# HPLC Column

# Affinity HPLC Column Selection and Handling Precautions

## The choice of HPLC columns

### The choice of column tubes

The materials of HPLC column tubes include SS316 (stainless steel), PTFE, and PMMA etc., determined by characteristics of mobile phase, pressure degree of column and sample. SS316 is used when mobile phase is organic solvents with pressure between 5 to 30 Mpa. When the mobile phase is 100% water or buffer solution with pressure less than 4 Mpa, PMMA or PTFE is chosen for less impact on activity of biological sample.

### Inner diameter

A.1-2mm ID column, is specific used for micro LC(MLC), such as LC -Mass spectrometry. But for routine analysis, it's not easy to use. Although the solvent consumption is small, the requirement is too rigid. It need the instrument only have a very small dead volume. Besides, this kind of columns is short-life.

B.4-6mm (3.9, 4.0, 4.6, 5.0, 6.0mm) ID columns are analytical scale and suitable for routine analysis. 4.6mm ID columns are the most usual type. Best flow rate is 1ml/min which general instruments can match with. They have high column efficiency, stable performance, and longer life time.

C. 7.8-10.0mm ID columns are semi-preparative column Chromatographic conditions can be transplanted from analytical column. They can be equipped on normal LC instruments to collect small amount of high purity components to quality and research.

D. 20-100mm ID columns are preparative column, which can prepare a large number of pure components with commercial value. At present, although the price is higher, it is must equipped for the pharmaceutical industry.

### The length of the column tube

Length of HPLC columns is between 50 and 500mm. For general analysis 150-250mm is most commonly used. Columns longer than 250mm though have high column efficiency, have much higher pressure. So it is not economic just for better efficiency to increase the column length.

## The choice of packing

### Particle size

particle size of commonly used packing is 3 - 10um. Small particle size can achieve high column efficiency, but column pressure is also high. Column pressure is an important factor that cannot be ignored. High column pressure may lead to packing collapse and reduce columns' life time. Especially when mobile phase is methanol with larger water content, hydrogen reaction formed between water and methanol makes the viscosity to increase. If high column efficiency is pursued, water-acetonitrile system is recommended.

For preparative column, main pursuit is preparation volume, and separation is secondary. Generally packing with larger size than 10 um is chosen with low cost and low column pressure.

For UHPLC which has higher column efficiency, better separation and shorter separation time, particle size is so small that the pressure is much higher than HPLC. We offer two specifications: 1.8μm and 2.2μm. UHPLC columns can withstand pressures up to 10000psi, and have good reproducibility.

### The specifications of packings

Molecular weight smaller than 2000

| | | | |
|---|---|---|---|
| Aqueous samples | Non-ionic | Reverse phase chromatography | C30,C18,C18-WP, C8 |
| | Ionic | Reverse phase chromatography | C30,C18,C18-WP, C8 |
| | | Ion exchange chromatography | SAX,SCX； Transgenomic ICSep AN, ICSep CN |
| | Amino acids | Reverse phase chromatography | C18 |
| | | Aqueous samples | Transgenomic AMINOSep amino acid column |
| | Organic acids | Ion exclusion chromatography | Transgenomic ICSep organic acid column;Shodex SUGAR SH1821， KC-811 |
| | Monosaccharides, disaccharides, oligosaccharides, | Reverse phase chromatography | NH2 |
| | | Ion exclusion chromatography | Shodex SUGAR SH1821 |
| | | Inverting chromatography | Transgenomic CARBOSep resin type sugar column |
| | Peptide | Reverse phase chromatography | C18 |
| Oil-soluble | Non-polar | Reversed-phase chromatography | C18 |
| | | Normal phase chromatography | NH2, CN, SIL |
| | Polar | Normal phase chromatography | NH2, CN, SIL |
| Chiral sample | | Chiral chromatography | Regis Whelk-O， RegisPack， RegisCell |

Molecular weight smaller than 2000

| | | | |
|---|---|---|---|
| Aqueous samples | Non-ionic | Reversed-phase chromatography | C18-BIO |
| | Proteins, polypeptides | Gel filtration chromatography (GFC) | Shodex KW-800, SB-800 HQ; Gel X series |
| | | Ion-exchange chromatography | SAX, SCX; Sep series |
| | | Reversed-phase chromatography | C18-BIO |
| | | Affinity chromatography | Shodex AFpak, |
| | Nucleic acid | Ion-exchange chromatography | SAX, SCX; Sep series |
| | Polysaccharide | Gel filtration chromatography (GFC) | Shodex KW-800, SB-800 HQ; Gel X series |
| | | Ion-exchange chromatography | SAX, SCX; Sep series |
| Oil-soluble Samples | | Gel filtration chromatography (GFC) | Shodex SB-800 HQ; Gel-S Series |
| | | Reversed-phase chromatography | C18-BIO |

# Precautions for use of columns

## Column Equilibration

When preparing to introduce your desired mobile phase into a new column, be aware of the miscibility of the solvents being introduced to the column and the solvent inside the column. If they are not, it is necessary to pump one or more miscible intermediate solvents through the column to avoid high pressure. Equilibrate the column with a minimum of 10 column volumes of mobile phase to be used.

### Reversed-phase columns equilibration method

Reversed-phase columns equilibrate in as little as 20 column volumes of mobile phase. If the new eluent being introduced contains buffer sales, it is recommended that the column is flushed with a highly aqueous eluent (such as 90:10 Water: MeCN) before introducing buffer, to avoid precipitation of salts on the column. For extra precaution, introduce new buffered eluents WITHOUT the buffer component for 5-10 column volumes, and then switch to the fully buffered eluent composition. Precipitation of buffer salts on the columns is essentially irreversible and destroys the column. When switching between solvents with vastly different polarities, it may be necessary to first purge the column with a mutually miscible solvent such as Isopropyl Alcohol or Dioxane at a reduced flow rate (approximately 50% of normal). Flushing with a minimum of 5 column volumes is recommended (e.g. 10mL for a 150 x 4.6mm I.D. column).

### Normal phase column equilibration method

Normal-phase columns require longer equilibration times (at least 50 column volumes). To ensure good reproducibility and faster equilibration of normal-phase columns, a small, constant percentage of water can be added to the mobile phase.

## Column maintenance

**Eluent pH:** At pH above 8, silica gels begin to dissolve; at acidic pH below 2.0 certain bonded phases (particularly CN) become hydrolyzed and gradual loss of bonded phase can occur. While many customers use the columns outside both sides of the pH spectrum with excellent results and good column lifetime, the best lifetimes are usually obtained at intermediate pH conditions.

**Pressure:** To maximize column life operate at pressures up to 20 MPa (~ 3000 psi) for standard HPLC phases (UHPLC columns can be used at higher pressures, as indicated on the test chromatogram).

**Sample Dissolution:** Samples should be dissolved in the eluent or solvent weaker than the eluent, which helps avoid sample precipitation at the column head and inconsistent retention values. Filter sample with 0.45μ membrane to remove particulate matter before injection.

**Solvents:** Use HPLC or spectroscopy grade solvents that have been filtered through a 0.45μ filter. Filter all buffer solutions before use. Avoid introduction of particulates onto the column at all costs.

**Guard Columns:** Use a guard column of matching chemistry and particle size between the injector and main column. Guard columns need to be replaced at regular intervals as determined by sample contamination. When system backpressure limit, it is usually an indication that the guard column should be replaced. A sudden appearance of split peaks is also indicative of a need to replace the guard column.

## Clean of Columns

**Clean of reverse phase silica bonded phase columns**

20 column volumes should be used for each wash stage:

95:5 water: ACN( Removal of buffer) → 100% ACN → 50:50 water: ACN

**Clean of normal phase silica bonded phase column**

20 column volumes should be used for each wash stage:

