolar interactions between adsorbent, polar solvent. For example, polar solvent as methanol has enough non-polarity to interrupt non-polar interaction between many compounds with weak polarity and adsorbent, then elute down compound from the adsorbent. For target compounds with weaker polarity, their elution requires weak or nonpolar solvents such as ethyl acetate, methyl tert-butyl ether, or even n-hexane.

In general, nonpolar extraction method has less selectivity than polar or ion-exchange extraction, especially when the target compound structure is similar to the matrix component of the sample, but nonpolar interactions are effective when used to separate a group of compounds with different structures.

In summary, polar solvents (especially pure water) can enhance the retention of such separations when use nonpolar interaction to retain target compound (i.e., when an reversed-phase solid extraction column is used) and can be selected as sample solvents or flushing solvents for sample loading; Solvent with weak polarity or mixed solvent can destroy the nonpolar interaction between the target compound and the adsorbent, eluting the target compound from the nonpolar adsorbent.

Polar interaction

There are polar interactions between various adsorbents and functional groups of target compound. Polar interactions include hydrogen bonds, dipole distances, induced dipole distances, π-π bonds, and a variety of other interactions. Polar groups often exist atoms with different electronegativites and the electron cloud has different densities among these atoms, so that the functional group has polarity. This property enables the target compound molecules with polar functional group to interact with the polar functional group on the adsorbent. Typical polar interaction groups include hydroxyl, amine, carbonyl, sulfhydryl, two bonds, and groups with heteroatoms such as oxygen, nitrogen, fluorine, sulfur, and phosphorus.

Due to the strong polarity of silica gel matrix (especially the free silica hydroxyl group), the polar interaction is widely found in the silica gel bonded adsorbent. In non-polar solvents, the secondary polarity interaction of silica gel bonding adsorbent is particularly significant. If contain amino groups and hydroxyl groups, it will be extremely sensitive to the secondary interaction. Non-polar adsorbents (C18, C8, PH, CH, etc.) which bonded nonpolar groups are often used to retain nonpolar or weak polarity compounds and its residual silicon hydroxyl on the substrate surface is end-capped. It often operate under the polar solvent environment, thus secondary interactions among these silicone bonded adsorbents are very weak. Polar interaction is desirable in polar silica bonded adsorbents (Silica, NH2, PSA) and Ion-exchange silica bonded adsorbents Silica bonded adsorbent (SCX, SAX), so there is no need to end-cap for inhibiting secondary interaction.

Hydrogen bond is one of the most important polar interaction forces. The conditions for hydrogen bonds are as follows: the covalently bonded hydrogen atoms of electronegative atom X (fluorine, chlorine, oxygen, nitrogen, etc.) are close to another electronegative atom Y (fluorine, chlorine, oxygen, nitrogen, etc.). Between X and Y, hydrogen is used as the medium to generate X-H... Y bonds. The hydroxyl group or amino groups are the primary hydrogen bonds donor. The functional groups (i.e., hydrogen bond receptors) that can interact with the hydrogen bond donor are those groups that contain oxygen, nitrogen, or sulfur atoms.

Nonpolar solvents can promote the retention of polar separators on polar adsorbents because nonpolar solvent molecules cannot easily destroy the polar interaction between the adsorbent and the target compound. Conversely, polar solvents can effectively destroy this polar interaction because polar target compounds are soluble in polar solvents and polar solvents can more effectively compete with target compounds for adsorption sites on the adsorbent.

High ion concentration can also destroy polar interaction. Polar target compounds are often retained on non-polar adsorbents through secondary interactions with silica matrix, but such retention is inhibited by high ion concentration. If secondary interactions are required, the Tris buffer can be used to strengthen the force through the adsorbent.

In conclusion, nonpolar solvents (especially n-hexane) can enhance the retention of such isolates when the target compound is retained

by polar interactions. They also can be selected as sample solvents and flushing solvents when loading sample. Polar and high ionic strength solvents can destroy the polar interaction between the target compound and the adsorbent, eluting the isolates from the polar adsorbent. The secondary polar interactions are an important factor for the extraction of amines or hydroxyl target compounds from non-polar solvents into polar adsorbents.

Ion interaction

Ion interaction is the Coulomb force that occurs between the charged (positive or negative) target compound and the opposite charged adsorbent. According to the characteristics of ions displayed by the target compound group and the adsorbent group, ion exchange interactions can be divided into two categories:

A Group that can be cationized (positive charge)

B Group that can be anionized (negatively charged)

Organic compounds such as primary amine, secondary amine, tertiary amine and quaternary amine as well as inorganic cations such as calcium, sodium and magnesium can be cationized. Sulfonic acid, carboxylic acid, phosphoric acid and other similar groups can be anionized. These groups "can" be positive or negative ions, but they are not ions in themselves. For that the potential ionic groups are dissociated or not depending on the pH of the solvent environment. In order for the target compound to be effectively retained on the adsorbent through the ion exchange mechanism, the following two conditions must be met simultaneously:

(1) The substrate/solvent pH must let both the target compound and the adsorbent be charged.

(2) The concentration of competing ions in the medium/solution with the same charge as the target compound is lower.

In order to realize the first condition, we need to know some other information. First, we need to know the pKa of conjugate acid of acidic compound or alkaline compound. When the pH of the environment is equal to the pKa of a certain compound, half of the molecules of the compound in solution are charged, while the other half are not. As for the pKa, remember the following relationship: When the pH is lower than the pKa of the molecule, the number of molecules with cationic groups increases; Conversely, the number of molecules with cationic groups will decrease. When the pH is higher than the pKa of the molecule, the number of molecules with anionic groups increases when the pH is higher than the pKa of the molecule. Conversely, the number of molecules with anionic groups will decrease.

In order to let the target compounds be retained, solvent/medium pH should be a proper number to make the target compounds and adsorbent with charge. The specific way is to control pH to be lower than pKa of conjugated acid of alkaline compound. And it should be at least lower than pKa of conjugated acid of alkaline compound about two units and higher than the pKa of conjugated acid of acidic compounds about two units. Under this pH, more than 99% of the target compounds are charged, the pH of sample solution when loading sample should satisfy this requirement. Solvent system, on the other hand, the pH is higher than the pKa of conjugated acid of alkaline compound or lower than pKa of acidic samples. Target compound ionic groups will tend to be neutral and retention will be weakened, if pH of the eluent can satisfy this requirement, the ionic type target compound will be eluted.

Ion strength is also an important factor in ion exchange. Ion concentration can be used to measure the total concentration of all ions in the solvent/medium environment. Due to the ion exchange competition machine system, the other same charge ions in solvent/medium will compete with the target compound adsorbent on ion exchange sites, affect retention of target compounds. Low ionic strength will strengthen retention of target compounds while high ionic strength will weaken that.

Ion exchange adsorbents have strong selectivity to specific ion groups. This selectivity is due to the molecular property of the adsorbent and has been observed in many cases. For example, selectivity of quaternary ammonium ion (a kind of strong anion exchange adsorbent) to citrate is 250 times higher than that to acetate. For this reason, compared with being equilibrated by citrate, quaternary ammonium type adsorbent which is equilibrated by acetate have stronger retention for anionic compounds. For the same reason, eluting ability of citrate buffer is far stronger than the that of acetate buffer for anionic target compounds which are retained by the quaternary ammonium type adsorbent. Ion exchange extraction can be greatly improved by the proper use of selectivity of adsorbents (for opposite ions).

Due to the presence of unbonded silica hydroxyl on the surface of silica matrix, the hydroxyl can partially release protons to form the negative charge. Therefore, all silica bonded phases manifest as ionic secondary interactions. Ionic secondary interactions significantly influence in the water environment and the isolate group that are most influenced by ionic secondary interactions is the amino group. For

example, when amino compounds in the water samples are retained by non-polar adsorbent, ion secondary interactions may also play a role. Using mixture of water/organic solvent (e.g. methanol aqueous solution) to elute, ion secondary interactions become more obvious. At this point, although the methanol concentration is sufficient to disrupt the nonpolar interaction, active secondary action can inhibit the elution of the amine compound. So it is necessary to change the pH (higher pH can make the alkaline compound neutral, lower pH can make the silicon hydroxyl neutral) or to add competitor (diethylamine or triethylamine) in eluting solvents for disrupting secondary mutual adsorption. Competitor can compete with amino compound for silicon hydroxyl groups on the surface of the adsorbent, then disrupt the secondary adsorption of amino compounds so as to elute amino compounds. Commonly used silica gel bonded reversed-phase adsorbent, such as C18, C8, PH, CH, C2, have been end-capped in the process of synthesis of packing materials, so ion secondary interactions of these adsorbents play a negligible role. Sometimes, in order to strengthen retention of amino compounds, it will deliberately cancel the end-capped process when synthetizing silica gel bonded reversed-phase adsorbent, such as C18 (unend-capped).

The adsorbents based on polymer matrix do not contain silicon hydroxyl, so there is no ionic secondary interactions. Commonly used ion exchange adsorbents are SCX and SAX, SCX is a kind of adsorbent formed by silica gel bonded benzenesulfonic group, which is very suitable for retaining amino compounds; SAX is a kind of adsorbent formed by silica gel bonded the quaternary ammonium group, which is very suitable for retaining compounds with carboxyl and phenolic hydroxyl groups. P- SCX, P-SAX, P-WCX, P-WAX are ion-exchange reversed-phase adsorbents based on polymer matrix, containing two retention matrices of ion exchange and reversed-phase with more excellent purification effect for the compound.

The following methods can promote ion exchange and enhance the retention of target compounds:
- The pH of the solvent/substrate is between the pKa of the target compound and the adsorbent
- Low ionic strength in solvent/matrix
- Use low-selectivity opposite ions to equilibrate adsorbent

The following methods can promote elution of ion-exchange separators:
- The pH of the solvent/substrate is higher than pKa of highly alkaline compound conjugate acid or or lower than the pKa of the acidic compound
- High ionic strength in solvent/matrix
- Solvents/media contain highly selective opposite ions
- Ionic secondary interactions are important for the retention of protonated amino compounds in polar solvents

Note: Opposite ion: ions opposite to the charge of ionic groups on adsorbent.

Operation Method of SPE

The purification mechanism of SPE can be divided into two types: type of retaining target compound and type of retaining interfering substances.

1. SPE Mode of Retaining Target Compound

This mode means that when the sample solution passes through the adsorbent, the target substance and some interfering substances are retained while most of the interfering substances flow out with the solvent. Remove remaining interfering substances by adding the flushing liquid, then elute the target compound with the eluent. This decontamination mechanism is the most commonly used mechanism.

Steps of this mode:

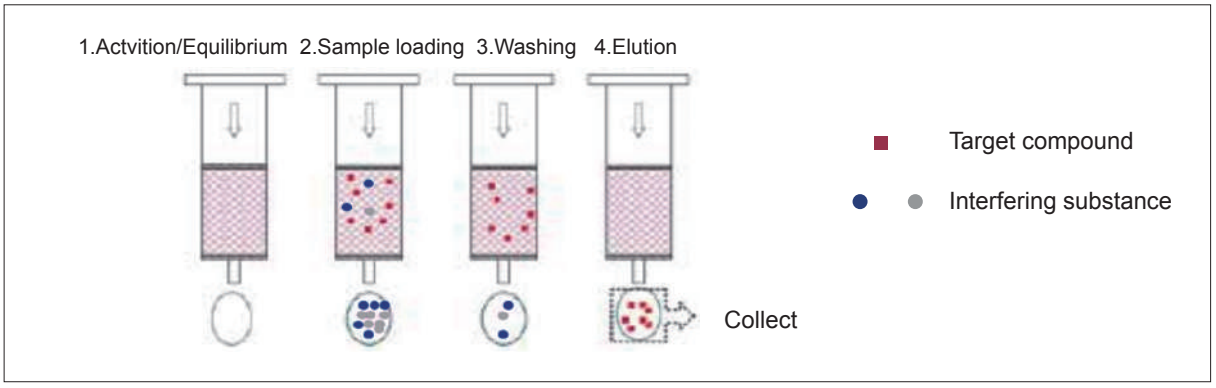
(1) Activation/equilibrium: activate the adsorbent in the column with organic solvent and remove interfering substances in the adsorbent, then equilibrate with the solution that is consistent with the sample solvent to create an appropriate environment for loading samples.

(2) Sample loading: add the sample solution to the column. The target compounds and part of interfering substances will be retained by the adsorbent while the remaining interfering substances flow out of the column with the sample solvent.

(3) Washing: add a kind of solution whose elution strength is stronger than that of the sample solvent without eluting the target compound to the column for removing the remaining interfering substances.

(4) Elution: add a kind of solution that can elute the target compound to the column and receive the effluent, analyze directly or process it before analysis.

In above steps, the selection of sample solvent, flushing liquid and eluent is the key to the success of SPE. Ensure that the sample solvent will not elute target compounds and the flushing liquid should elute interfering substances to the maximum extent without eluting target compounds. The selection of sample eluent, flushing liquid and eluent will be introduced specifically in "Optimization of SPE" part.



2. SPE mode of retaining interfering substance

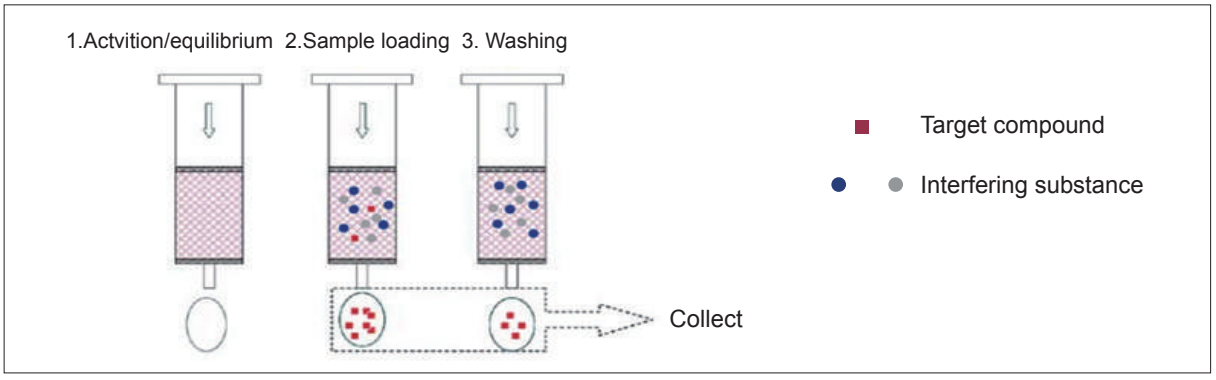
This mode refers to that when the sample solution passes through the adsorbent, the main interfering substances are retained while the target substance and some impurities flow out with the solvent. Then add an appropriate volume of solvent until the target substance is completely washed out. This mechanism is often used in the analysis of various pesticide residues in fruits and vegetables and removal of fat-soluble interfering substance in ion analysis.

Steps of this mode:

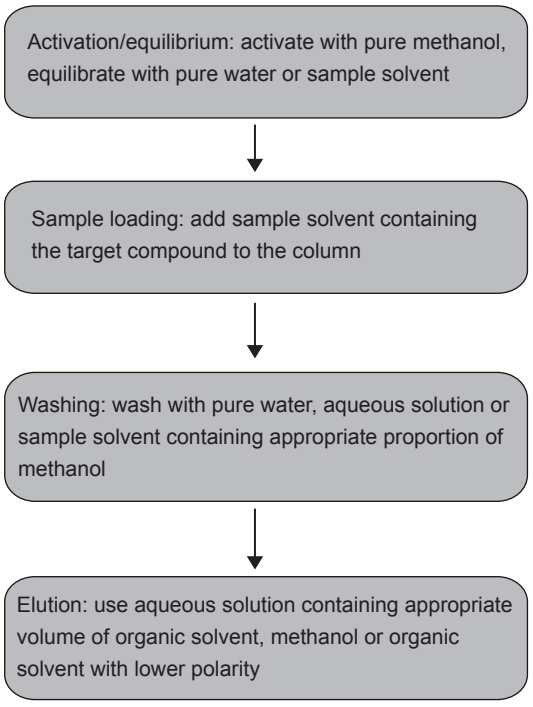
(1) Activation/equilibrium: activate or equilibrate the column with the solution that is consistent with the sample solvent and create an appropriate environment for loading samples.

(2) Sample loading: add the sample solution to the column. The main interfering substances will be retained by the adsorbent while the target compounds and some interfering substance will flow out of the column with the sample solvent, then collect the effluent.

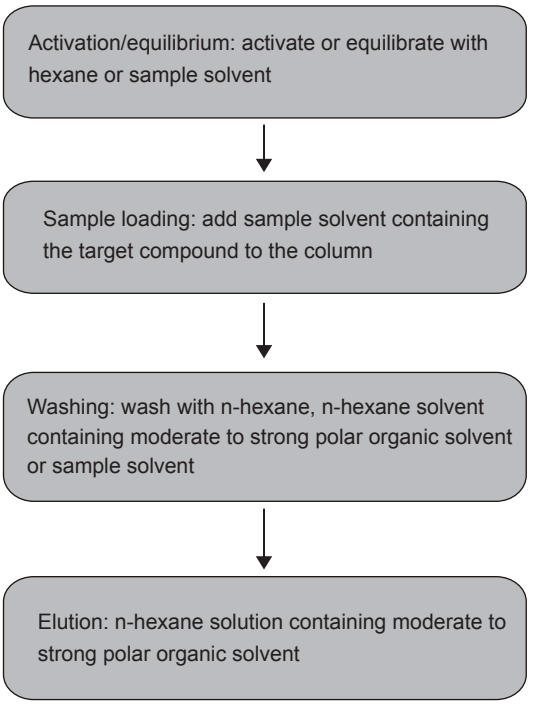
(3) Washing: wash with the solution that is consistent with the sample solvent and wash down the remaining target compounds in the adsorbent, then collect the effluent to mix with that of (2). In the above operation, the activation solution, sample solvent, and the flushing liquid are usually in the same solvent system. If the main interfering substances are polar compounds, polar adsorbents such as silica gel and amino adsorbent should be selected. Weak-polarity and non-polar solvents should be selected for the sample solvent and flushing liquid respectively. If the main interfering substances are weak-polarity or non-polar compounds, non-polar adsorbents such as C18 and BRP should be selected, and the sample solvent or flushing liquid should be in polar solvent system such as pure water.



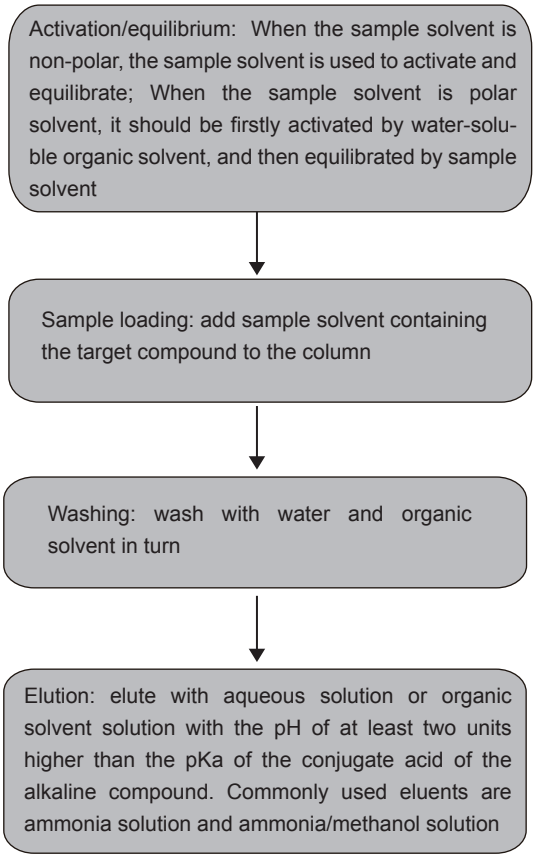
General operation method of reversed-phase SPE column



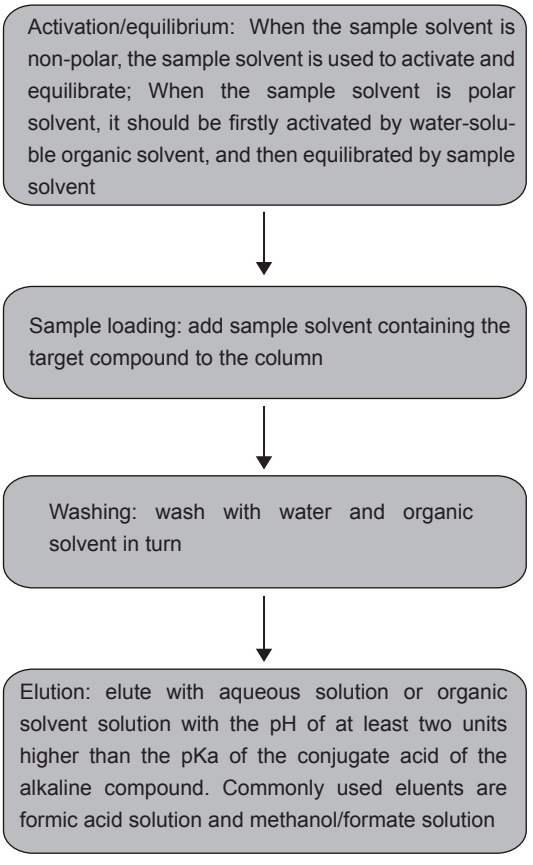
General operation method of normal phase SPE column



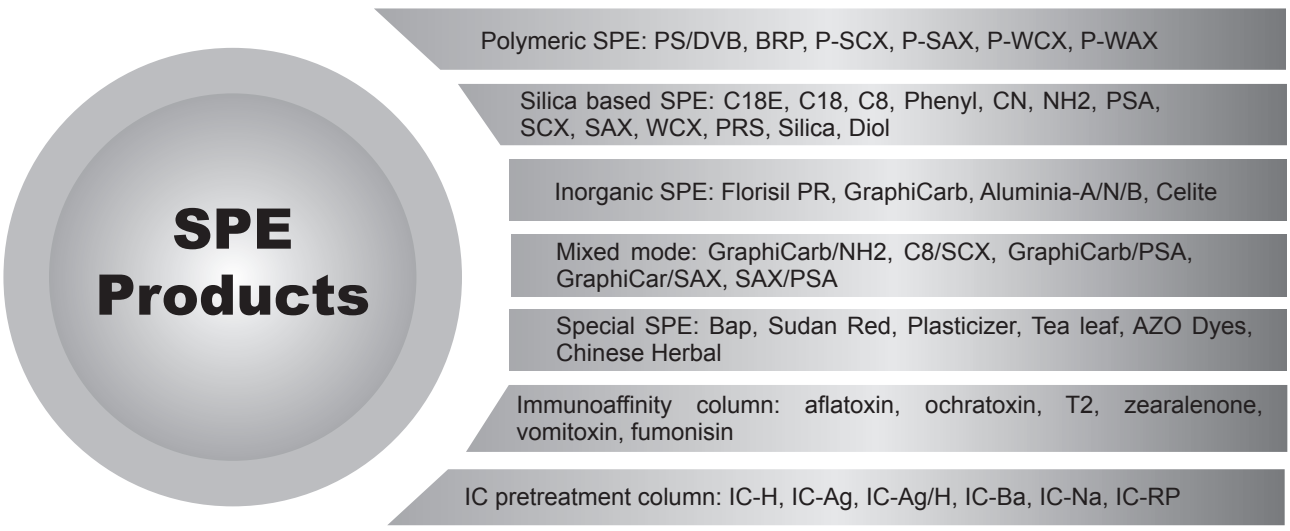
General operation method of cation exchange SPE column



General operation method of anion exchange SPE column



Welchrom® SPE Instroduction and Ordering Information



Welchrom® Polymeric SPE

Welchrom polymer based packing materials have overcome the shortcomings of traditional silica matrix packing materials, and the use proportion of SPE has been increasing gradually.

Welchrom® SPE polymer matrix has the following advantages over silica matrix:

(1) The pH range is wide (0-14), and can be used with most organic solvents.

(2) There is no active hydroxyl group on the polymer surface, which eliminates the influence of secondary adsorption caused by insufficient recovery rate of basic compound.

(3) Polymer matrix has large adsorption capacity and higher recovery rate for most organic compounds, organic compounds are prone to be quantitatively eluted after adsorption, so the analysis results have great reproducibility.

(4) High recovery rate and high adsorption capacity reduce the detection limit and the amount of polymer adsorbent needed.

(5) Some expensive extracts will not be contaminated by the hydrolysis of the bonded phase. Spherical particles, narrow particle size distribution, to ensure the reproducibility of the results.

(6) High anti-interference stability: if Welchrom® polymer based SPE column accidentally get dried during sample preparation, it can be rewetted and retain its properties without risking loss of analytes and affecting the reproducibility of the results.

Currently, BRP, P-SCX, P-WCX, P-WAX, P-SAX and PS/DVB are available for your sample processing.

Mixed ion-exchange reversed phase adsorbents can be obtained by different ionic groups bonded the benzene ring of Welchrom® BRP. They are as follows:

(1) P-SCX: a mixed-mode strong cation exchange reversed-phase adsorbent, obtained by BRP adsorbent bonded sulfonic acid groups,

(2) P-SAX: a mixed mode strong anion exchange reversed-phase adsorbent, obtained by BRP adsorbent bonded quaternary ammonium groups. It has both anion-exchange and inverse-phase retention modes and is suitable for carboxylic acid compounds with pKa between 2-8.

(3) P-WCX: a mixed mode weak cation exchange reversed-phase adsorbent, obtained by BRP adsorbent bonded carboxyl groups, with both weak cation exchange and reversed-phase retention modes, suitable for strongly basic compounds whose pKa of conjugated acids is greater than 10, such as compounds containing quaternary ammonium groups.

(4) P-WAX: a mixed mode weak anion exchange reversed-phase adsorbent, obtained by BRP adsorbent bonded piperazine groups, with both weak cation exchange and reversed-phase retention modes, suitable for strongly acidic compounds whose pKa is less than 1, such as compounds containing sulfonic acid and phosphoric acid groups.

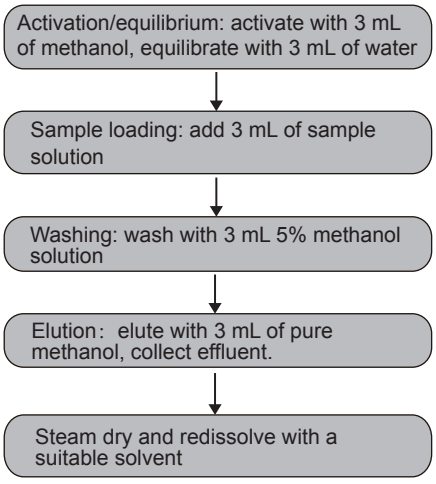
1. Welchrom® BRP

Welchrom® BRP is a monodisperse hydrophilic and hydrophobic surface equilibrium reversed-phase adsorbent. It is a kind of polymer adsorbent that has been through surface modification and polar functional groups are introduced. BRP is abbreviation of “Banlanced Reverse Polymer”. It is used to separate polar and non- polar substances and its adsorption capacity is 3-10 times that of the C18-bonded silica stationary phase, such as drug extraction separation of naproxen, ibuprofen, fenorprofen, indometacin, caffeine, theobromine, doxepini hydrochloridum, etc.

Technical parameters

Matrix	Divinyl benzene polymer
Parameter	Particle size: 40-60 μm Pore size: 80 Å Surface area: 800-1000 m^2
Function groups	Phenyl, vinyl, pyrrolidone
Retention mechanism	Reversed-phase retention

General operation method of Welchrom® BRP (Take Welchrom® BRP, 60 mg/3 ml as example)



Application

1. Food safety: drug residue in animal samples, such as tetracyclines, chloramphenicol, sulfonamides, avermectins, macrolide antibiotics, furan drug and its metabolites. Drug residue in plant samples.Additives in food such as dimethyl fumarate, neotame, sucralose and so on.
2. Environment: PAHs, PAEs, phenolic compound, bisphenol A, triazine herbicides in water and soil.
3. Biological sample: drug analysis in blood and urine, such as tetracycline drugs, cocaine and its metabolites, morphine and its metabolites, barbiturates, tricyclic drugs, ranitidine and etc.