THF → Chloroform → Methylene Chloride → Hexane

# Common Troubleshooting

| Problem | Possible cause | Solution |
|---|---|---|
| No peaks or very small peaks | Detector off | Check detector |
| | Broken connections to recorder | Check connections |
| | No sample/Wrong sample | Check sample. Be sure it is not deteriorated. Check for bubbles in the vials |
| | Wrong settings on recorder or detector | Check attenuation. Check gain |
| No Flow | Pump off | Start Pump |
| | Flow interrupted | "Check reservoirs. Check position of the inlet tubing. Check loop for obstruction or air. Check degasing of mobile phase. Check compatibility of the mobile phase components." |
| | Leak | Check fittings. Check pump for leaks and precipitates. Check pump seals. |
| | Air trapped in the system | Disconnect column and prime pump. Flush system with 100% methanol or isopropanol. Contact servicing if necessary. |
| Column end leaks | Loose fitting | Tighten or replace fitting |
| | White powder at loose fitting | Cut tubing and replace ferrule; disassemble fitting, rinse and reassemble. |
| Leak at detector | Detector-seal failure | Replace detector seal or gaskets. |
| Leak at injection valve | Worn or scratched valve rotor | Replace valve rotor |
| Leak at pump | Pump seal failure | Replace pump seal; check piston for scratches and, if necessary, replace |
| Changing Retention Times | Buffer retention times | Use buffer with concentration greater than 20 mM. |
| | Contamination buildup | Flush column occasionally with strong solvent |
| | Equilibration time insufficient for gradient | Pass at least 10 column volumes through the column for |
| | run or changes in isocratic mobile phase | gradient regeneration or after solvent changes |
| | First few injections - active sites | Condition column by injecting concentrated sample |
| | Inconsistent on-line mobile-phase mixing | Ensure gradient system is delivering a constant composition; compare with manually prepared mobile phase; partially premix mobile phase |
| | Selective evaporation of mobile-phase component | Cover solvent reservoirs; use less-vigorous helium purging; prepare fresh mobile phase |
| | Varying column temperature | Thermostat or insulate column; ensure laboratory temperature is constant. |
| | Active sites on column packing | Use mobil-phase modifier, competing base (basic compounds), or increase buffer strength; use higher coverage column packing. |
| | Column overloaded with sample | Decrease sample amount or use larger-diameter column. |
| | Increasing flow rate | Check and reset pump flow rate. |
| | Loss of bonded stationary phase or base silica | Use mobile-phase pH between pH 2 and pH 8 |
| | Varying column temperature | Thermostat or insulate column; ensure laboratory temperature is constant |
| Increasing Retention Times | Decreasing flow rate | Check and reset pump flow rate; check for pump cavitation; check for leaking pump seals and other leaks in system |
| | Changing mobile-phase composition | Cover solvent reservoirs; ensure that gradient system is delivering correct composition. |
| | Loss of bonded stationary phase | Use mobile-phase pH between pH 2 and pH 8 |
| Slow column equilibration time | Reversed phase ion pairing - long chain ion pairing reagents require longer equilibration time | Use ion-pairing reagent with shorter alkyl chain length |
| Void Time noise | Air bubbles in mobile phase | Degas or use back pressure restricor on detector |
| | Positive-negative - difference in refractive index of injection solvent and mobile phase | Normal with many samples; use mobile phase as sample solvent |
| Drifting baseline | Negative direction (gradient elution) - absorbance of mobile-phase A | Use non-UV absorbing mobile phase solvents; use HPLC grade mobile phase solvents; add UV absorbing compound to mobile phase B. |
| | Positive direction (gradient elution) - absorbance of mobile phase B | Use higher UV absorbance detector wavelength; use non-UV absorbing mobile phase solvents; use HPLC grade mobile phase solvents; add UV absorbing compound to modile phase A. |
| | Positive direction - contamination buildup and elution | Flush column with strong solvent; clean up sample; use HPLC grade solvents |
| | Wavy or undulating - temperature changes in room | Monitor and control changes in room temperature; insulate column or use column oven; cover refractive index detector and keep it out of air currents. |
| Baseline noise | Continous - detector lamp problem or dirty cell | Replace UV lamp( each should last 2000 h; clean and flush flow cell. |
| | Gradient or isocratic proportioning- lack of solvent mixing | Use proper mixing device; check proportioning precision by spiking one solvent with UV absorbing compound and mointor UV absorbance detector outputl. |
| | Gradient or isocratic proportioning - malfunctioning proportioning valvesl | Clean or replace proportioning precision valves; partially remix solventsl. |
| | Occasional sharp spikes - external electrical interference | Use voltage stabilizer for LC system; use independent electrical circuit. |
| | Periodic - pump pulses | Service or replace pulse damper; purge air from pump; clean or replace check valves. |
| | Random - contamination buildup | Flush column with strong solvent; clean up sample; use HPLC grade solvent |
| | Spikes - bubble in detector | Degas mobile phase; use back pressure restrictor at detector outlet. |
| | Spikes - column temperature higher than boiling point of solvent | Use lower column temperature. |

# Common Troubleshooting

| Problem | Possible cause | Solution |
|---|---|---|
| Decreasing Pressure | Insufficient flow from pump | Loosen cap on mobile phase reservior |
| | Leak in hydralic lines from pump to column | Tighten or replace fittings; tighten rotor in injection valve |
| | Leaking pump check valve or seals | Replace or clean check valves; replace pump seals. |
| | Pump cavitation | Degas solvent; check for obstruction in line from solvent reservoir to pump; replace inlet-line frit |
| Fluctuating pressurre | Bubble in pump | Degas solvent; purge solvent with helium |
| | Leaking pump check valve or seals | Replace or clean check valves; replace pump seals |
| High Back Pressure | Column blocked wth irreversibly adorbed sample | Improve sample cleanup; use guard column; reverse-flush column with strong solvent to dissolve blockage |
| | "Column particle size too small (for example 3 micrometers)" | Use larger particle size (for example 5 micrometer) |
| | Microbial growth on column | "Use at least 10% organic modifier in mobile phase; use fresh buffer daily; add 0.02% sodium azide to aqueous mobile phase; store column in at least 25% organic solvent without buffer" |
| | Mobile phase viscosity too high | Use lower viscosity solvents or higher temperature |
| | Plugged frit in in-line filter or guard column | Replace frit or guard column |
| | Plugged inlet frit | Replace endfitting or frit assembly |
| | Polymetric columns - solvent change causes swelling of packing | Use correct solvent with column; change to proper solvent compositionl consult manufacturer's solvent-compatibility chartl use a column with a higher percentage of cross-linking |
| | Salt precipitation (especially in reversed-phase chromatography with high concentration of organic solvent in mobile phase) concentration of organic solvent in mobile phase) | Ensure mobile phase compatibility with buffer concentration; decrease ionic strength and water-organic solvent ratio; premix mobile phase |
| | When injector disconnected from column - blockage in injector | Clean injector or replace rotor |
| Increasing Pressure | Blocked flow lines | Systematically disconnect components from detector end to column end to find blockage; replace or clean blocked component |
| | Particulate buildup at head of column | "Filter sample; use .5 micrometer in-line filter; disconnect and backflush column; replace inlet frit" |
| | Water-organic solvent systems - buffer precipitation | "Ensure mobile phase compatibility with buffer concentration; decrease ionic strength or water organic solvent ratio" |
| Broad peaks | Analytes eluted early due to sample overload | Dilute sample 1:10 and reinject |
| | Detector-cell volume too large | Use smallest possible cell volume consistent with sensitivity needs; use detector with no heat exchanger in system |
| | Injection volume too large | Decrease solvent strength of injection solvent to focus solute; inject smaller volume |
| | Large extra column volume | Use low- or zero-dead-volume endfittings and connectors; use smallest possible diameter of connecting tubing (<0.10 in. i.d.); connect tubing with matched fittings |
| | Mobile-phase solvent viscosity too high | Increase column temperature; change to lower viscosity solvent |
| | Peak dispersion in injector valve | Decrease injector sample loop size; introduce air bubble in front and back of sample in loop |
| | Poor column efficiency | Use smaller-particle-diameter packing, lower-viscosity mobile phase, higher column temperature, or lower flow rate |
| | Retention time too long | Use gradient elution or stronger isocratic mobile phase |
| | Sampling rate of data system too low | Increase sampling frequency. |
| | Slow detector time constant | Adjust time constant to match peak width |
| | Some peaks broad - late elution of analytes retained from previous injection | Flush column with strong solvent at end of run; end gradient at higher solvent concentration |
| Ghost peaks | Contamination | Flush column to remove contaminatint; use HPLC-grade solven |
| | Elution of analytes retained from previous injection | Flush column with strong solvent at end of run; end gradient at higher solvent concentration |
| | Ion-pair chromatography - upset equilibrium | Prepare sample in mobile phase; reduce injection volume |
| | Oxidation of trifluoroacetic acid in peptide mapping | Prepare trifluoroacetic acid solutions fresh daily; use antioxidant |
| | Reversed-phase chromatography - contaminated water | Check suitability of water by running different amounts through column and measure peak height of interferences as function of enrichment time; clean water by running it through old reversed-phase column; use HPLC-grade water. |
| | Unknown interferences in sample | Use sample cleanup or prefractionation before injection. |
| Negative peaks | Refractive index detection - refractive index of solute less than that of mobile phase | Reverse polarity to make peak positive |
| | UV-absorbance detection - absorbance of solute less than that of mobile phase | Use mobile phase with lower UV absorbance; if recycling solvent, stop recycling when recycled solvent affects detection |