Ordering information of Welchrom® BRP

P/N	Description	P/N	Description
00522-20015	Welchrom® BRP, 30 mg/1 ml, 100 pk	00522-20006	Welchrom® BRP, 500 mg/6 ml, 30 pk
00522-20001	Welchrom® BRP, 100 mg/1 ml, 100 pk	00522-20007	Welchrom® BRP, 1000 mg/6 ml, 30 pk
00522-20009	Welchrom® BRP, 60 mg/3 ml, 50 pk	00522-20106	Welchrom® BRP, 500 mg/12 ml, 20 pk

P/N	Description	P/N	Description
00522-20002	Welchrom® BRP, 100 mg/3 ml, 50 pk	00522-20075	Welchrom® BRP, 1 g/12 ml, 20 pk
00522-20003	Welchrom® BRP, 150 mg/3 ml, 50 pk	00522-20115	Welchrom® BRP, 1 g/30 ml, 10 pk
00522-20004	Welchrom® BRP, 200 mg/3 ml, 50 pk	00522-20008	Welchrom® BRP, 2 g/12 ml, 20 pk
00522-20090	Welchrom® BRP, 225 mg/3 ml, 50 pk	00522-20096	Welchrom® BRP, 2.5 g/30 ml, 10 pk
00522-20049	Welchrom® BRP, 400 mg/3 ml, 50 pk	09522-20006	Welchrom® BRP, 500 mg/6 ml, 30 pk, glass
00522-20005	Welchrom® BRP, 500 mg/3 ml, 50 pk	00522-20017	Welchrom® BRP, 10g/bottle
00522-20043	Welchrom® BRP, 150 mg/6 ml, 30 pk	00522-20018	Welchrom® BRP, 100g/bottle
00522-20014	Welchrom® BRP, 200 mg/6 ml, 30 pk		

2. Welchrom® PS/DVB

Welchrom® PS/DVB is a kind of polymer adsorbent which takes highly crosslinked polystyrene/divinyl benzene copolymer as base materials. With large surface area (800 m^2/g) and high adsorption capacity, Welchrom® PS/DVB allows for rapid adsorption and separation of hydrophobic substances, such as phenol, surfactants, ethidium bromide, antibiotics, amino acids and peptides, etc. Polar compounds with insufficient retention capacity can be extracted in C18 and C8 stationary phase.

Equivalent to Agilent Bond Elute LMS, Bond Elute PPL.

Technical parameters

Matrix	Divinyl benzene polymer
Parameter	Particle size: 40-60 μm Pore size: 80 Å Surface area: 800-1000 m^2
Function groups	Phenyl, vinyl
Retention mechanism	Reversed-phase retention

Application

1. Food safety: analysis of drug residues in animal samples and pesticide residues in plant samples; Analysis of food additives in seasonings and processed foods; Analysis of antioxidant in vegetable oil.
2. Environment: phenolic compounds.
3. Biological samples: analysis of drugs in blood and urine.

Ordering information of Welchrom® BRP

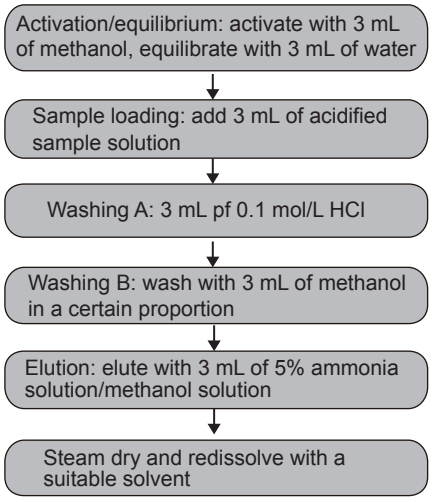
P/N	Description	P/N	Description
00526-20015	Welchrom® PS/DVB, 30 mg/1 ml, 100 pk	00526-20005	Welchrom® PS/DVB, 500 mg/3 ml, 50 pk
00526-20001	Welchrom® PS/DVB, 100 mg/1 ml, 100 pk	00526-20097	Welchrom® PS/DVB, 60 mg/6 ml, 30 pk
00526-20009	Welchrom® PS/DVB, 60 mg/3 ml, 50 pk	00526-20084	Welchrom® PS/DVB, 100 mg/6 ml, 30 pk
00526-20002	Welchrom® PS/DVB, 100 mg/3 ml, 50 pk	00526-20043	Welchrom® PS/DVB, 150 mg/6 ml, 30 pk
00526-20003	Welchrom® PS/DVB, 150 mg/3 ml, 50 pk	00526-20014	Welchrom® PS/DVB, 200 mg/6 ml, 30 pk
00526-20004	Welchrom® PS/DVB, 200 mg/3 ml, 50 pk	00526-20006	Welchrom® PS/DVB, 500 mg/6 ml, 30 pk
00526-20012	Welchrom® PS/DVB, 250 mg/3 ml, 50 pk		

3. Welchrom® P-SCX

Polymer matrix adsorbent often has mixed-mode retention mechanism, Welchrom ® polymer-based SPE products is no exception. Welchrom ® P-SCX is a kind of mixed-mode polymer-based adsorbent which has strong cation exchange function and hydrophilicity of reversed-phase chromatographic stationary phase, containing strongly acidic sulfonic acid functional groups to retain both basic and neutral compounds, such as melamine, amphetamines, chlorpheniramine, and phencyclidine. Equivalent to Waters Oasis MCX.

Technical parameters

Matrix	Divinyl benzene polymer
Parameter	Particle size: 40-60 μm Pore size: 80 Å Surface area: 800-1000 m^2
Function groups	Pyrrolidone, benzene sulfonic acid functional groups, phenyl, vinyl
Retention mechanism	Reversed-phase retention and strong cationic mechanism



Application

1. Food safety: melamine analysis; Analysis of alkaline drug residues in animal samples, such as metronidazole, ronidazole, dimetridazole, sulfanilamides, clenbuterol and other drugs; Analysis of alkaline pesticides in vegetables, fruits and fruit juice, such as carbendazim, thiabendazole and other fungicides.
2. Biological samples: analysis of alkaline drugs in blood and urine.

Ordering information of Welchrom® P-SCX

P/N	Description	P/N	Description
00523-20015	Welchrom® P-SCX, 30 mg/1 ml, 100 pk	00523-20043	Welchrom® P-SCX, 150 mg/6 ml, 30 pk
00523-20001	Welchrom® P-SCX, 100 mg/1 ml, 100 pk	00523-20014	Welchrom® P-SCX, 200 mg/6 ml, 30 pk
00523-20016	Welchrom® P-SCX, 60 mg/3 ml, 50 pk	00523-20006	Welchrom® P-SCX, 500 mg/6 ml, 30 pk
00523-20002	Welchrom® P-SCX, 100 mg/3 m, 50 pk	00523-20007	Welchrom® P-SCX, 1 g/6 ml, 30 pk
00523-20003	Welchrom® P-SCX, 150 mg/3 ml, 50 pk	00523-20075	Welchrom® P-SCX, 1 g/12 ml, 20 pk
00523-20004	Welchrom® P-SCX, 200 mg/3 ml, 50 pk	00523-20005	Welchrom® P-SCX, 500 mg/3 ml, 50 pk

4. Welchrom® P-SAX

Welchrom® P-SAX is a kind of mixed-mode adsorbent with strong anion exchange function and reversed-phase chromatography hydrophobicity, containing quatmonium functional groups. It is commonly used to separate and purify acidic substances, such as tyrosine, estrone, adenineand nucleoside, from alkaline and neutral impurities. With polymer as matrix, Welchrom® P-SAX can tolerate many organic solvents, and is stable in aqueous solution from pH range of 0 to 14.

Technical parameters

Matrix	Divinyl benzene polymer
Parameter	Particle size: 40-60 μm Pore size: 80 Å Surface area: 800-1000 m^2
Function groups	Pyrrolidone, quaternary ammonium functional groups, phenyl, vinyl
Retention mechanism	Reversed-phase retention and strong anionic mechanism

Application

1. Analysis of food additives in food and flavoring, such as benzoic acid, sorbic acid, dehydroacetic acid, vanillin, methyl vanillin, ethyl vanillin, etc.
2. Analysis of mycotoxins in food, such as patulin, citronin, ochratoxin A, bongkrekic acid, etc.
3. Analysis of kirenol, darutoside and darutigenol in natural herbal medicine.
4. Detection of caffeine in white wine.
5. Agricultural residue analysis in food, such as pentachlorophenol sodium, clodinafop-propargyl, etc.

Ordering information of Welchrom® P-SAX

P/N	Description	P/N	Description
00524-20015	Welchrom® P-SAX, 30 mg/1 ml, 100 pk	00524-20084	Welchrom® P-SAX, 100 mg/6 ml, 30 pk
00524-20001	Welchrom® P-SAX, 100 mg/1 ml, 100 pk	00524-20043	Welchrom® P-SAX, 150 mg/6 ml, 30 pk
00524-20016	Welchrom® P-SAX, 60 mg/3 ml, 50 pk	00524-20014	Welchrom® P-SAX, 200 mg/6 ml, 30 pk
00524-20002	Welchrom® P-SAX, 100 mg/3 ml, 50 pk	00524-20006	Welchrom® P-SAX, 500mg/6ml, 30 pk
00524-20003	Welchrom® P-SAX, 150 mg/3 ml, 50 pk	00524-20007	Welchrom® P-SAX, 1000 mg/6 ml, 30 pk
00524-20004	Welchrom® P-SAX, 200 mg/3 ml, 50 pk	00524-20075	Welchrom® P-SAX, 1 g/12 ml, 20 pk
00524-20005	Welchrom® P-SAX, 500 mg/3 ml, 50 pk	00524-20097	Welchrom® P-SAX, 60 mg/6 ml, 30 pk

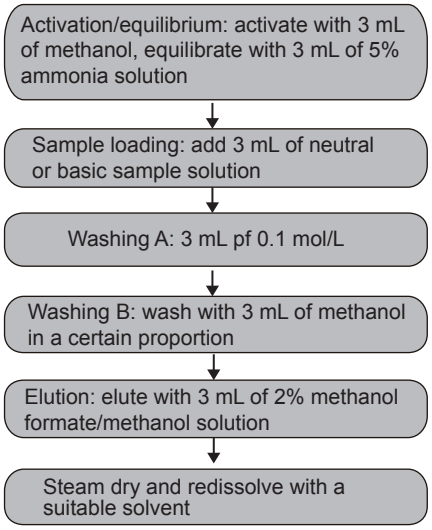
5. Welchrom® P-WCX

Welchrom® P-WCX is a kind of polymer-based weak cation exchange sorbent whose retention mechanism is weak cation exchange and reversed-phase retention. Its packing materials contain carboxylic groups, which is suitable for the separation and purification of strongly basic compounds. The matrix of divinylbenzene polymer enables it to keep stable properties even under high pH conditions.

Technical parameters

Matrix	Divinyl benzene polymer
Parameter	Particle size: 40-60 μm Pore size: 80 Å Surface area: 800-1000 m^2
Function groups	Pyrrolidone, carboxylic, phenyl, vinyl
Retention mechanism	Reversed-phase retention and weak cationic mechanism

General operation method of Welchrom® P-WCX (Take Welchrom® P-WCX,60 mg/3 ml as example)



Application

Separate and purify strongly basic compounds, such as those with quaternary ammonium groups.

Ordering information of Welchrom® P-WCX

P/N	Description	P/N	Description
00539-20005	Welchrom® P-WCX, 500 mg/3 ml, 50 pk	00539-20015	Welchrom® P-WCX 30 mg/1 ml 100 pk
00539-20006	Welchrom® P-WCX, 500 mg/6 ml, 30 pk	00539-20016	Welchrom® P-WCX 60 mg/3 ml 50 pk

6. Welchrom® P-WAX

Welchrom® P-WAX column is polymer-based weak anion exchange column. Its packing materials have both weak anion exchange and reversed-phase retention mechanism. The piperazine groups on BRP packing materials bonded the phenyl groups, which is suitable for the separation and purification of strong acid substances. The divinyl benzene polymer keeps its stable performance from pH range of 0 to 14.

Technical parameters

Matrix	Polymer
Parameter	Particle size: 40-60 μm Pore size: 80 Å Surface area: 800-1000 m^2
Function groups	Pyrrolidinone, piperazine, phenyl, vinyl
Retention mechanism	Reversed-phase retention and weak anionic mechanism

Application

1. Separation and purification of strongly acidic compounds, such as compounds containing sulfonic acid groups.
2. Detection and analysis of artificial pigment in food, better recovery effect of erythrosine than that of PA column.

Ordering information of Welchrom® P-WAX

P/N	Description	P/N	Description
00525-20015	Welchrom® P-WAX, 30 mg/1 ml, 100 pk	00525-20005	Welchrom® P-WAX, 500 mg/3 ml, 50 pk
00525-20001	Welchrom® P-WAX, 100 mg/1 ml, 100 pk	00525-20097	Welchrom® P-WAX, 60 mg/6 ml, 30 pk
00525-20016	Welchrom® P-WAX, 60 mg/3 ml, 50 pk	00525-20084	Welchrom® P-WAX, 100 mg/6 ml, 30 pk
00525-20002	Welchrom® P-WAX, 100 mg/3 ml, 50 pk	00525-20043	Welchrom® P-WAX, 150 mg/6 ml, 30 pk
00525-20003	Welchrom® P-WAX, 150 mg/3 ml, 50 pk	00525-20014	Welchrom® P-WAX, 200 mg/6 ml, 30 pk
00525-20004	Welchrom® P-WAX, 200 mg/3 ml, 50 pk	00525-20006	Welchrom® P-WAX, 500 mg/6 ml, 30 pk

7. Welchrom® PA

Adsorbent of Welchrom® PA column is polyamide, a polymeric compound containing amide groups in the molecular backbone repeating unit, commonly known as "nylon". Amide groups can form hydrogen bonds with polar compounds and have a good adsorption and retention effect on polar compounds. Both column and packing materials are suitable for the determination of synthetic colorants in food such as lemon yellow, new red, amaranth red, carmine red, sunset yellow, bright blue and so on or the removal of pigment in samples.

Application

Determination of synthetic colorants in food.

Ordering information of Welchrom® PA

P/N	Description	P/N	Description
00541-20001	Welchrom® PA, 100 mg/1 ml, 100pk	00541-20008	Welchrom® PA, 2 g/12 ml, 20pk
00541-20002	Welchrom® PA, 100 mg/3 ml, 50pk	00541-20009	Welchrom® PA, 60 mg/3 ml, 50pk
00541-20003	Welchrom® PA, 150 mg/3 ml, 50pk	00541-20014	Welchrom® PA, 200 mg/6 ml, 30pk
00541-20004	Welchrom® PA, 200 mg/3 ml, 50pk	00541-20100	Welchrom® PA, 3 g/12 ml, 20pk
00541-20005	Welchrom® PA, 500 mg/3 ml, 50pk	00541-20114	Welchrom® PA, 4 g/60 ml, 10pk
00541-20006	Welchrom® PA, 500 mg/6 ml, 30pk	00541-20017	Welchrom® PA, 10 g/ bottle
00541-20007	Welchrom® PA, 1 g/6 ml, 30pk	00541-20018	Welchrom® PA, 100 g/ bottle

Welchrom® Silica Based SPE

Welchrom® silica SPE products select amorphous silica gel of high quality and high purity with an average particle size of 45 μm, an average pore diameter of 60 Å, Pore volume of 0.80 cm^3/g and Surface area of 480 m^2/g. This kind of silica gel is an ideal choice for extraction with moderate resistance and flow rate. In addition, Welch uses unique surface treatment technology when bonding silicone. Further, the bonding phase also adopts a more stable three-way bonding mode, which ensures the constant extraction recovery rate of the analytes. At present, the most commonly used adsorbent in SPE is still silica gel or bonded silica gel with pH range of 2-7.5. There are various kinds of silica based adsorbents can be selected.

In Welchrom® SPE products, Silica matrices include C18E(end-capped), C18(unend-capped), C8, Phenyl, CN, NH2, PSA, SCX, SAX, WAX, PRS, Silica, Diol.

General properties of silica-based adsorbent:

(1) Functional groups bonded on the surface of silica gel play a major role in the retention of target compounds; Based on the different types of bonding functional groups, the retention mechanism of adsorbent on the target compound includes reversed-phase retention, normal phase retention and ion exchange retention.

(2) The silica gel bonded adsorbent is stable in the pH range of 2-7.5.

(3) The silica gel bonded adsorbent is rigid, neither shrinks nor expands when the solvent is transformed, and it can quickly reach a balance in the new solvent.

(4) The silica gel bonded adsorbent substrate is 40-63 μm spherical silica gel, with uniform particle size and smooth surface, even under the condition of no pressure solvent, it can pass through the adsorbent; The silica gel bonded adsorbent has a characteristic pore diameter of about 60 Å and is suitable for compounds with molecular weight less than 15,000. In the synthesis of reversed-phase adsorbent, they are all end-capped, while normal phase adsorbents and ion exchange adsorbents are unend-capped.

1. Welchrom® C18E

Welchrom® C18E is a kind of C18 adsorbent with end-capped packing materials, which have the most hydrophobicity. It has excellent strong retention characteristics for non-polar compounds and retains most organic compounds as the most widely used SPE adsorbent. Because C18 has the ability to retain most of the organic substances in water-soluble matrices, it has the least selectivity and is often used to treat analytical samples with multiple or widely different structures. At the same time, the packing mateirals of C18E does not retain salt at all, so C18E column can usually be used instead of ion-exchange column for desalting some small molecules and some medium-sized molecules.

Technical parameters

Matrix	Silica gel
Parameter	Particle size: 40-60 μm Pore volume: 0.80 cm^3/g Pore size: 60 Å Surface area: 480 m^2/g
Function groups	C18 alkyl chain
Endcapped	Yes
Carbon loading	17%



Retention mechanism	Reversed-phase retention

Application

1. Extraction of organic pollutants in water: PAHs, PAEs, PCBs, phenolic substances, microcystin, agricultural residues (such as abamectin, carnavir, atrazine, etc.).
2. Field of life sciences: such as extraction of drugs and their metabolites in plasma, serum and urine; extraction of pesticide and veterinary drug residues in food.
3. Extracts of plants and animals: desalination of biological macromolecules such as aromatic oils, fat-soluble vitamins, water-soluble vitamins, carbohydrates, organic acids and steroids.

Ordering information of Welchrom® C18E

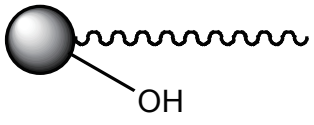
P/N	Description	P/N	Description
00559-11001	Welchrom® C18E, 100 mg/1 ml, 100 pk	00559-11013	Welchrom® C18E, 250 mg/6 ml, 30 pk
00559-11015	Welchrom® C18E, 30 mg/1 ml, 100 pk	00559-11069	Welchrom® C18E, 300 mg/6 ml, 30 pk
00559-11009	Welchrom® C18E, 60 mg/3 ml, 50 pk	00559-11087	Welchrom® C18E, 350 mg/6 ml, 30 pk
00559-11045	Welchrom® C18E, 30 mg/3 ml, 50 pk	00559-11006	Welchrom® C18E, 500 mg/6 ml, 30 pk
00559-11002	Welchrom® C18E, 100 mg/3 ml, 50 pk	00559-11007	Welchrom® C18E, 1 g/6 ml, 30 pk
00559-11003	Welchrom® C18E, 150 mg/3 ml, 50 pk	00559-11008	Welchrom® C18E, 2 g/12 ml, 2 0pk
00559-11004	Welchrom® C18E, 200 mg/3 ml, 50 pk	00559-11035	Welchrom® C18E, 5 g/30 ml, 10 pk
00559-11012	Welchrom® C18E, 250 mg/3 ml, 50 pk	00559-11107	Welchrom® C18E, 1 g/60 ml, 10 pk
00559-11066	Welchrom® C18E, 300 mg/3 ml, 50 pk	00559-11042	Welchrom® C18E, 5 g/60 ml, 10 pk
00559-11022	Welchrom® C18E, 360 mg/3 ml, 50 pk	00559-11041	Welchrom® C18E, 10 g/60 ml, 10 pk
00559-11005	Welchrom® C18E, 500 mg/3 ml, 50 pk	00559-11115	Welchrom® C18E, 1 g/30 ml, 10 pk

2. Welchrom® C18

Welchrom® C18 are unend-capped packing mateirals of C18 adsorbent. The more residual silicohydroxyl on the surface provides additional polar interaction, which makes the hydrophobic bonded silica gel more closely in contact with the more polar extractant, and enhances the retention ability of alkaline compounds and polar substances. Welchrom® C18 is a general-purpose stationary phase for extraction of polar and non-polar compounds, compared to end-capped Welchrom® C18E. The carbon load of Welchrom® C18 was about 17%. The average particle size of silica gel in packing materials was 45 μm, the average pore diameter was 60 Å, the pore volume was 0.80 cm^3/g , and surface area was 480 m^2/g.

Technical parameters

Matrix	Silica gel
Parameter	Particle size: 40-60 μm Pore volume: 0.80 cm^3/g Pore size: 60 Å Surface area: 480 m^2/g
Function groups	C18 alkyl chain, silicon hydroxyl
Endcapped	No
Carbon loading	17%
Retention mechanism	Reversed-phase retention



Application

1. Similar to C18E, but with enhanced retention for polar compounds.
2. Detection of agricultural residues in water, such as atrazine, simazine, etc.
3. Detection of food additives in baked food and processed food, such as acesulfame potassium, saccharin sodium, aspartame, etc.
4. Detection of food additives in beverages, such as acesulfame potassium, caffeine, etc.

Ordering information of Welchrom® C18

P/N	Description	P/N	Description
00504-11001	Welchrom® C18, 100 mg/1 ml, 100 pk	00504-11005	Welchrom® C18, 500 mg/3 ml, 50 pk
00504-11002	Welchrom® C18, 100 mg/3 ml, 50 pk	00504-11006	Welchrom® C18, 500 mg/6 ml, 30 pk
00504-11003	Welchrom® C18, 150 mg/3 ml, 50 pk	00504-11007	Welchrom® C18, 1 g/6 ml, 30 pk
00504-11004	Welchrom® C18, 200 mg/3 ml, 50 pk	00504-11009	Welchrom® C18, 60 mg/3 ml, 50 pk
00504-11075	Welchrom® C18, 1 g/12 ml, 20 pk		

3. Welchrom® C8

Welchrom® C8 is similar to C18 bonded phase in adsorptivity, mainly depending on non-polar carbon bond interactions. However, due to the alkyl chain of C8 is shorter than that of C18 chain, the retention of non-polar compounds is weaker than that of C18, which is helpful to elution of non-polar samples with too strong adsorbability. C8 column can extract both fat-soluble and water-soluble vitamins from plasma and it is also used in the desalination of biological macromolecular samples. Welchrom® C8 is a commonly used non-polar adsorbent with hydrophobicity less than that of C18 and the retention of non-polar compounds weaker than that of C18, which is conducive to desorption after adsorption of non-polar overstrong samples. For alkaline analytes, the use of C8 adsorbent can increase extraction efficiency and recovery rate.

Technical parameters

Matrix	Silica gel
Parameter	Particle size: 40-60 μm Pore volume: 0.80 cm^3/g Pore size: 60 Å Surface area: 480 m^2/g
Function groups	Octane group
Endcapped	Yes
Carbon loading	12%
Retention mechanism	Reversed-phase retention



Application

1. Extraction of organic pollutants in water: PAHs, PAEs, PCBs, insecticides, herbicides, phenolic substances, etc.
2. Field of life sciences: such as the extraction of drugs and their metabolites in plasma, serum and urine.
3. Extraction of pesticide and veterinary drug residues in food.
4. Animal and plant extracts: aromatic oils, fat-soluble vitamins, water-soluble vitamins, carbohydrates, organic acids, steroids, etc.
5. Desalination of biological macromolecules.

Ordering information of Welchrom® C8

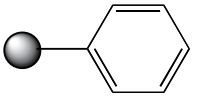
P/N	Description	P/N	Description
00505-11001	Welchrom® C8, 100 mg/1 ml, 100 pk	00505-11005	Welchrom® C8, 500 mg/3 ml, 50 pk
00505-11002	Welchrom® C8, 100 mg/3 ml, 50 pk	00505-11006	Welchrom® C8, 500 mg/6 ml, 30 pk
00505-11003	Welchrom® C8, 150 mg/3 ml, 50 pk	00505-11007	Welchrom® C8, 1 g/6 ml, 30 pk
00505-11004	Welchrom® C8, 200 mg/3 ml, 50 pk	00505-11008	Welchrom® C8, 2 g/12 ml, 20 pk

4. Welchrom® Phenyl

Welchrom® Phenyl formed by Phenyl SPE bonded stationary phase, and its SPE column packing mterials increase the unique polar forces of the benzene ring and improves the retention ability of alkaline compounds. When aromatic compounds and non-aromatic compounds are extracted together, a different selectivity than C18, C8 and other reversed-phase of Welchrom® Phenyl is manifested. Welchrom® Phenyl based on silica gel has an average particle size of 45 μm, pore diameter of 60 Å, pore volume of 0.80 cm^3/g, surface area of 480 m^2/g.

Technical parameters

Matrix	Silica gel
Parameter	Particle size: 40-60 μm Pore volume: 0.80 cm^3/g Pore size: 60 Å Surface area: 480 m^2/g
Function groups	Phenyl group
Endcapped	Yes
Carbon loading	10%
Retention mechanism	Reversed-phase retention



Application

1. Extraction of organic pollutants in water: PAHs, PAEs, PCBs, insecticides, herbicides, phenolic substances, etc.
2. Field of life sciences: such as the extraction of drugs and their metabolites in plasma, serum and urine.
3. Extraction of pesticide and veterinary drug residues in food.
4. Animal and plant extracts: aromatic oils, fat-soluble vitamins, water-soluble vitamins, carbohydrates, organic acids, steroids, etc.

Ordering information of Welchrom® Phenyl

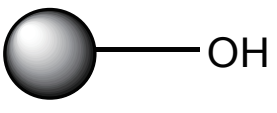
P/N	Description	P/N	Description
00506-11001	Welchrom® Phenyl, 100 mg/1 ml, 100 pk	00506-11005	Welchrom® Phenyl, 500 mg/3 ml, 50 pk
00506-11002	Welchrom® Phenyl, 100 mg/3 ml, 50 pk	00506-11006	Welchrom® Phenyl, 500 mg/6 ml, 30 pk
00506-11003	Welchrom® Phenyl, 150 mg/3 ml, 50 pk	00506-11007	Welchrom® Phenyl, 1 g/6 ml, 30 pk
00506-11004	Welchrom® Phenyl, 200 mg/3 ml, 50 pk	00506-11008	Welchrom® Phenyl, 2 g/12 ml, 20 pk

5. Welchrom® Silica

Welchrom® Silica is an unbonded active silica normal phase adsorbent with a weak acid and strong polarity. Its retention to target mainly achieved by hydrogen bonding. The silica-hydroxyl group on the surface of silica gel can be ionized, and its function is similar to that of weak cation exchange adsorbent under moderate pH conditions.

Technical parameters

Matrix	Silica gel
Parameter	Particle size: 40-60 μm Pore volume: 0.80 cm^3/g Pore size: 60 Å Surface area: 480 m^2/g
Function groups	Silicon hydroxyl



Endcapped	No
Retention mechanism	Normal phase retention

Application

1. Extraction of compounds with polar groups in lipid samples.
2. Adsorption of interfering substance in extract during pesticide residue analysis.

Ordering information of Welchrom® Silica

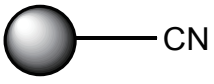
P/N	Description	P/N	Description
00500-11001	Welchrom® Silica, 100 mg/1 ml, 100 pk	00500-11006	Welchrom® Silica, 500 mg/6 ml, 30 pk
00500-11004	Welchrom® Silica, 200 mg/3 ml, 50 pk	00500-11007	Welchrom® Silica, 1 g/6 ml, 30 pk
00500-11005	Welchrom® Silica, 500 mg/3 ml, 50 pk	00500-11008	Welchrom® silica, 2 g/10 ml, 20 pk
00500-11018	Welchrom® Silica, 100 g/bottle	00500-11017	Welchrom® Silica, 10 g/ bottle

6. Welchrom® CN

Welchrom® CN is a cyano-polar bonding adsorbent with both polar and non-polar interactions. It can be used as a non-polar adsorbent to extract both polar and non-polar substances from aqueous solution samples or polar substances from solvents with relatively less polarity.