| Problem | Possible cause | Solution |
|---|---|---|
| Peak Doubling | Blocked Frit | Replace or clean frit; install 0.5-um porosity in-line filter between pump and injector to eliminate mobile-phase contaminants or between injector and column to eliminate sample contaminants |
| | Coelution of interfering compound | Use sample cleanup or prefractionation; adjust selectivity by changing mobile or stationary phase |
| | "Coelution of interfering compound from previous injection" | Flush column with strong solvent at end of ran; end gradient at higher solvent concentration |
| | Column overloaded | Use higher-capacity stationary phase; increase column diameter; decrease sample amount |
| | Column void or channeling | Replace column, or, if possible, open top endfitting and clean and fill void with glass beads or same column packing; repack column |
| | Injection solvent too strong | Use weaker injection solvent or stronger mobile phase |
| | Sample volume too large | Use injection volume equal to one-sixth of column volume when sample prepared in mobile phase for injection |
| | Unswept injector flow path | Replace injector rotor |
| Peak Fronting | Channeling in column | Replace or repack column |
| | Column overloaded | Use higher-capacity stationary phase; increase column diameter; decrease sample amount |
| Tailing Peaks | Basic solutes - silanol interactions | Use competing base such as triethylamine; use a stronger mobile phase; use base-deactivated silica-based reversed-phase column; use polymeric column |
| | Beginning of peak doubling | See peak doubling |
| | Chelating solutes - trace metals in base silica | Use high purity silica-based column with low trace-metal content; add EDTA or chelating compound to mobile phase; use polymeric column |
| | Silica-based column - degradation at high pH | Use polymeric, sterically protected, or high-coverage reversed-phase column; install silica gel saturator column between pump and injector |
| | Silica-based column - degradation at high temperature | Reduce temperature to less than 50 ˚C |
| | Silica-based column - silanol interactions | Decrease mobile-phase pH to suppress silanol ionization; increase buffer concentration; derivatize solute to change polar interactions |
| | Unswept dead volume | Minimize number of connections; ensure injector rotor seal is tight; ensure all compression fittings are correctly seated |
| | Void formation at head of column | Replace column, or, if possible, open top end fitting and clean and fill in void with glass beads or same column packing; rotate injection valve quickly; use injection valve with pressure bypass; avoid pressure shock |
| Spikes | Bubbles in mobile phase | Degas mobile phase; use back-pressure restrictor at detector outlet; ensure that all fittings are tight |
| | Column stored without caps | Store column tightly capped; flush reversed-phase columns with degassed methanol |
| | | |

# Correspond with other brand columns

| Column | Supelco | Kromasil | Agilent | GL |
|---|---|---|---|---|
| C18-WP | Discovery RP-Amide C16 | | ZORBAX Rx C18 | Inertsil ODS-EP |
| C18 | SUPELCOSIL LC-18 Discovery C18 | Kromasil C-18 | ZORBAX Eclipse XDB-C18 | Inertsil ODS-2 |
| C18-BIO | Discovery BIO Wide Pore C18 | Kromasil 300A C-18 | ZORBAX 300SB-C18 | Inertsil WP300 c18 |
| C8 | DISCOVERY C8 | Kromasil C-8 | ZORBAX Eclipse XDB-C8 | Inertsil C8 |
| C4 | | Kromasil C4 | | Inertsil C4 |
| Phenyl | SUPELCOSIL LC-DP | Kromasil Phenyl | ZORBAX Eclipse XDBPhenyl | |
| Silica | SUPELCOSIL LC-Si | Kromasil SIL | ZORBAX Silica | Inertsil Sil |
| NH2 | SUPELCOSIL LC-NH2 | Kromasil NH2 | ZORBAX NH2 | Inertsil NH2 |
| CN | SUPELCOSIL LC-CN | Kromasil CN | ZORBAX Eclipse XDB-CN | Inertsil CN-3 |

| Column | Merck | Waters | Thermo |
|---|---|---|---|
| C18-WP | | SymmetryShield C18 | |
| C18 | Puropsher STAR RP-18 endcapped | Symmetry C18 | Hypersil ODS C18 |
| C18-BIO | Lichrospher wp 300 RP-18e | Symmetry 300 | Hypersil 300A C18 |
| C8 | Purospher STAR RP-8 endcapped | Symmetry C8 | Hypersil C8 |
| C4 | | Spherisorb® C4 | Hypersil GOLD C4 |
| Phenyl | | Spherisorb® Phenyl | Hypersil Phenyl-2 |
| Silica | Lichrospher si 100 | Spherisorb® W(Silica) | Hypersil Silica |
| NH2 | Purospher STAR NH2 | Spherisorb® NH2 | Hypersil NH2 |
| CN | Lichrospher CN | Spherisorb® CN | Hypersil CN (CPS-2) |
| | | | |

# The USP liquid phase column summary

USP is United States Pharmacopoeia, provides a number of indicators for HPLC column packing:

| USP | Packing Description | Recommence HPLC columns |
|---|---|---|
| L1 | Octadecyl silane chemically bonded to porous silica or ceramic µparticles, 1.5 to 10µm in diameter, or a monolithic rod | C18, C18-WP. C18-BIO |
| L2 | Octadecyl silane chemically bonded to silica gel of a controlled surface porosity that has been bonded to a solid spherical core, 30 to 50µ in diameter | C18 Packing |
| L3 | Porous silica microparticles, 5 to 10µ in diameter | Silica |
| L4 | Silica gel of controlled surface porosity bonded to a solid spherical core, 30 to 50µ in diameter | Silicycle packing |
| L7 | Octyl silane chemically bonded to totally porous microsilica particles, 3 to 10µ in diameter | C8 |
| L8 | An essentially monomolecular layer of aminopropyl-silane chemically bonded to totally porous silica gel support, 10µ in diameter | NH2 |
| L9 | Irregular or spherical, totally porous silica gel having a chemically bonded, strongly acidic ation-exchange coating, 3 to 10 µm in diameter | SCX |
| L10 | Nitrile groups chemically bonded to porous silica microparticles, 3 to 10µ in diameter | CN, Shodex Silica 5CN |
| L11 | Phenyl groups chemically bonded to porous silica microparticles, 3 to 10µ in diameter | Phenyl, Shodex Silica 5NPE |
| L12 | Strong anion-exchange packing made by chemically bonding a quaternary amine to a solid silica spherical core, 30 to 50 µm in diameter" | |
| L13 | Trimethylsilane chemically bonded to porous silica microparticles, 3 to 10µ in diameter | Shodex Silica 5TMS |
| L14 | Silica gel having a chemically bonded, strongly basic quaternary ammonium anion-exchange coating, 5 to 10 µm in diameter. | SAX |
| L15 | Hexyl silane chemically bonded to totally porous silica particles, 3 to 10µ in diameter | Spherisorb S5 C6 |
| L16 | Dimethyl silane chemically bonded to totally porous silica particles, 5 to 10 µm in diameter | |
| L17 | Strong cation-exchange resin consisting of sulfonated cross-linked styrene-divinylbenzene copolymer in the hydrogen form, 7 to 11µ in diameter | Sep H-L, H-M, H-H |
| L18 | Dimethyl silane chemically bonded to totally porous silica particles, 5 to 10 µm in diameter | |
| L19 | Strong cation-exchange resin consisting of sulfonated cross-linked styrene-divinylbenzene copolymer in the calcium form, 9µ in diameter. | Sep Ca-L, Ca-M, Ca-H |
| L20 | Dihydroxypropane groups chemically bonded to porous silica particles, 3 to 10µ in diameter. | Shodex PROTEIN KW-800 |
| L21 | A rigid, spherical styrene-divinylbenzene copolymer, 5 to 10µ in diameter. | "Transgenomic PRX-1, Shodex GPC KF-800,K-800, KD-800" |
| L22 | A cation exchange resin made of porous polystyrene gel with sulfonic acid groups, about 10µ in size | Shodex ICY-521, SUGAR KS-800 series |
| L23 | An ion exchange resin made of porous polymethacrylate or polyacrylate gel with quaternary ammonium groups, about 10µ in size | Shodex IEC QA-825 |
| L24 | A semi-rigid hydrophilic gel consisting of vinyl polymers with numerous hydroxyl groups on the matrix surface, 32 to 63 µm in diameter | |
| L25 | Packing having the capacity to separate compounds with a MW range from 100 to 5000 daltons (as determined by polyethylene oxide), applied to neutral, anionic, and cationic water- soluble polymers. A polymethacrylate resin base,crosslinked with poly-hydroxylated ether (surface contained some residual carboxyl functional groups) was found suitable. | Shodex OHpak SB-802 HQ Shodex OHpak SB-802.5 HQ, SB402.5 |
| L26 | Butyl silane chemically bonded to totally porous silica particles, 5 to 10µ in diameter | C4 |
| L27 | Porous silica particles, 30 to 50µ in diameter | Silicycle packing |
| L28 | A multifunctional support, which consists of a high purity, 100 , spherical silica substrate that has been bonded with anionic (amine) functionality in addition to a conventional reversed phase C8 functionality" | |
| L29 | Gamma alumina, reversed phase, low carbon percentage by weight, alumina-based polybutadiene spherical particles, 5 µm diameter with a pore diameter of 80" | |
| L30 | Ethyl silane chemically bonded to a totally porous silica particle, 3 to 10 µm in diameter | |
| L31 | A strong anion-exchange resin-quaternary amine bonded on latex particles attached to a core of 8.5 µm macroporous particles having a pore size of 2000 Å and consisting of ethylvinylbenzene cross-linked with 55 % divinyl benzene | |
| L32 | A chiral ligand-exchange packing- L-proline copper complex covalently bonded to irregularly shaped silica particles, 5 to 10 µm in diameter | |
| L33 | Packing having the capacity to separate proteins of 4,000 to 400,000 daltons. It is spherical, silica-based and processed to provide pH stability | Shodex PROTEIN KW-800 series Shodex KW400 series |
| L34 | Strong cation-exchange resin consisting of sulfonated cross-linked styrene-divinylbenzene copolymer in the lead form, about 9µ in diameter | Sep Pb-L, Pb-M, Pb-H |
| L35 | A zirconium-stabilized spherical silica packing with a hydrophilic (diol-type) molecular monolayer bonded phase having a pore size of 150Å. | Agilent Zorbax GF-250 |
| L36 | 3,5-dinitrobenzoyl derivative of L-phenylglycine covalently bonded to 5 µm aminopropyl silica | |
| L37 | Packing having the capacity to separate proteins by molecular size over a range of 2,000 to 40,000 Da. It is a polymethacrylate gel | Shodex OHpak SB-803 HQ, SB403 |
| L38 | Methacrylate-based size-exclusion packing for water-soluble samples | Shodex OHpak SB-802HQ |
| L39 | Hydrophilic polyhydroxymethacrylate gel of totally porous spherical resin | Shodex Ohpak SB-800HQ, Shodex Rspak DM-614 |
| L40 | Cellulose tri-3,5-dimethylphenylcarbamate coated porous silica particles, 5µ to 20µ in diameter | Regis Cell ® |
| L41 | Immobilized α 1-acid glycoprotein on spherical silica particles | |
| L42 | Octylsilane and octadecylsilane groups chemically bonded to porous silica particles,5 µm in diameter | |
| L43 | Pentafluorophenyl groups chemically bonded to silica particles, 5 to 10 µm in diameter( 5-10µm) | Supelco Discovery HSF5 |
| L44 | A multifunctional support, which consists of a high purity, 60 , spherical silica substrate that has been bonded with a cationic exchanger, sulfonic acid functionality in addition to a conventional reversed phase C8 functionality. | |
| L45 | Beta cyclodextrin bonded to porous silica particles, 5 to 10 µm in diameter | Shodex ORpak CDBS-453 |

| USP | Packing Description | Recommence HPLC columns |
|---|---|---|
| L46 | Polystyrene/divinylbenzene substrate agglomerated with quaternary amine functionalized latex beads, 10 µm in diameter. | |
| L47 | High capacity anion-exchange microporous substrate, fully functionalized with a trimethylamine group, 8 µm in diameter. | |
| L48 | Sulfonated, cross-linked polystyrene with an outer layer of submicron, porous,anion-exchange microbeads, 15 µm in diameter. | |
| L49 | A reversed-phase packing made by coating a thin layer of polybutadiene on to spherical porous zirconia particles, 3 to 10 µm in diameter. | Discovery Zr-PBD |
| L50 | Multifunction resin with reversed-phase retention and strong anion-exchange functionalities. The resin consists of ethylvinylbenzene, 55 % cross-linked with divinylbenzene copolymer, 3 to 15 µm in diameter, and a surface area of not less than 350 m2/g, substrate is coated with quaternary ammonium functionalized latex particles consisting of styrene cross-linked with divinylbenzene. | |
| L51 | Amylose tris-3,5-dimethylphenylcarbamate-coated, porous, spherical, silica particles,5 to 10 µm in diameter. | ® |
| L52 | A strong cation exchange resin made of porous silica with sulfopropyl groups, 5 to 10 µm in diameter. | SCX |
| L53 | Weak cation-exchange resin consisting of ethylvinylbenzene, 55 % cross-linked with divinylbenzene copolymer, 3 to 15 µm diameter. Substrate is surface grafted with carboxylic acid and/or phosphoric acid functionalized monomers. Capacity not less than 500 µm in diameter. | |
| L54 | "A size exclusion medium made of covalent bonding of dextran to highly cross-linked porous agarose beads, about 13 µm in diameter." | |
| L55 | A strong cation exchange resin made of porous silica coated with polybutadiene-maleic acid copolymer, about 5 µm in diameter. | |
| L56 | Isopropyl silane chemically bonded to totally porous silica particles, 3 to 10 µm in diameter | |
| L57 | A chiral-recognition protein, ovomucoid, chemically bonded to silica particles, about 5 µm in diameter, with a pore size of 120 angstroms. | |
| L58 | Strong cation-exchange resin consisting of sulphonated cross-linked styrene-divinylbenzene copolymer in the sodium form, about 7 to 11µm diameter | Sep Na-L, Na-M, Na-H, Transgenomic Coregel 87N |
| L59 | Packing having the capacity to separate proteins by molecular weight over the range of 10 to 500kDa. It is spherical(10µm), silica-based,and processed to provide hydrophilic characteristics and pH stability | Shodex PROTEIN KW-800 series, Shodex KW400 series" |
| L60 | Spherical, porous silica gel, 3 to 10 µm in diameter, surface has been covalently modified with palmitamidopropyl groups and endcapped. | C18-WP |
| L61 | Hydroxide-selective, strong anion-exchange resin consisting of a highly cross-linked core of 13 µm microporous particles, pore size less than 10 , and consisting of ethylvinylbenzene cross-linked with 55 % divinylbenzene with a latex coating composed of 85 nm diameter microbeads bonded with alkanol quarternary ammonium ions (6 %). | |
| L62 | C30 silane bonded phase on a fully porous spherical silica, 3 to 15 µm in diameter. | C30 |
| L63 | Glycopeptide teicoplanin linked through multiple covalent bonds to a 100 A units spherical silica | |
| L64 | Strongly basic anion exchange resin consisting of 8% crosslinked styrene divinylbenzene copolymer with a quartenary ammonium group in the chloride form, 45 to 180 µm in diameter | |
| L65 | Strongly acidic cation exchange resin consisting of 8% sulfonated crosslinked styrene divinylbenzene copolymer with a sulfonic acid group in the hydrogen form,63 to 250 µm in diameter | |
| L66 | A crown ether coated on a 5 µm particle size silica gel substrate.The active site is (S)-18-crown-6ether | |
| L67 | Porous vinyl alcohol copolymer with a C18 alkyl group attached to the hydroxyl group of the polymer, 2 to 10 µm in diameter | Shodex Asahipak ODP-40 Shodex ET-RP1 |
| L68 | Spherical,porous silica,10µm or less in diameter, the surface of which has been covalently modified with alkyl amide groups and not endcapped | |
| L69 | Ethylvinylbenzene/divinylbenzene substrate agglomerated with quaternary amine functionalized 130nm latex beads,about 6.5µm in diameter | |
| L70 | Cellulose tris(phenyl carbamate)coated on 5µm silica | |
| L71 | Arigid, spherical polymetacrylate, 4 to 6 µm in diameter | Shodex RSpak DE-613 |
| L72 | (S)-phenylglycine and 3,5-dinitroanaline urea linkage covalently bonded to silica | |
| L73 | A rigid,spherical polydivinylbenzene particle,5 to 10 µm in diameter | |
| L74 | A strong anion-exchange resin consisting of a highly cross-linked core of 7-µm macroporous particles having a 100 Angstroms average pore size and consisting of ethylvinylbenzene cross-linked with 55% divinylbenzene and an anion-exchange layer grafted to the surface,which is functionalized with alkyl quartenary ammonium ions. | |
| L75 | A chiral-recognition protein,bovine serum albumin(BSA),chemically bonded to silica particles,about 7 µm in diameter,with a pore size of 300 Angstroms. | |