Technical parameters

Matrix	Silica gel
Parameter	Particle size: 40-60 μm Pore volume: 0.80 cm^3/g Pore size: 60 Å Surface area: 480 m^2/g
Function groups	Cyano
Endcapped	Yes
Carbon loading	6.5%
Retention mechanism	Reversed-phase or normal phase retention



Application

Detection of pesticides, drugs and their metabolites in water samples.

Ordering information of Welchrom® CN

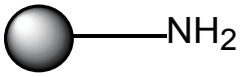
P/N	Description	P/N	Description
00507-11001	Welchrom® CN, 100 mg/1 ml, 100 pk	00507-11005	Welchrom® CN, 500 mg/3 ml, 50 pk
00507-11002	Welchrom® CN, 100 mg/3 ml, 50 pk	00507-11006	Welchrom® CN, 500 mg/6 ml, 30 pk
00507-11003	Welchrom® CN, 150 mg/3 ml, 50 pk	00507-11007	Welchrom® CN, 1 g/6 ml, 30 pk
00507-11004	Welchrom® CN, 150 mg/3 ml, 50 pk	00507-11008	Welchrom® CN, 2 g/12 ml, 20 pk

7. Welchom® NH_2

As aminopropyl groups bonded SPE packing materials, Welchom® NH2 can be used as either a polar adsorbent or a weak anion exchanger. When activated with nonpolar solvents such as n-hexane, it can form hydrogen bonds with any molecule containing -OH, -NH or -SH groups. In water-based environment, pH<7.8 can be used as a weak anion exchanger.

Technical parameters

Matrix	Silica gel
Parameter	Particle size: 40-60 μm Pore volume: 0.80 cm^3/g Pore size: 60 Å Surface area: 480 m^2/g
Function groups	Aminopropyl
Endcapped	No
Carbon loading	3.5%
Retention mechanism	Normal phase retention and weak anion exchange



Application

1. Can be used to separate structural isomers.
2. Extraction of compounds with polar groups in lipid samples, such as thiomersal in skin care products.
3. Used in agricultural residue analysis to remove polar compounds (such as carbohydrates and pigments), organic acids, phenols, etc.
4. Detection of synthetic colorants in beverages, condiments and processed meats, such as acid orange II, etc.

Ordering information of Welchrom® NH_2

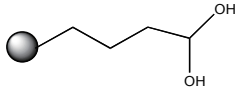
P/N	Description	P/N	Description
00509-11001	Welchrom® NH_2, 100 mg/1 ml, 100 pk	00509-11005	Welchrom® NH_2, 500 mg/3 ml, 50 pk
00509-11002	Welchrom® NH_2, 100 mg/3 ml, 50 pk	00509-11006	Welchrom® NH_2, 500 mg/6 ml, 30 pk
00509-11003	Welchrom® NH_2, 150 mg/3 ml, 50 pk	00509-11007	Welchrom® NH_2, 1 g/6 ml, 30 pk
00509-11004	Welchrom® NH_2, 200 mg/3 ml, 50 pk	00509-11008	Welchrom® NH_2, 2 g/12 ml, 20 pk
00509-11035	Welchrom® NH_2, 5 g/30 ml, 10 pk		

8. Welchrom® Diol

Welchrom® Diol is a kind of polar adsorbent that its silica matrix bonded diol. According to the different activation conditions and matrix conditions of the samples, it may show weak non-polar interaction, and extract non-polar substances from the water-based samples. In most cases, it is used as polar adsorbent whose polar effect is similar to that of unbonded silica gel to extract polar molecules from non-polar solvents. Isomers and other structurally similar compounds also can be separated by it.

Technical parameters

Matrix	Silica gel
Parameter	Particle size: 40-60 μm Pore volume: 0.80 cm^3/g Pore size: 60 Å Surface area: 480 m^2/g
Function groups	Diol
Endcapped	No
Retention mechanism	Normal phase retention



Application

Separation and purification of polar target compounds or compounds with moderate polarity.

Ordering information of Welchrom® Diol

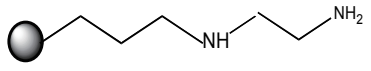
P/N	Description	P/N	Description
00510-11001	Welchrom® Diol, 100 mg/1 ml, 100 pk	00510-11005	Welchrom® Diol, 500 mg/3 ml, 50 pk
00510-11002	Welchrom® Diol, 100 mg/3 ml, 50 pk	00510-11006	Welchrom® Diol, 500 mg/6 ml, 30 pk
00510-11003	Welchrom® Diol, 150 mg/3 ml, 50 pk	00510-11007	Welchrom® Diol, 1 g/6 ml, 30 pk
00510-11004	Welchrom® Diol, 200 mg/3 ml, 50 pk		

9. Welchom® PSA

Welchrom® PSA is an adsorbent similar to NH_2. PSA has two amino groups with pKa of 10.1 and 10.9, respectively. It has stronger ion exchange capacity than NH_2 SPE column and is generally used in anion exchange retention mode. The average particle size of silica gel matrix is 45 μm, the pore diameter is 60 Å, the pore volume is 0.80 cm^3/g, and the specific surface area is 480 m^2/g.

Technical parameters

Matrix	Silica gel
Parameter	Particle size: 40-60 μm Pore volume: 0.80 cm^3/g Pore size: 60 Å Surface area: 480 m^2/g
Function groups	Ethylenediamine
Endcapped	No
Carbon loading	7%
Retention mechanism	Normal phase retention and weak anion exchange



Application

1. Used to separate structural isomers.
2. Used to extract compounds with polar groups in lipid samples.
3. Used to remove polar compounds (such as carbohydrates and pigments), organic acids, phenols, etc., such as acid orange II in processed meat in agricultural residue analysis .

Ordering information of Welchrom® PSA

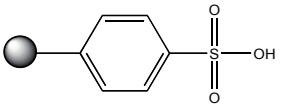
P/N	Description	P/N	Description
00508-11001	Welchrom® PSA, 100 mg/1 ml, 100 pk	00508-11043	Welchrom® PSA, 150 mg/6 ml, 30 pk
00508-11002	Welchrom® PSA, 100 mg/3 ml, 50 pk	00508-11006	Welchrom® PSA, 500 mg/6 ml, 30 pk
00508-11003	Welchrom® PSA, 150 mg/3 ml, 50 pk	00508-11007	Welchrom® PSA, 1 g/6 ml, 30 pk
00508-11004	Welchrom® PSA, 200 mg/3 ml, 50 pk	00508-11008	Welchrom® PSA, 2 g/12 ml, 20 pk
00508-11005	Welchrom® PSA, 500 mg/3 ml, 50 pk	09508-11014	Welchrom® PSA, 200 mg/6 ml, 30 pk/glass
09508-11007	Welchrom® PSA, 1 g/6 ml, 30 pk, glass	09508-11006	Welchrom® PSA, 500 mg/6 ml, 30 pk/glass

10. Welchrom® SCX

Welchrom® SCX is a strong cation exchange extraction column based on silica gel, bondind to benzenesulfonic acid groups.

Technical parameters

Matrix	Silica gel
Parameter	Particle size: 40-60 μm Pore volume: 0.80 cm^3/g Pore size: 60 Å Surface area: 480 m^2/g
Function groups	Benzene sulfonic acid group
Endcapped	No
Carbon loading	2%
Retention mechanism	Normal phase retention or cation exchange



Application

Purification of alkaline compounds in aqueous samples, biological fluids and organic phases and detection of niacin and niacinamide in skin care products and agricultural residues in vegetables, such as cyromazine.

Ordering information of Welchrom® SCX

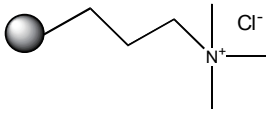
P/N	Description	P/N	Description
00512-11001	Welchrom® SCX, 100mg/1 ml, 100 pk	00512-11004	Welchrom® SCX, 200 mg/3 ml, 50 pk
00512-11009	Welchrom® SCX, 60 mg/3 ml, 50 pk	00512-11005	Welchrom® SCX, 500 mg/3 ml, 50 pk
00512-11002	Welchrom® SCX, 100 mg/3 ml, 50 pk	00512-11006	Welchrom® SCX, 500 mg/6 ml, 30 pk
00512-11003	Welchrom® SCX, 150 mg/3 ml, 50 pk	00512-11007	Welchrom® SCX, 1 g/6 ml, 30 pk

11. Welchrom® SAX

Welchrom® SAX is a strong anion exchange extraction column that binds quaternary amine salt functional groups on the silica surface. It is mainly used for adsorption and enrichment of weak anion targets, such as organic acids and enrich negatively charged objects from water or non-water.

Technical parameters

Matrix	Silica gel
Parameter	Particle size: 40-60 μm Pore volume: 0.80 cm^3/g Pore size: 60 Å Surface area: 480 m^2/g
Function groups	Quaternary ammonium group
Endcapped	No
Carbon loading	7.5%
Retention mechanism	Normal phase retention or anion exchange



Application

Purification of alkaline compounds from aqueous samples, biological fluids and organic phases.

Ordering information of Welchrom® SAX

P/N	Description	P/N	Description
00513-11001	Welchrom® SAX, 100 mg/1 ml, 100 pk	00513-11004	Welchrom® SAX, 200 mg/3 ml, 50 pk
00513-11009	Welchrom® SAX, 60 mg/3 ml, 50 pk	00513-11097	Welchrom® SAX, 60 mg/6 ml, 30 pk
00513-11002	Welchrom® SAX, 100 mg/3 ml, 50 pk	00513-11005	Welchrom® SAX, 500 mg/3 ml, 50 pk
00513-11003	Welchrom® SAX, 150 mg/3 ml, 50 pk	00513-11006	Welchrom® SAX, 500 mg/6 ml, 30 pk
00513-11007	Welchrom® SAX, 1 g/6 ml, 30 pk		

12. Welchrom® WCX

Welchrom® WCX is a weak cation exchange extraction column based on silica gel. The functional group bonded on the silica gel surface is carboxyl group with pKa of 3.8. Since the carboxylic group is bonded, the anion exchange effect is not too strong, so there is no need to elute the target compound with strong basic elution solvent. Welchrom® WCX is more suitable for the adsorption and retention of strong cations because such strong cationic targets interact strongly with SCX packing materials and are difficult to be eluted from SCX packing materials.

Technical parameters

Matrix	Silica gel
Parameter	Particle size: 40-60 μm Pore volume: 0.80 cm^3/g Pore size: 60 Å Surface area: 480 m^2/g
Function groups	Carboxylic acid group
Retention mechanism	Normal phase retention or weak cation exchange



Application

Detection and analysis of alkaloids and azacyclic compounds, such as paraquat in water, rapid detection of insecticides.

Ordering information of Welchrom® WCX

P/N	Description	P/N	Description
00514-11001	Welchrom® WCX, 100 mg/1 ml, 100 pk	00514-11004	Welchrom® WCX, 200 mg/3 ml, 50 pk
00514-11009	Welchrom® WCX, 60 mg/3 ml, 50 pk	00514-11005	Welchrom® WCX, 500 mg/3 ml, 50 pk
00514-11002	Welchrom® WCX, 100 mg/3 ml, 50 pk	00514-11006	Welchrom® WCX, 500 mg/6 ml, 30 pk
00514-11003	Welchrom® WCX, 150 mg/3 ml, 50 pk	00514-11007	Welchrom® WCX, 1 g/6 ml, 30 pk

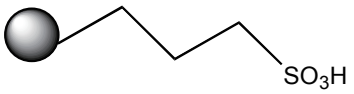
13. Welchrom® PRS

Welchrom® PRS is a strong cationic exchange extraction column based on silica gel, bonding to propyl sulfonic acid functional groups. In nonpolar solvents, PRS with polarity and hydrogen bonding action can be used for extraction and separation of cationic targets.

Technical parameters

Matrix	Silica gel

Parameter	Particle size: 40-60 μm Pore volume: 0.80 cm^3/g Pore size: 60 Å Surface area: 480 m^2/g
Function groups	Propane sulfonic acid group
Retention mechanism	Normal phase retention or cation exchange



Application

Detection of cationic targets, alkaloids and azacyclic compounds.

Ordering information of Welchrom® PRS

P/N	Description	P/N	Description
00511-11001	Welchrom® PRS, 100 mg/1 ml, 100 pk	00511-11004	Welchrom® PRS, 200 mg/3 ml, 50 pk
00511-11009	Welchrom® PRS, 60 mg/3 ml, 50 pk	00511-11005	Welchrom® PRS, 500 mg/3 ml, 50pk
00511-11002	Welchrom® PRS, 100 mg/3 ml, 50 pk	00511-11006	Welchrom® PRS, 500 mg/6 ml, 30 pk
00511-11003	Welchrom® PRS, 150 mg/3 ml, 50 pk	00511-11007	Welchrom® PRS, 1 g/6 ml, 30 pk

14. Welchrom® Thiol

Features:

(1) Product specifications: particle size: 40-63 μm, Pore size: 60 Å, carbon loading: 1.2 mmol/g

(2) Packing mateirals have high quality and high purity;

(3) Fast reaction speed;

(4) Can be used in most solvents;

(5) Excellent lot-to-lot reproducibility, excellent reaction properties and excellent physical or chemical properties;

(6) Good mechanical stability and thermal stability.

Application

Welchrom® Thiol can capture large amounts of metal under a variety of conditions. This product is frequently used in the pharmaceutical industry for the laboratory, most suitable for capturing metal Pd (Ⅱ), Cu, Ag, Hg. In addition, the metals Pb, Rh, Ru and Sn in the sample can also be captured. The following figure shows the Welchrom® Thiol metal cleanup table.

Scavenger	Ag	Cd	Cr	Co	Cu	Fe	Hg	Nl	Pb	Pd (II)	Pd (O)	Pt	Rh (I)	Rh (II)	Rh (III)	Ru (II)	Ru (IV)	Sn	V	Zn
Thiol	▼				▼		▼		▲	▼	▼		▼	▼	▲		▼	▲		

▼ Preferred scavengers ▲ scavengers

Ordering information of Welchrom® Thiol

P/N	Product	Description
00575-11040	Welchrom SPE packing materials	Welchrom Thiol, particle size 40-63 μm, Pore size 50 Å, 25 g

Welchrom® Inorganic SPE

Welchrom® Inorganic SPE is commonly used as a normal phase polarity adsorbent, with different polarity and surface pH, and different applications. However, it is generally used for sample purification before analysis, especially for the purification of organic extract of complex samples. Florisil PR adsorbent, for example, is often used to purify organic solvent extracts of plant and animal tissue samples. most commonly for pesticide residue analysis. Such adsorbents are also used in the pretreatment of samples for the detection and analysis of Sudan red and malachite green in food.