# Pressure unit conversion table

1atm = 1.01325bar

| UNIT | Pa | KPa | MPa | bar | kgf/cm$^2$ | mm$H_2O$ | mmHg | p.s.i |
|---|---|---|---|---|---|---|---|---|
| Pa | 1 | $10^{-3}$ | $10^{-6}$ | $10^{-5}$ | $10.2\times10^{-6}$ | $101.97\times10^{-3}$ | $7.5\times10^{-3}$ | $0.15\times10^{-3}$ |
| KPa | $10^{3}$ | 1 | $10^{-3}$ | $10^{-2}$ | $10.2\times10^{-3}$ | 101.97 | 7.5 | 0.15 |
| MPa | $10^{6}$ | $10^{3}$ | 1 | 10 | 10.2 | $101.97\times10^{3}$ | $7.5\times10^{3}$ | $0.15\times10^{3}$ |
| bar | $10^{5}$ | $10^{2}$ | $10^{-1}$ | 1 | 1.02 | $10.2\times10^{3}$ | 750.06 | 14.5 |
| kgf/cm2 | 98066.5 | 98.07 | $98.07\times10^{-3}$ | 0.98 | 1 | 10.000 | 735.56 | 14.22 |
| mmH2O | 9.806 | $9.807\times10^{-3}$ | $9.807\times10^{-6}$ | $98.07\times10^{-6}$ | $10^{-4}$ | 1 | $73.56\times10^{-3}$ | $1.42\times10^{-3}$ |
| mmHg | 133.32 | $133.32\times10^{-3}$ | $133.32\times10^{-6}$ | $1.33\times10^{-3}$ | $1.36\times10^{-3}$ | 13.6 | 1 | $19.34\times10^{-3}$ |
| p.s.i | 6894.76 | 6.89 | $6.89\times10^{-3}$ | $68.95\times10^{-3}$ | $70.31\times10^{-3}$ | 703.07 | 51.71 | 1 |

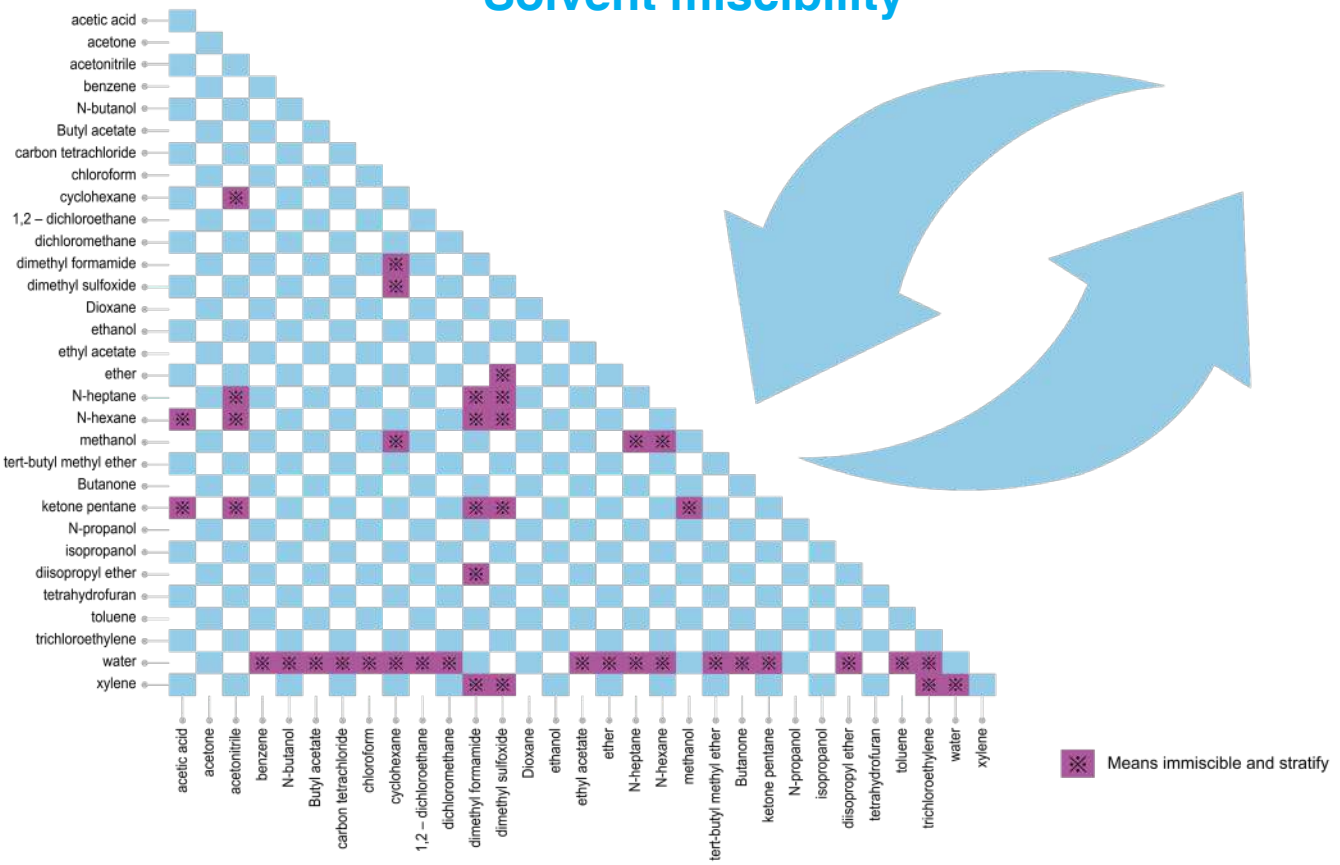
# Pressure unit conversion table

| Solvent ①② | UV wavelength nm ③ | Refractive index ④ | Boiling point ˚C | Viscosity (cp 25 ˚C ) | Polarity | Solubility ⑤ | Dielectric constant 20 ˚C |
|---|---|---|---|---|---|---|---|
| Isooctane (*) | 210 | 1.389 | 99 | 0.47 | 0.1 | 0.01 | 1.94 |
| N-heptane (*) | 200 | 1.385 | 98 | 0.4 | 0.2 | 0.01 | 1.92 |
| N-hexane (*) | 190 | 1.372 | 69 | 0.3 | 0.1 | 0.01 | 1.88 |
| N-pentane (**) | 210 | 1.355 | 36 | 0.22 | 0 | 0.01 | 1.84 |
| Cyclohexane | 210 | 1.423 | 81 | 0.9 | 0.1 | 0.012 | 2.02 |
| Cyclopentane (*) | 210 | 1.404 | 49 | 0.42 | 0.2 | 0.004 | 1.97 |
| Carbon tetrachloride | 265 | 1.457 | 77 | 0.9 | 1.6 | 0.008 | 2.24 |
| Toluene | 285 | 1.494 | 110 | 0.55 | 2.4 | 0.046 | 2.4 |
| Xylene | 290 | 1.493 | 138 | 0.6 | 2.5 | unknown | 2.3 |
| Chlorobenzene | unknown | 1.521 | 132 | 0.75 | 2.7 | unknown | 5.6 |
| Benzene | 280 | 1.498 | 80 | 0.6 | 2.7 | 0.07 | 2.3 |
| Dichloromethane (**) | 245 | 1.421 | 40 | 0.41 | 3.1 | 1.6 | 8.9 |
| N-butanol | 210 | 1.397 | 118 | 2.98 | 3.9 | 7.81 | 17.5 |
| N-propanol | 210 | 1.385 | 97 | 2.27 | 4 | Miscible | 20.3 |
| Tetrahydrofuran(*) | 220 | 1.405 | 66 | 0.55 | 4 | Miscible | 7.4 |
| Ethyl acetate (*) | 256 | 1.37 | 77 | 0.43 | 4.4 | 8.7 | 6.4 |
| Isopropanol | 210 | 1.384 | 82 | 2.3 | 4.3 | Miscible | 18.3 |
| Chloroform (*) | 245 | 1.443 | 61 | 0.53 | 4.1 | 0.815 | 4.8 |
| Acetone (*) | 330 | 1.356 | 56 | 0.3 | 5.4 | Miscible | 21.4 |
| Ethanol | 210 | 1.359 | 78 | 1.08 | 4.3 | Miscible | 24.6 |
| Acetic acid | 230 | 1.37 | 118 | 1.26 | 6 | Miscible | 6.2 |
| Acetonitrile | 210 | 1.341 | 82 | 0.34 | 6.2 | Miscible | 37.5 |
| Methanol (*) | 210 | 1.326 | 65 | 0.54 | 6.6 | Miscible | 32.7 |
| Glycol | unknown | 1.431 | 197 | 19.9 | 6.9 | Miscible | 37.7 |
| Water | 268 | 1.338 | 100 | 1 | 10.2 | Miscible | 80 |

① (*) means a low viscosity (<0.5cp), boiling point appropriate in (> 45 ˚C)
② (**) means small viscosity, low boiling point solvent.
③ Means approximate cutoff wavelength,when lower than this value, solvent is opaque.

④ Refractive index when 25 ˚C .
⑤ Percentage by weight of water at 20 ˚C when dissolved in a solvent, this value is useful in the liquid - solid chromatography.

# Solvent miscibility



# Application Index

# Brief introduction

Currently, HPLC is widely used in the chemical, biological and pharmaceutical field. These series include silica and polymer matrix columns, both analysis and preparative columns, to meet needs of customers in various fields.

## Silica-based analytical column

### HPLC columns

The Columns base on high-purity silica gel, using unique bonding technique, with excellent peak shape, better selectivity, sensitivity and reproducibility. With low content of matrix metal, the columns show perfect peak shape for all types of analytes. Different types of bonded phases provide more flexibilityfor method development. To ensure excellent column performance and long column life, we comply with strict production process in manufacturing and have a strict quality control for HPLC columns.

- Suitable for all types of samples
- Excellent column reproducibility
- A variety of bonded phases

The packings information:

| Packings | C18-WP | C18 | C18-BIO | C8 | C4 | Phenyl | CN | Diol |
|---|---|---|---|---|---|---|---|---|
| Particle diameter (μm) | 3 and 5 | 5 and 10 | 5 | 3 and 5 | 5 | 5 | 3 and 5 | 3 and 5 |
| Pore size(Å) | 100 | 120 | 300 | 120 | 300 | 120 | 120 | 120 |
| Pore volume (mL/g) | 1.1 | 1.0 | 0.9 | 1.0 | 0.9 | 1.0 | 1.0 | 1.0 |
| Endcapped | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Specific surface area(m2/g) | 450 | 300 | 100 | 300 | 100 | 300 | 300 | 300 |
| Metallic impurities (ppm) | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 |
| Carbon content | 17% | 17% | 8% | 10% | 3% | 11% | 7.5% | 8.8% |
| pH range | 1.5 - 10 | 2 - 8 | 1.5 - 11 | 2 - 8 | 2 - 8 | 2 - 8 | 2.5 - 8 | 2.5 - 8 |
| Temperature range ( ℃) | 20 - 60 | 20 - 60 | 20 - 60 | 20 - 60 | 20 - 60 | 20 - 60 | 20 - 60 | 20 - 60 |

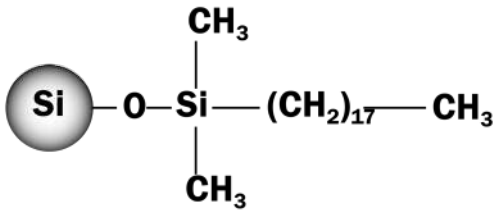
| Packings | NH2 | Silica | SAX | SCX | HILIC | HILIC(2) | HILIC(3) | 30 |
|---|---|---|---|---|---|---|---|---|
| Particle diameter (μm) | 3 and 5 | 3 and 5 | 3 and 5 | 3 and 5 | 3 and 5 | 3 and 5 | 5 | 3 and 5 |
| Pore size(Å) | 120 | 120 | 120 | 120 | 120 | 120 | 120 | 120 |
| Pore volume (mL/g) | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| Specific surface area(m2/g) | 300 | 300 | 300 | 300 | 300 | 300 | 300 | 450 |
| Metallic impurities (ppm) | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 |
| Carbon content | 4% | 0% | 16% | 11% | 8.6% | 8% | 16% | 20% |
| pH range | 2 - 8 | 2 - 8 | 2 - 8 | 2 - 8 | 1.5 - 8 | 1.5 - 8 | 1.5 - 8 | 2 - 8 |
| Temperature range ( ℃) | 20 - 60 | 20 - 60 | 20 - 60 | 20 - 60 | 20 - 60 | 20 - 60 | 20 - 60 | 20 - 60 |

# C18-WP

[ Recommended for Method Development, fit for a variety of mobile phase conditions ]

C18-WP use high purity of spherical silica matrix and have excellent stability. C18-WP can use 100% pure water as mobile phase for separation of acidic, neutral and basic organic compound, as well as many drugs and peptides etc. A variety of specifications, from analytical to preparative scale can be provided.

- bonded C18 groups
- pH stability range: 1.5-10
- Suitable for 100% water mobile phase
- Strong retain for polar substances
- Symmetrical peak shape for Alkaline substances
- High specific surface area, suitable for high load



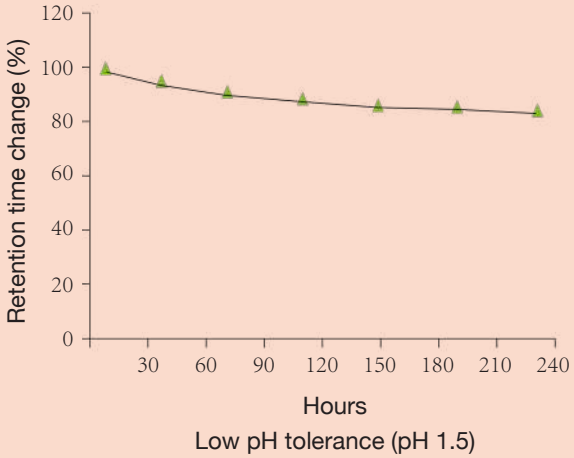

**PH stability**

## Stability of low pH

In the low pH mobile phase, the main reason for short column life is drop of chemical bonded groupfrom silica gel by hydrolysis. Hydrolysis leads to changing retention timeof the analyte, short lifetime and poor reproducibility.
The following figure shows C18-WP stability under the conditions of pH 1.5 mobile phase.

**Low pH tolerance (pH 1.5)**

| | |
|---|---|
| Column | C18-WP, 4.6 x 150 mm, 5μm |
| Mobile phase | Acetonitrile: 0.1% trifluoroacetic acid (pH 1.5) (50/50) |
| Flow rate | 1.0 mL / min |
| Detection | UV 254 nm |
| Column temperature | 30 ˚ C |
| Sample | toluene |



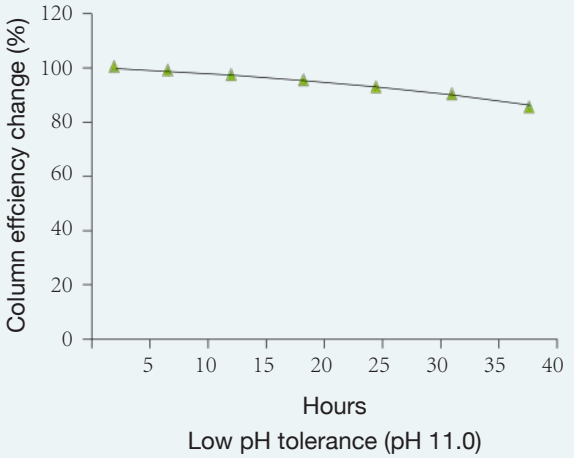

Low pH tolerance (pH 1.5)

## Stability of high pH

In the high pH mobile phase, silica matrix is gradually dissolved. Ordinary pH range of silica-based columns is 2-8. When the pH of mobile phase is more than 8,silica gel is dissolved speedily, and column life is very short. C18-WP columns can protect silica matrix to have a longer life in high pH conditions, due to unique bonding and endcapped technology.

**High pH tolerance (pH 11.0)**

| | |
|---|---|
| Column | C18-WP, 4.6 x 150 mm, 5μm |
| Mobile phase | Methanol: 0.5% aqueous ammonia (pH 11.0) (20/80) |
| Flow rate | 1.0 mL / min |
| Detection | UV 254 nm |
| Column temperature | 30 ˚ C |
| Sample | Phthalatedipropyl |




Low pH tolerance (pH 11.0)

**100% stability of the aqueous phase**

Usually silica-based reversed-phase column can not be used in high proportion of water mobile phase conditions, andorganic phase in the mobile phasemust be maintained more than 5%. This may limit some polar compounds'separation in reversed-phase conditions. The reason is hydrophobic collapse.

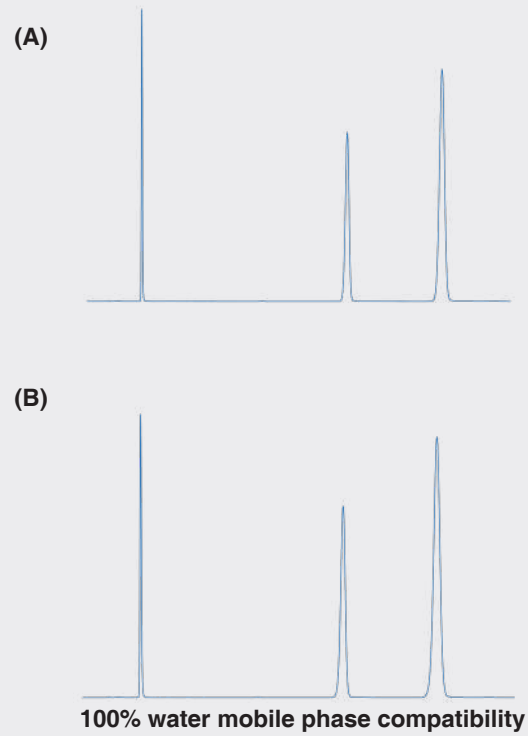
"Hydrophobic collapse" is a phenomenon that reversed-phase column loss the ability of retaining compounds in a mobile phase with a very high water content. Due to the hydrophobic interaction of functional groups, the surface of the stationary phase cannot be wet by the mobile phase and hydrophobic chains fold up.