Welchrom® Inorganic SPE matrix inorganic adsorbent has good purification effect, high and constant recovery, good reproducibility after strictly controlled activation treatment.

1. Welchrom® Florisil PR

Welchrom® Florisil PR is a synthetic adsorbent with high selectivity consisting of silicon dioxide, magnesium oxide and sodium sulfate. It is often used for sample purification and extraction separation of chlorine-containing pesticides before chromatographic analysis and of PCBs, PAHs, etc.

Technical parameters

Matrix	Magnesium silicate
Parameter	60-100 mesh (150-250 μm)
Function groups	Silicon hydroxyl
Retention mechanism	Normal phase retention

Application

Analysis of environmental samples and pesticide residues, such as pyrethroid pesticide residues in eggs, detection of PAHs in water and food.

Ordering information of Welchrom® Florisil PR

P/N	Description	P/N	Description
00516-20001	Welchrom® Florisil PR, 100 mg/1 ml, 100 pk	00516-20006	Welchrom® Florisil PR, 500 mg/6 ml, 30 pk
00516-20002	Welchrom® Florisil PR, 100 mg/3 ml, 50 pk	00516-20007	Welchrom® Florisil PR, 1 g/6 ml, 30 pk
00516-20003	Welchrom® Florisil PR, 150 mg/3 ml, 50 pk	00516-20075	Welchrom® Florisil PR, 1 g/12 ml, 20 pk
00516-20004	Welchrom® Florisil PR, 200 mg/3 ml, 50 pk	00516-20008	Welchrom® Florisil PR, 4 g/12 ml, 20 pk
00516-20005	Welchrom® Florisil PR, 500 mg/3 ml, 50 pk	00516-20095	Welchrom® Florisil PR, 1000 mg/6 ml, 30 pk, glass
00516-20035	Welchrom® Florisil PR, 5 g/30 m, 10 pk	09516-20007	Welchrom® Florisil PR, 1 g/12 ml, 20 pk

2. Welchrom® Alumina-N

Welchrom® Alumina-N is a strong polar SPE adsorbent of neutral alumina with neutral surface treatment, it can interact with aluminum metal centers and form hydrogen bonds with surface silicol groups, absorbing molecules with the charged surface by ion exchange.

Further, it has strong retention ability to heterocyclic compounds containing nitrogen, phosphorus, sulfur groups, aromatic hydrocarbons and organic amines, etc. Widely used for sample pretreatment of sudan red and malachite green.

Technical parameters

Matrix	Al_2O_3 particle
Parameter	Particle size: 50-200 μm
Function groups	Aluminum hydroxyl
pH	7.5
Retention mechanism	Normal phase retention or anion exchange

Application

Separation of polar or non-polar compounds from water-soluble and water-insoluble samples, or detection of food additives in beverages, such as lutein and acesulfame potassium, etc.

Ordering information of Welchrom® Alumina-N

P/N	Description	P/N	Description
00518-20001	Welchrom® Alumina-N, 100 mg/1 ml, 100 pk	00518-20013	Welchrom® Alumina-N, 250 mg/6 ml, 30 pk
00518-20002	Welchrom® Alumina-N, 100 mg/3 ml, 50 pk	00518-20006	Welchrom® Alumina-N, 500 mg/6 ml, 30 pk
00518-20003	Welchrom® Alumina-N, 150 mg/3 ml, 50 pk	00518-20007	Welchrom® Alumina-N, 1 g/6 ml, 30 pk
00518-20004	Welchrom® Alumina-N, 200 mg/3 ml, 50 pk	00518-20036	Welchrom® Alumina-N, 2 g/6 ml, 30 pk
00518-20066	Welchrom® Alumina-N, 300 mg/3 ml, 50 pk	00518-20075	Welchrom® Alumina-N, 1 g/12 ml, 20 pk
00518-20049	Welchrom® Alumina-N, 400 mg/3 ml, 50pk	00518-20008	Welchrom® Alumina-N, 2 g/12 ml, 20 pk
00518-20005	Welchrom® Alumina-N, 500 mg/3 ml, 50 pk	00518-20095	Welchrom® Alumina-N, 4 g/12 ml, 20 pk
00518-20068	Welchrom® Alumina-N, 1000 mg/3 ml, 50 pk	00518-20074	Welchrom® Alumina-N, 5 g/12 ml, 20 pk
00518-20014	Welchrom® Alumina-N, 200 mg/6 ml, 30 pk	00518-20035	Welchrom® Alumina-N, 5 g/30 ml, 10 pk
00518-20037	Welchrom® Alumina-N, 22 g/60 ml, 10 pk	09518-20036	Welchrom® Alumina-N, 2 g/6 ml, 30 pk, glass

3. Welchrom® Alumina-B

Welchrom® Alumina-B is an alkaline alumina SPE adsorbent formed by adding acidic alumina with alkaline solution. The surface is negatively charged with the function of cation exchange. Particle size of Welchrom® Alumina-B particle is 50-200 μm.

Technical parameters

Matrix	Al_2O_3 particle
Parameter	Particle size: 50-200 μm
Function groups	Aluminum hydroxyl
pH	10.0
Retention mechanism	Normal phase retention or cation exchange

Application

Retention of polar compounds, cationic compounds and neutral amine samples. Detection of sulfonamides in feed.

Ordering information of Welchrom® Alumina-B

P/N	Description	P/N	Description
00520-20001	Welchrom® Alumina-B, 100 mg/1 ml, 100 pk	00520-20068	Welchrom® Alumina-B, 1000 mg/3 ml, 50 pk
00520-20002	Welchrom® Alumina-B, 100 mg/3 ml, 50 pk	00520-20014	Welchrom® Alumina-B, 200 mg/6 ml, 30 pk
00520-20003	Welchrom® Alumina-B, 150 mg/3 ml, 50 pk	00520-20006	Welchrom® Alumina-B, 500 mg/6 ml, 30 pk
00520-20004	Welchrom® Alumina-B, 200 mg/3 ml, 50 pk	00520-20007	Welchrom® Alumina-B, 1000 mg/6 ml, 30 pk
00520-20005	Welchrom® Alumina-B, 500 mg/3 ml, 50 pk	00520-20075	Welchrom® Alumina-B, 1 g/12 ml, 20 pk
00520-20008	Welchrom® Alumina-B, 2 g/12 ml, 20 pk		

4. Welchrom® Alumina-A

Welchrom® Alumina-A is a aluminium oxide SPE adsorbent with acidic surface (pH=4.5) and particle size of 50-200 μm. It can be used as strong-polarity adsorbent and moderate-polarity anion exchanger.

Application

Separation and purification of acid, moderate polarity and polar target compounds.

Ordering information of Welchrom® Alumina-A

P/N	Description	P/N	Description
00519-20001	Welchrom® Alumina-A, 100 mg/1 ml, 100 pk	00519-20005	Welchrom® Alumina-A, 500 mg/3 ml, 50 pk
00519-20002	Welchrom® Alumina-A, 100 mg/3 ml, 50 pk	00519-20068	Welchrom® Alumina-A, 1000 mg/3 ml, 50 pk
00519-20003	Welchrom® Alumina-A, 150mg/3 ml, 50 pk	00519-20014	Welchrom® Alumina-A, 200 mg/6 ml, 30 pk
00519-20004	Welchrom® Alumina-A, 200 mg/3 ml, 50 pk	00519-20006	Welchrom® Alumina-A, 500 mg/6 ml, 30 pk
00519-20007	Welchrom® Alumina-A, 1000 mg/6 ml, 30 pk		

5. Welchrom® Na_2SO_4

Packing material of Welchrom® Na_2SO_4 is anhydrous sodium sulfate, which has the effect of dehydration and can effectively eliminates the interference of water in the sample.

Ordering information of Welchrom® Na_2SO_4

P/N	Description	P/N	Description
00551-20005	Welchrom® Na_2SO_4, 500 mg/3 ml, 50 pk	00551-20018	Welchrom® Na_2SO_4, 100 g/bottle
00551-20007	Welchrom® Na_2SO_4, 1 g/6 ml, 30 pk	00551-20024	Welchrom® Na_2SO_4, 500 g/bottle
00551-20131	Welchrom® Na_2SO_4, 6 g/12 ml, 20 pk		

6. Welchrom® GraphiCarb

Activated carbon adsorption capacity is large, but the adsorption is irreversible and the extraction is difficult to elute. Welchrom® Graphi-Carb overcomes the shortcomings of irreversibility of activated carbon adsorption while remaining high affinity for both polar and non-polar organic substances and large adsorption capacity. Therefore, it has excellent properties such as high purification effect, high recovery rate and high reproducibility, which is widely used in agricultural residue analysis and sample pretreatment with high pigment content. In addition, graphitized carbon is not porous material, so it takes a short time to reach adsorption equilibrium, which means it can save the time of sample treatment.

Technical parameters

Matrix	Graphite
Function groups	Carbon six-member ring
Retention mechanism	Surface adsorption retention

Application

Detection of moderate and nonpolar target compounds and aromatic ring compounds.

Ordering information of Welchrom® GraphiCarb

P/N	Description	P/N	Description
00517-20001	Welchrom® Carb, 100 mg/1 ml, 100 pk	00517-20012	Welchrom® Carb, 250 mg/3 ml, 50 pk
00517-20002	Welchrom® Carb, 100 mg/3 ml, 50 pk	00517-20005	Welchrom® Carb, 500 mg/3 ml, 50 pk
00517-20003	Welchrom® Carb, 150 mg/3 ml, 50 pk	00517-20013	Welchrom® Carb, 250 mg/6 ml, 30 pk
00517-20004	Welchrom® Carb, 200 mg/3 ml, 50pk	00517-20006	Welchrom® Carb, 500 mg/6 ml, 30 pk
00517-20007	Welchrom® Carb, 1000 mg/6 ml, 30 pk		

7. Welchrom® Acticarbon

Welchrom® Acticarbon activated carbon column can be used for the detection of nitrosamine and acrylamide in water.

Ordering information of Welchrom® Acticarbon

P/N	Description	P/N	Description
00582-20001	Welchrom® Acticarbon, 100 mg/1 ml, 100 pk	00582-20013	Welchrom® Acticarbon, 250 mg/6 ml, 30 pk
00582-20004	Welchrom® Acticarbon, 200 mg/3 ml, 50 pk	00582-20043	Welchrom® Acticarbon, 150 mg/6 ml, 30 pk
00582-20006	Welchrom® Acticarbon, 500 mg/6 ml, 30 pk	00582-20075	Welchrom® Acticarbon, 1 g/12 ml, 20 pk
00582-20008	Welchrom® Acticarbon, 2 g/12 ml, 20 pk	00582-20017	Welchrom® Acticarbon, 10 g/bottle
00582-20012	Welchrom® Acticarbon, 250 mg/3 ml, 50 pk	00582-20018	

Welchrom® Mixed Mode SPE

Welchrom® Mixed Mode SPE adsorbent is a mixture of stationary phases with two modes of action, using a variety of interfacial effects to separate and purify the analytical components. Extraction of alkaline drugs from the biological matrix and analysis of agricultural residues in the biological matrices. As there are many interferences in the biological matrix which are difficult to be washed or removed, such mixed-mode adsorbents are often required.

1. Welchrom® C8/SCX

Welchrom® C8/SCX Mixed Mode SPE product formed by a C8 alkyl stationary phase change stationary phase SCX with a silica based strong cation in an optimized proportion, which provides a dual retention mechanism. C8 can interact with the hydrophobic part of the analyte, while SCX can interact with the protonated amino part of the analyte. Due to the strong dual interaction between the adsorbent and the analyte, stronger flushing solvents and conditions are allowed to be used to remove the interferences adsorbed on the adsorbent.

Technical parameters

Matrix	Silica gel
Function groups	C8 alkyl chain, sulfonic acid group, octyl group, benzene sulfonic acid group
Retention mechanism	Mixed mode of reversed-phase retention and cation exchange retention

Application

Detection of cationic target compounds, such as melamine, clenbuterol, etc.

Ordering information of Welchrom® C8/SCX

P/N	Description	P/N	Description
00556-11001	Welchrom® C8/SCX, 100 mg/1 ml, 100 pk	00556-11005	Welchrom® C8/SCX, 500 mg/3 ml, 50 pk
00556-11002	Welchrom® C8/SCX, 100 mg/3 ml, 50 pk	00556-11014	Welchrom® C8/SCX, 200 mg/6 ml, 30 pk
00556-11003	Welchrom® C8/SCX, 150 mg/3 ml, 50 pk	00556-11006	Welchrom® C8/SCX, 500 mg/6 ml, 30 pk
00556-11004	Welchrom® C8/SCX, 200 mg/3 ml, 50 pk	00556-11007	Welchrom® C8/SCX, 1 g/6 ml, 30 pk

2. Welchrom® GraphiCarb/NH_2

In pesticide residue analysis, Welchrom® GraphiCarb/NH_2 has special separation and extraction efficacy, such as the removal of pigments, fatty acids, phenols, and the extraction of organophosphates from tea leaves, etc. It is suitable for the pre-treatment and determination of pesticide residues in food and plants.

Technical parameters

Matrix	Silica gel, graphitized carbon
Function groups	Carbon six-member ring, amino group, aminopropyl group

Retention mechanism	Mixed mode of reversed-phase retention and cation exchange retention

Application

Purification of samples in agricultural residue detection.

Ordering information of Welchrom® Carb/NH_2

P/N	Description	P/N	Description
00527-20010	Welchrom® Carb/NH_2, 250 mg/250 mg/6 ml, 30 pk	00527-20091	Welchrom® Carb/NH_2, 500 mg/1 g/6 ml, 30 pk
00527-20011	Welchrom® Carb/NH_2, 500 mg/500 mg/6 ml, 30 pk	00527-20008	Welchrom® Carb/NH_2, 1 g/1 g/12 ml, 20 pk
00527-20072	Welchrom® Carb/NH_2, 300 mg/500 mg/6 ml, 30 pk		

3. Welchrom® SAX/PSA

Welchrom® SAX/PSA is composed of an equal amount of SAX in the upper layer and an equal amount of PSA in the lower layer. The SAX packing materials in the upper layer can absorb the acidic substances in the sample matrix, while the PSA in the lower layer can absorb the organic acids, fatty acids, pigments and other interferents in the sample, which are widely used in the analysis of multi-pesticide residues in food.

Technical parameters

Matrix	Silica gel
Function groups	Quaternary ammonium group, ethylenediamine group
Retention mechanism	Mixed mode of normal phase retention and anion exchange retention

Application

Purification of samples in agricultural residue testing detection.

Ordering information of Welchrom® SAX/PSA

P/N	Description
00569-11011	Welchrom® SAX/PSA, 500 mg/500 mg/6 ml, 30 pk

4. Welchrom® GraphiCarb/PSA

Welchrom® GraphiCarb/PSA is composed of the same amount of graphitized carbon black in the upper layer and the same amount of PSA in the lower layer. The packing materials of graphitized carbon black in the upper layer can absorb pigments in the sample matrix, while the PSA in the lower layer can absorb organic acids, fatty acids, pigments and other interferents in the sample. So Welchrom® GraphiCarb/PSA is widely used in the analysis of multi-pesticide residues in food.

Technical parameters

Matrix	Silica gel
Function groups	Carbon six-member ring, ethylenediamine group
Retention mechanism	Mixed mode of normal phase retention and surface adsorption

Application

Purification of samples in agricultural residue detection.

Ordering information of Welchrom® GraphiCarb/PSA

P/N	Description
00548-20011	Welchrom® GraphiCarb/PSA, 500 mg/500 mg/6 ml, 30 pk

5. Welchrom® C18/CN

Welchrom® C18/CN column formed by packing C18 and CN in a certain proportion, which is suitable for the determination of 4-nitrofuran metabolites (AHD), 5-methylmorlin-3-amino-2-azolidinyl ketone (AMOZ), 3-amino-2-azolidinyl ketone (AOZ), and furacillin metabolites

Application

Determination of nitrofuran metabolites residues in aquatic products by HPLC method

Ordering information of Welchrom® C18/CN

P/N	Description	P/N	Description
00555-11004	Welchrom® C18/CN, 200mg/3ml, 50pk	00555-11071	Welchrom® C18/CN, 600mg/6ml, 30pk
00555-11049	Welchrom® C18/CN, 400mg/3ml, 50pk		

Welchrom® Special SPE

Welchrom® special SPE column adsorbents include benzopyrene column, Sudan red column, plasticiser column, tea column and Chinese herbal medicine column.

1. Welchrom® BaP（benzopyrene）

Welchrom® BaP is packing material of pretreatment developed for the determination of benzo (a) pyrene in animal and vegetable oil. This column based on normal phase retention mechanism to keep the interferents of grease in the column. Target benzopyrene flows out of column with solvent so as to realize separation of oil distractors and benzopyrene. This kind of packing material can effectively remove interfering neutral fats and vitamins in the cooking oil with stable recovery rate, reproducibility, simple and fast method, which makes it the optimal choice for benzopyrene analysis.

Technical parameters

Matrix	Neutral Al_2O_3
Function groups	Aluminum hydroxy
Retention mechanism	Normal phase retention

Application

Detection of benzopyrene in animal and vegetable oil.

Ordering information of Welchrom® BaP

P/N	Description
00547-20037	Welchrom® BaP, 22 g/60 ml, 10 pk

2. Welchrom® BAP-2 （benzopyrene molecular imprinted）

Welchrom ® BaP-2 SPE column, extract the benzo (a) pyrene in oil samples, then use methylene chloride method to develop a new method for grease of benzene and (a) pyrene detection. With a better oil removal efficiency, stable benzo (a) pyrene recovery rate, less dosage of solvent greener, this method is also more convenient.

Ordering information of Welchrom® BaP-2

P/N	Description
00594-20006	Welchrom® BaP-2, 500 mg/6ml, 30 pk

3. Welchrom® Special Column for Plasticizer

Welchrom® Special Column for Plasticizer is divided into two types: W-PTC and O-PTC. W-PTC column is mainly used to extract phthalate ester targets from polar solvents and liquor. O-PTC column is mainly used to extract phthalate targets from non-polar solvents.

Technical parameters of W-PTC column

Matrix	Polymer
Retention mechanism	Reversed- phase retention

Application

Determination of plasticizer in polar solvent.

Technical parameters of O-PTC column

Matrix	Polymer
Retention mechanism	Reversed- phase retention

Application

Determination of plasticizer in nonpolar solvent.

Ordering information of Welchrom® Special Column for Plasticizer

P/N	Description	P/N	Description
09566-11011	O-PTC (oil), 500/500/6 ml, 30 pk	09566-20007	W-PTC (water), 1 g/6 ml, 30 pk

4. Welchrom® TPT (special for tea leaf)

Welchrom ® TPT is a pretreatment column that developed for the pesticide residues in tea, mainly preparing packing materials according to removing the interferents affected the detection. The whole column bed is composed of three kinds of adsorbents which can be used for the residue detection of all kinds of pesticides in tea (including organophosphorus, organochlorine, carbamate, and permethrin, etc.).

Ordering information of Welchrom® TPT

P/N	Description	P/N	Description
00545-20011	Welchrom® TPT, 1000 mg/6 ml, 30 pk	00545-20061	Welchrom® TPT, 2 g/12 ml, 20 pk

5. Welchrom® TPH (special for Chinese herbal medicine)

Packing materials of Welchrom® CTD (special for Chinese herbal medicine) SPE column are composed of A, B, C components in a certain proportion. The function is to remove pigment, acid interfering impurities, sugar and fat soluble impurities from the herb without adsorbing

Ordering information of Welchrom® CTD

P/N	Description	P/N	Description
00568-20007	Welchrom® CTD, 1 g/6 ml, 30 pk	00568-20008	Welchrom® CTD, 2 g/12 ml, 20 pk

6. Welchrom® Special Column for Sudan Red

Welchrom® Special Column for Sundan Red is the packing material of pretreatment developed for the determination of Sudan red dye in food. Based on the mechanism of normal phase retention, this purification column can effectively remove the interference of matrix such as fat, organic acid and vitamin in edible oil, which makes it the optimal choice for Sudan red dye analysis in food.

Technical parameters

Matrix	Neutral alumina
Function groups	Aluminum hydroxyl
Retention mechanism	Normal phase retention

Application

Sundan Red

Ordering information of Welchrom® Special Column for Sundan Red

P/N	Description	P/N	Description
00566-20006	Welchrom® SDD, 500 mg/6 ml, 30 pk	00566-20008	Welchrom® SDD, 2 g/12 ml, 20 pk
00566-20095	Welchrom® SDD, 4 g/12 ml, 20 pk		

7. Welchrom® SDH

Specification of Welchrom® SDH Special Column is 500 mg/6 mL. This column of can be used to quickly and efficiently detect four kinds of Sudan red in chili oil, chili paste, chili powder and other condiments. This method has high sensitivity and good reproducibility, which overcomes numerous problems such as tedious pretreatment method, instability and unsatisfactory reproducibility existing in other method.

Ordering information of Welchrom® Special Column for Sundan Red

P/N	Description
00599-20006	Welchrom® SDH, 500 mg/6 ml, 30 pk

8. Welchrom® SDH-2

Welchrom® SDH-2 Special Column, part number: 00599-20011, specification: 500 mg/500 mg/6 ml, 15 ea (This Sudan Red column can be divided into two parts: the grease removal column at the upper place, named column No. 1; And the adsorption retention Sudan red column at the lower place, named column 2. Using Welchrom ® SDH-2 Special Column can quickly and efficiently detect four kinds of Sudan red in chili oil, chili paste, chili powder and other condiments. This method has high sensitivity and good reproducibility, which overcomes numerous problems such as tedious pretreatment method, instability and unsatisfactory reproducibility existing in other methods.

Ordering information of Welchrom® SDH-2

P/N	Description
00599-20011	Welchrom® SDH-2, 500 mg/500 mg/6 ml, 15 ea

9. Welchrom® Vitamin K1

Welchrom® Vitamin K1 pretreatment column can effectively remove the interfering impurities such as chlorophyll from the crude vitamin K1 extract of low-fat plant samples like fruits and vegetables.

Application

Determination of vitamin K1 in food

Ordering information of Welchrom® Vitamin K1

P/N	Description
00573-20036	Welchrom® Vitamin K1, 2 g/6 ml, 30 pk

10. Welchrom® HON

Welchrom® HON is suitable for the detection of honey oligosaccharides. Activated carbon and diatomite packing materials can effectively enrich the high molecular sugars in honey for subsequent separation and detection.

Application

China Pharmacopoeia 2020 edition of honey detection item - oligosaccharide

Ordering information of Welchrom® HON

P/N	Description
00593-20113	Welchrom® HON, 500 mg/12 ml, 20 pk

11. Welchrom® DNPH and Welchrom® KI

Welchrom ® DNPH column can be used to analyze 14 kinds of aldehydes and ketones compounds in the car or environmental with Welchrom® KI, because 2, 4 dinitrophenylhydrazine (DNPH) coated silica gel will absorb aldehyde ketones compounds under acidic condition (this reaction has high specificity).

Application

Determination of aldehydes and ketones in ambient air by HPLC method

Method for sampling and determination of volatile organic compounds and aldosterone in vehicles

Ordering information of Welchrom® DNPH and Welchrom® KI

P/N	Description	P/N	Description
005PM-067-20	Welchrom® DNPH, 350 mg/3 ml, 20 pk	005PM-072-20	Welchrom® KI, 1000 mg/3 ml, 20 pk
005PM-067-50	Welchrom® DNPH, 350 mg/3 ml, 50 pk	005PM-072-50	Welchrom® KI, 1000 mg/3 ml, 50 pk
005PM-070-20	Welchrom® DNPH, 1000 mg/6 ml, 20 pk	005PM-073-20	Welchrom® KI, 1500 mg/6 ml, 20 pk
005PM-075-20	Welchrom® DNPH-II, 200 mg/1 ml, 20 pk	005PM-076-20	Welchrom® KI-II, 1 g/1 ml, 20 pk

Welchrom® Immunoaffinity Column

Welchrom® Immunoaffinity Column is used to separate and purify mycotoxins from samples based on specific reactions between antigens and antibodies. Antibodies in the immunoaffinity column suspend in the gel by covalent bonding and specifically adsorb the mycotoxin in the sample. If the sample being tested contains the mycotoxin, the toxin will be captured and bound by the antibody when the sample passes through the immunoaffinity column.

All other substances will be washed out of the immunoaffinity column. Methanol is used as an eluent to elute mycosins from the antibodies.

Welchrom® Immunoaffinity Column has features as follows

1. Select monoclonal antibodies with high specificity and affinity to ensure obtaining high-purity samples.
2. Has large capacity and high antibody content, which increases the sample adsorption capacity and improves the purification efficiency.
3. Large volume samples are allowed to be purified through column, which has excellent concentration effect on low concentration samples, thus effectively improving the detection of various methods.
4. Passed a large number of scientific experiments, with good stability and reliability, while the sample recovery rate can reach 90%-110%.
5. The product has strong versatility and is suitable for a variety of buffer systems without complex and toxic reagents.
6. Simple and fast operation, only 10-15 minutes for a single sample. Strong applicability, no need for specific experimental environment.
7. The purified samples are suitable for ELISA, HPLC, fluorescence spectrophotometry, etc.
8. Conform to national standard method.

Application

Detection of mycotoxin in grain, peanut, grain oil, alcohol, feed, Chinese medicinal materials, flavoring and dairy products.

Ordering information of Welchrom® Immunoaffinity Column

P/N	Product	Specification	Application Range
01140-00031	Aflatoxin volume(B1, B2, G1, G2)	1 ml, 25 pcs	Grain and oil, feed, Chinese medicine, condiments, etc
01140-00032	Aflatoxin volume(B1, B2, G1, G2)	3 ml, 15 pcs	Grain and oil, feed, Chinese medicine condiments, etc
01140-00033	Aflatoxin volume(B1, B2, G1, G2)	3 ml, 30 pcs	Grain and oil, feed, Chinese medicine, condiments, etc
01140-01031	Aflatoxin volume(B1, B2, G1, G2, M1, M2)	1 ml, 25 pcs	Grain and oil, feed, Chinese medicinal materials, condiments, dairy products, etc
01140-01032	Aflatoxin volume(B1, B2, G1, G2, M1, M2)	3 ml, 15 pcs	Grain and oil, feed, Chinese medicinal materials, condiments, dairy products, etc
01140-05031	Aflatoxin B1	1 ml, 25 pcs	Grain and oil, feed, Chinese medicinal materials, condiments, dairy products, etc
01140-05032	Aflatoxin B1	3 ml, 15 pcs	Grain and oil, feed, Chinese medicinal materials, condiments, dairy products, etc
01140-03031	Aflatoxin M1	1 ml, 25 pcs	Dairy products
01140-03032	Aflatoxin M1	3 ml, 15 pcs	Dairy products
01140-04031	Zearalenone	1 ml, 25 pcs	Grain, feed, condiments, etc

P/N	Product	Specification	Application Range
01140-04032	Zearalenone	3 ml, 15 pcs	Grain, feed, condiments, etc
01140-02031	Vomitoxin (deoxynivalenol)	1 ml, 25 pcs	Grain, feed, condiments, etc
01140-02032	Vomitoxin (deoxynivalenol)	3 ml, 15 pcs	Grain, feed, condiments, etc

SPE Manifold and Accessories

Square cylinder SPE manifold

Features of properties

Matching 20 μm clean polyethylene frit, which is suitable for every specification of column tube, customized product services are also available.

1. The vacuum glass gas chamber is convenient for real-time monitoring of the extraction process, and can be autoclaved and sterilized at 121℃.

2. Use vacuum gauge and exhaust valve to optimize flow rate of sample.

3. Equipped with support plate of various Pore sizes to meet most sampling tubes, the support frame of multiple gears can freely adjust the height of the support plate.