According to the research, the hydrophobic collapse generally occurs when restarting of the mobile phase after stopping pump. The experiment can verify whether a column is compatible with pure water. Test column efficiency at first, and wash the column with 100% water mobile phaseat 1.0mL/min for 2h. Then slow down the flow rate to zero and stop pump for 1h. Columns are washed with 100% water mobile phase again and tested for column efficiency the second time.

Compare the difference of retention before and after stopping pump.

**Test Condition**

| | |
|---|---|
| Column | C18-WP, 4.6 x 150 mm, 5μm |
| Mobile phase | methanol: water (70/30) |
| Flow rate | 1.0 mL / min |
| Detection | UV 254 nm |
| Column temperature | 30 ° C |
| Sample | 1. Uracil 2. Toluene 3. Naphthalene |




**100% water mobile phase compatibility**

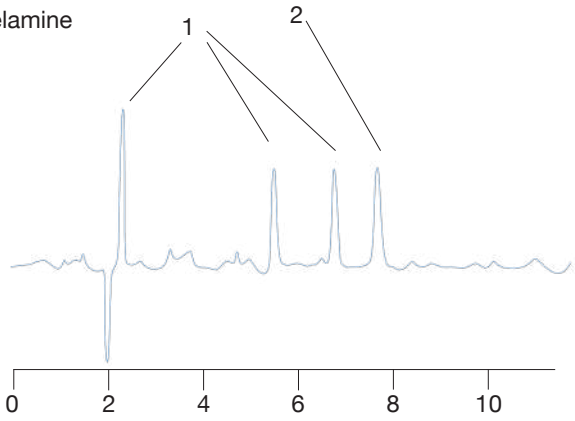
A before pump stopping

B after pump stopping

**Melamine in Milk Powder (according toGB/T22388-2008)** No.03215

1.Impurities in Milk

2.Melamine




| | |
|---|---|
| Column: | C18-WP 4.6 × 150mm, 5μm (HCA050U046X15072A) |
| Mobile phase: | 10 mM hexane sulfonate +10 mM citric acid buffer solution / acetonitrile (90/10) |
| Flow rate: | 1.0 mL/min |
| Detection: | 240 nm |
| Column temperature: | 40 ℃ |

## C18-WP

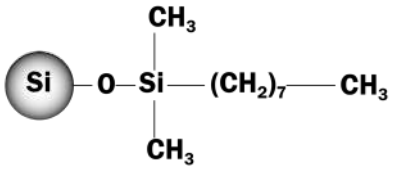
Ordering Information:

| Product Code | Particle size | diameter × length |
|---|---|---|
| HCA030U021X05073A | 3μm | 2.1 × 50mm |
| HCA030U021X10073A | 3μm | 2.1 × 100mm |
| HCA030U021X15073A | 3μm | 2.1 × 150mm |
| HCA030U021X20073A | 3μm | 2.1 × 200mm |
| HCA030U021X25073A | 3μm | 2.1 × 250mm |
| HCA030U046X05073A | 3μm | 4.6 × 50mm |
| HCA030U046X10073A | 3μm | 4.6 × 100mm |
| HCA030U046X15073A | 3μm | 4.6 × 150mm |
| HCA030U046X20073A | 3μm | 4.6 × 200mm |
| HCA030U046X25073A | 3μm | 4.6 × 250mm |
| HCA050U021X05072A | 5μm | 2.1 × 50mm |
| HCA050U021X10072A | 5μm | 2.1 × 100mm |
| HCA050U021X15072A | 5μm | 2.1 × 150mm |
| HCA050U021X20072A | 5μm | 2.1 × 200mm |
| HCA050U021X25072A | 5μm | 2.1 × 250mm |
| HCA050U046X05072A | 5μm | 4.6 × 50mm |
| HCA050U046X10072A | 5μm | 4.6 × 100mm |
| HCA050U046X15072A | 5μm | 4.6 × 150mm |
| HCA050U046X20072A | 5μm | 4.6 × 200mm |
| HCA050U046X25072A | 5μm | 4.6 × 250mm |

# C18

[ Conventional C18 column ]

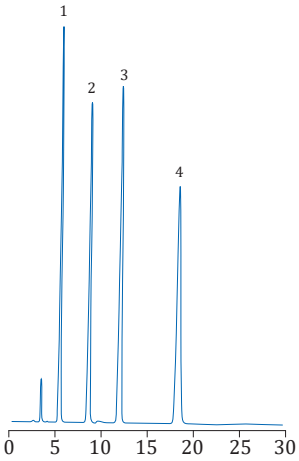
- Bonded C18 groups
- High-purity silica, metal content <10ppm
- Less hydrophobic than C18-WP, with different selectivity
- Economic column




Based on high purity spherical silica, C18 column is good at separating a variety of compounds.It is a typical economic column with high price ratio, as well as long column lifetime. For most analytes, the retention times are shorter than that of C18-WP columns of same specifications.

## Purine alkaloid No.03217

1.Theobromine
2.Theophyline
3.Caffeine
4.Phenol

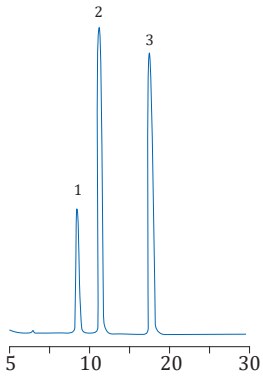



Min

| | |
|---|---|
| Column: | C18 4.6 × 150mm, 5μm (HCA050U046X15071A) |
| Mobile phase: | methanol / water (25/75) |
| Flow rate: | 1.0 mL/min |
| Detection: | 254 nm |
| Column temperature: | 40 ℃ |

## Tricyclic antidepressants No.03216

1.Protriptyline
2.Nortriptyline
3.Amitriptyline




Min

| | |
|---|---|
| Column: | C18 4.6 × 150mm, 5μm (HCA050U046X15071A) |
| Mobile phase: | methanol / 20 mM $K_2HPO_4$ buffer (pH 7.0) (80/20) |
| Flow rate: | 1.0 mL/min |
| Detection: | 254 nm |
| Column temperature: | 40 ℃ |

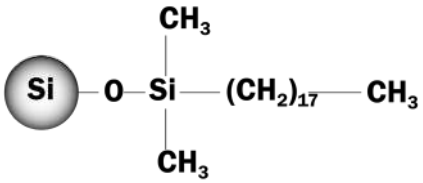
Ordering Information:
Particle size diameter × length Item No.

| Product Code | Particle size | diameter × length |
|---|---|---|
| HCA050U021X05071A | 5μm | 2.1 × 50mm |
| HCA050U021X10071A | 5μm | 2.1 × 100mm |
| HCA050U021X15071A | 5μm | 2.1 × 150mm |
| HCA050U021X20071A | 5μm | 2.1 × 200mm |
| HCA050U021X25071A | 5μm | 2.1 × 250mm |
| HCA050U046X05071A | 5μm | 4.6 × 50mm |
| HCA050U046X10071A | 5μm | 4.6 × 100mm |
| HCA050U046X15071A | 5μm | 4.6 × 150mm |
| HCA050U046X20071A | 5μm | 4.6 × 200mm |
| HCA050U046X25071A | 5μm | 4.6 × 250mm |
| HCA100U046X15074A | 10μm | 4.6 × 150mm |
| HCA100U046X25074A | 10μm | 4.6 × 250mm |

# C18-BIO

[ Applicable to macromolecules ]

- Bonded C18 groups
- 300Å pore size, fit for macromolecules separation, such as peptides 1
- High column effciency and long lifetime
- Stable in the range of pH 1.5-11

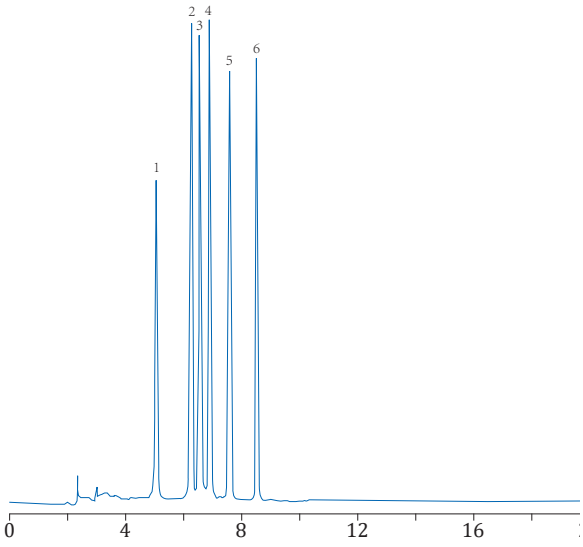



300Å pore size, highpurity silica, high density bonding, and completely endcapped, make C18-BIO able to separatelarge moleculars, especially proteins and polypeptides.