4. Equipped with a tray to protect the glass air chamber and prevent wearing in the base.

Technical parameters

A. 12 or more independent valves

B. Anti-atomizing glass vacuum tank (imported from abroad)

C. Glass vacuum tank pressure ≤66 Kpa

D. Size: 195*100*170/mm (12 ports) 295*100*170/mm (24 ports)

E. Test tube size: less than the standard 16 mm

F. Inlet pressure: <0.1 MP

G. Suitable for: test tube/centrifugal tube/sample bottle, etc

H. Net weight 3.5 kg (12 ports) 6 kg (24 ports)

I. Relative humidity: <85% RH

J. Standard number of pores: standard 12/24 pores

Manifold list

a. 4 cover plate support rods b. 12 or 24 flow rate control valves (Stopcock). c. 1 pressure vacuum gauge d. 12 positioning C type clamps of test tube holder

Ordering information

P/N	Name	Specification	Application
00824-31001	SPE manifold	SPE manifold, 12 ports, 1 pk	Standard
00824-32001	SPE manifold	SPE manifold, 24 ports, 1 pk	Standard
00824-10003	SPE accessory	SPE cock (flow control), white valve,12pk	Optional
00824-20005×12	SPE accessory	SPE connector 12 pk	Optional

WEL-REX oil-free vacuum pump

WEL-REX oil-free vacuum pump is mainly used in pharmaceutical analysis, fine chemical industry, bio-pharmaceutical, health detection, food and environmental detection, university scientific research and other fields. As an ideal product for supporting chromatographic

instruments and rotary evaporator, it can work continuously without oil and has advantages of small volume, low noise, high efficiency, long lifetime, safe, reliable, economical and practical.

Main application

- Vacuum filtration
- Solvent filtration
- Vacuum distillation
- Vacuum drying
- HPLC
- Rotary evaporators
- Compression and gas conversion
- Gel drying

Features

- This product can produce clean vacuum without any working medium (oil-free). does not produce pollution, the production process uses new technology and new materials.
- Easy to carry, easy to move and work smoothly. Oil-free lubrication, piston structure, more corrosion resistance than ordinary diaphragm pump, longer lifetime.
- Designed with cooling and exhaust system, this pump can ensure continuous operation.
- The pressure adjustable design can meet the vacuum and gas flow rate in a certain range.
- Imported bearings, smooth operation, no noise, long lifetime, high efficiency.
- Unique oil-water separator can effectively prevent the liquid into the pump body and prolong the service life of the pump body.

Ordering information

P/N	Name	Specification	Suitable range
WEL-REX-25A	Oil-free vacuum pump	25 L/Min negative pressure	Vacuum hose included 600 MM
WEL-REX-40B	Oil-free vacuum pump	40 L/Min negative pressure	Vacuum hose included 600 MM



Doprah® IC Pretreatment Column

1. Overview:

In the process of ion chromatography, impurities such as metal ions or organic compounds are often found in the samples. On the one hand, the presence of these impurities will interfere with the detection of target ions, and on the other hand, it will cause pollution of ion chromatography column packing, reducing the separation performance and life of the column. The pretreatment column of ion chromatography is developed based on the principle of solid phase extraction, using high purity filler, using the principle of reverse adsorption and ion exchange, can effectively remove impurities such as impurity ion and organic matter in the sample, to avoid the influence of impurities on the pollution of ion chromatography column and its separation performance.

Ion chromatography pretreatment column: IC-H, IC-AG, IC-AG /H, IC-BA, IC-NA, IC-RP, IC-C18, IC-AG /Na, IC-BA /Ag/H

2. Purification mode:

(1) Impurity adsorption mode -- purification: the interfering component is combined with fixation, and the analyte is not retained by the column but directly passed through.

(2) Target adsorption mode -- enrichment + matrix elimination: the analyte is combined with the fixed phase, and the interfering component is not retained by the column but directly passed through. Then appropriate eluent is used to extract the analyte.

3. Advantages:

- Exchange capacity: 2.7-2.9 meg, 1.3 times that of common products on the market
- High column packing capacity, more thorough removal of impurities, can be used for multiple times depending on the specific conditions of the sample
- Column body adopts unique combination mode, which can resist high pressure and prevent collapse or leakage
- Low concentration of ion residue in IC column to ensure the accuracy of detection

Ordering Information

P/N	Product	Specification	Application
D876114	Doprah® IC-H	1cc, 50pk	Adjust pH of sample solution, neutralize alkaline solution, remove heavy metals from the sample solution
D876124	Doprah® IC-H	2.5cc, 50pk	Adjust pH of sample solution, neutralize alkaline solution, remove heavy metals from the sample solution
D886114	Doprah® IC-Ag	1cc, 50pk	Remove Cl^-, Br^-, I^-, AsO_4^{3-}, CrO_4^{2-}, CN^-, MoO_4^{2-}, PO_4^{3-}, SeO_3^{2-}, SO_3^{2-}, S^{2-}, SCN^-, etc. from sample solution
D886124	Doprah® IC-Ag	2.5cc, 50pk	Remove Cl^-, Br^-, I^-, AsO_4^{3-}, CrO_4^{2-}, CN^-, MoO_4^{2-}, PO_4^{3-}, SeO_3^{2-}, SO_3^{2-}, S^{2-}, SCN^-, etc. from sample solution
D896114	Doprah® IC-Ag/H	1cc, 50pk	Remove Cl^-, Br^-, I^-, AsO_4^{3-}, CrO_4^{2-}, CN^-, MoO_4^{2-}, PO_4^{3-}, SeO_3^{2-}, $SeCN^-$, SO_3^{2-}, S^{2-}, SCN^- and $WO4^{2-}$, free Ag ions and heavy metal ions, etc. from the sample solution
D896124	Doprah® IC-Ag/H	2.5cc, 50pk	Remove Cl^-, Br^-, I^-, AsO_4^{3-}, CrO_4^{2-}, CN^-, MoO_4^{2-}, PO_4^{3-}, SeO_3^{2-}, SO_3^{2-}, S^{2-}, SCN^-, free Ag ions and heavy metal ions, etc. from the sample solution
D906114	Doprah® IC-Ba	1cc, 50pk	Remove sulfate ions from the sample solution
D916114	Doprah® IC-Na	1cc, 50pk	Remove heavy metals from the sample solution
D916124	Doprah® IC-Na	2.5cc, 50pk	Remove heavy metals from the sample solution

P/N	Product	Specification	Application
D926114	Doprah® IC-RP (Polystyrene - divinylbenzene high polymer)	1cc, 50 pk	Removal of hydrophobic compounds and hydrophobic substances containing hydrophilic groups, such as aromatic compounds, pH 1-14
D926124	Doprah® IC-RP (Polystyrene - divinylbenzene high polymer)	2.5cc, 50 pk	Removal of hydrophobic compounds and hydrophobic substances containing hydrophilic groups, such as aromatic compounds, pH 1-14
D956114	Doprah® IC-C18	1cc, 50 pk	Removal of hydrophobic compounds, pH 2-8
D956124	Doprah® IC-C18	2.5cc, 50 pk	Removal of hydrophobic compounds, pH 2-8
D966114	Doprah® IC-Ag/Na	1cc, 50 pk	Remove Cl^-, Br^-, I^-, AsO_4^{3-}, CrO_4^{2-}, CN^-, MoO_4^{2-}, PO_4^{3-}, SeO_3^{2-}, SO_3^{2-}, S^{2-}, SCN^-, etc. from sample solution
D966124	Doprah® IC-Ag/Na (Ag, Na, strong acid cation exchange resin composite)	2.5cc, 50 pk	Remove Cl^-, Br^-, I^-, AsO_4^{3-}, CrO_4^{2-}, CN^-, MoO_4^{2-}, PO_4^{3-}, SeO_3^{2-}, SO_3^{2-}, S^{2-}, SCN^-, etc. from sample solution
D986124	Doprah® IC-Ba/Ag/H (Ba, Ag, H strong acid cation exchange resin composite)	2.5cc, 50 pk	Remove Cl^-, Br^-, I^-, AsO_4^{3-}, CrO_4^{2-}, CN^-, MoO_4^{2-}, PO_4^{3-}, SeO_3^{2-}, SO_3^{2-}, S^{2-}, SCN^-, SO_4^{2-}, etc. from sample solution

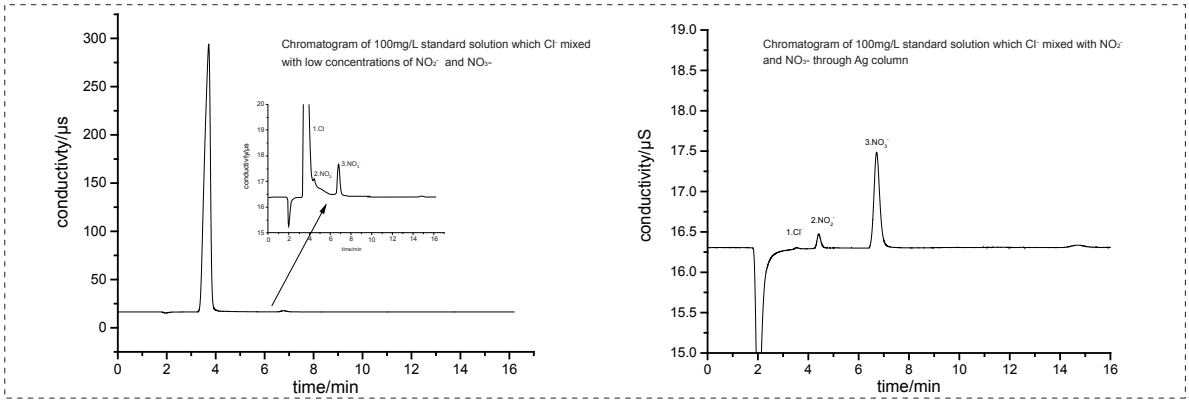
Pretreatment Method

Type	Flushing reagent	Flushing reagent volume (mL)	Max. flow rate (mL/min)	Effluent volume to be discarded (mL)
IC-H	Deionized water	10	2	3
IC-Ag	Deionized water	10	2	3
IC-Ag/H	Deionized water	10	2	3
IC-Ba	Deionized water	10	2	3
IC-Na	Deionized water	10	2	3
IC-RP	1. Methanol 2. Deionized water	5 10	2	3

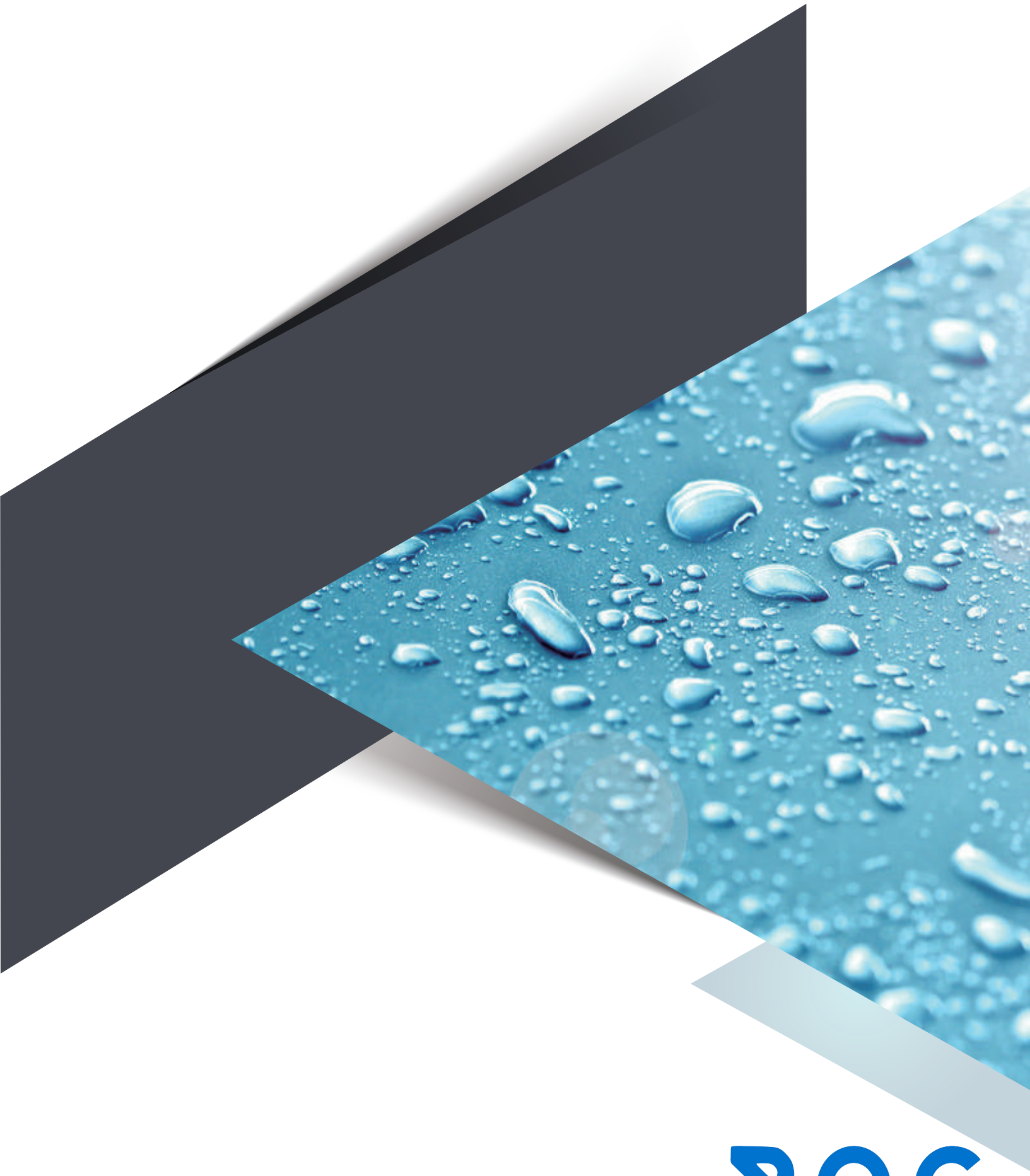
Note: take 5ml sample solution as an example

4. Application

100mg/L standard solution which Cl^- mixed with low concentrations of NO_2^- and NO_3^-



The removal rate of Cl^- reached 99.95% after high concentration of Cl^- solution had passed through IC-AG column, which solved the interference problem of Cl^- to the determination of NO_2^- .



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