**Applications:**

## Oligonucleotide No.03218

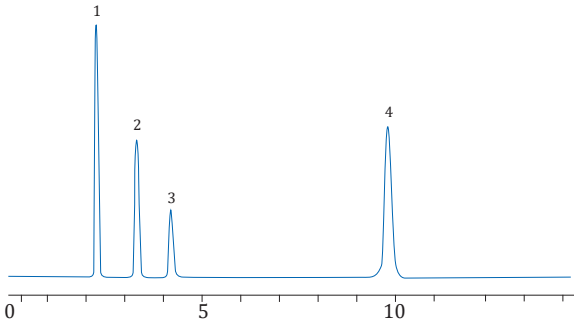
1.CAAGACGCAA
2.CAACCAACGT
3.GGTGATCAAC
4.CCCTGAACAA
5.CGTGTATTGG
6.GGTCCTATAC




Column: C18-BIO 4.6 × 150mm, 5μm (HCA050U046X15078A)
Mobile phase: A: 50 mM $NaH_2PO_4$ buffer solution (pH 7.0); B: acetonitrile 0min B: 5%; 20min B: 15%
Flow rate: 1.0 mL/min
Detection: 260 nm
Column temperature: 25 ℃

## Anti-HIV drugs No.03217

1.Theobromine
2.d4T
3.AZT-Glucuronide
4.AZT




Column: C18-BIO 4.6 × 150mm, 5μm (HCA050U046X15078A)
Mobile phase: methanol / 20 mM $NH_4H_2PO_4$ buffer (10/90)
Flow rate: 1.0 mL/min
Detection: 260 nm
Column temperature: 35 ℃

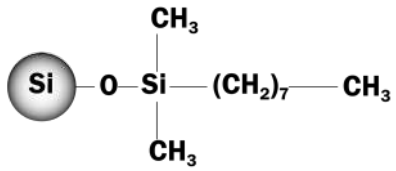
Ordering Information:

| Product Code | Particle size | diameter × length |
|---|---|---|
| HCA050U021X05078A | 5μm | 2.1 × 50mm |
| HCA050U021X10078A | 5μm | 2.1 × 100mm |
| HCA050U021X15078A | 5μm | 2.1 × 150mm |
| HCA050U021X20078A | 5μm | 2.1 × 200mm |
| HCA050U021X25078A | 5μm | 2.1 × 250mm |
| HCA050U046X05078A | 5μm | 4.6 × 50mm |
| HCA050U046X10078A | 5μm | 4.6 × 100mm |
| HCA050U046X15078A | 5μm | 4.6 × 150mm |
| HCA050U046X20078A | 5μm | 4.6 × 200mm |
| HCA050U046X25078A | 5μm | 4.6 × 250mm |

# C8

[ High resolution, rapid analysis ]

- Bonded C8 groups
- Better resolutionthan C18 group for medium polarity subjects,and short retention time for non-polar compunds
- Good peak shapes for acidic, basic, and neutral substances
- Long column life and good repeatability

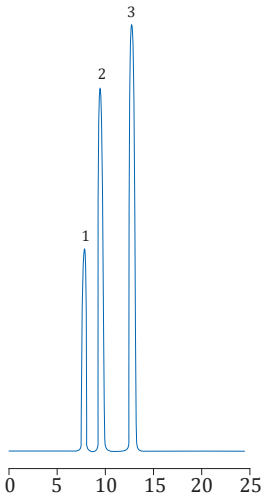



C8 offers less degree of hydrophobic selectivity compared to C18. C8 is a better choice if need to save time and achieve rapid analysis in the same chromatographic condition on octadecyl bonded phase.

Applications

## Tricyclic antidepressants No.03220

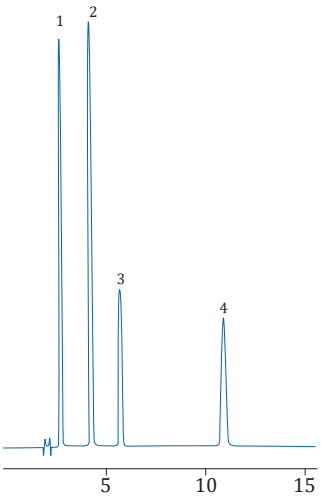
1.Protriptyline
2.Nortriptyline
3.Amitriptyline




| | |
|---|---|
| Column: | C8 4.6 × 150mm, 5μm (HCA050U046X15075A) |
| Mobile phase: | methanol / 20 mM $K_2HPO_4$ buffer (pH 7.0) (80/20) |
| Flow rate: | 1.0 mL/min |
| Detection: | 254 nm |
| Column temperature: | 40 ℃ |

## SulfaNo No.03221

1.Sulfonamide
2.Sulfisomidine
3.Sulfadiazine
4.Sulfamethazine




| | |
|---|---|
| Column: | C8 4.6 × 150mm, 5μm (HCA050U046X15075A) |
| Mobile phase: | acetonitrile / 0.1% $H_3PO_4$ buffer (10/90) |
| Flow rate: | 1.0 mL/min |
| Detection: | 254 nm |
| Column temperature: | 40 ℃ |

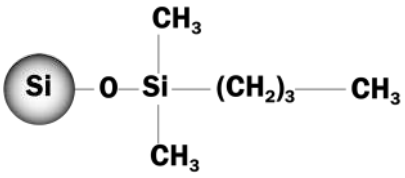
Ordering Information:

| Product Code | Particle size | diameter × length |
|---|---|---|
| HCA030U021X05065A | 3μm | 2.1 × 50mm |
| HCA030U021X10065A | 3μm | 2.1 × 100mm |
| HCA030U021X15065A | 3μm | 2.1 × 150mm |
| HCA030U021X20065A | 3μm | 2.1 × 200mm |
| HCA030U021X25065A | 3μm | 2.1 × 250mm |
| HCA030U046X05065A | 3μm | 4.6 × 50mm |
| HCA030U046X10065A | 3μm | 4.6 × 100mm |
| HCA030U046X15065A | 3μm | 4.6 × 150mm |
| HCA030U046X20065A | 3μm | 4.6 × 200mm |
| HCA030U046X25065A | 3μm | 4.6 × 250mm |
| HCA050U021X05075A | 5μm | 2.1 × 50mm |
| HCA050U021X10075A | 5μm | 2.1 × 100mm |
| HCA050U021X15075A | 5μm | 2.1 × 150mm |
| HCA050U021X20075A | 5μm | 2.1 × 200mm |
| HCA050U021X25075A | 5μm | 2.1 × 250mm |
| HCA050U046X05075A | 5μm | 4.6 × 50mm |
| HCA050U046X10075A | 5μm | 4.6 × 100mm |
| HCA050U046X15075A | 5μm | 4.6 × 150mm |
| HCA050U046X20075A | 5μm | 4.6 × 200mm |
| HCA050U046X25075A | 5μm | 4.6 × 250mm |

# C4

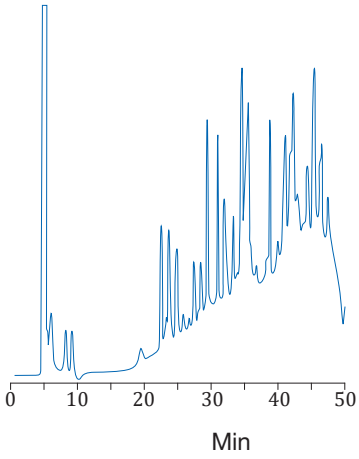
[ Low hydrophobic reverse phase, rapid analysis ]

- Bonded C4 groups
- 300Å pore size, fit for macromolecules separation
- Rapid analysis
- High column efficiency and excellent peak shape




Retention times are shorter than on C8 and C18 phases. 300Å pore size is suitable for analysis of biological samples.

**Hydrolysis bovine serum albumin** No.03222




| | |
|---|---|
| Column: | C4 4.6 × 250mm, 5μm (HCA050U046X15079A) |
| Mobile phase: | A: 0.09% TFA; B: 0.085% TFA + 80% acetonitrile<br>0min B 5%; 5min B 5%; 35min B 50%; 45min B 100% |
| Flow rate: | 1.0 mL/min |
| Detection: | 214 nm |
| Column temperature: | 25 ℃ |

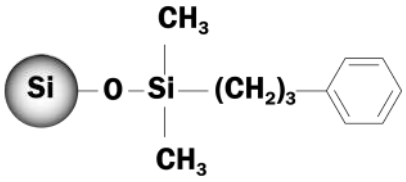
Ordering Information:

| Product Code | Particle size | diameter × length |
|---|---|---|
| HCA050U021X05079A | 5μm | 2.1 × 50mm |
| HCA050U021X10079A | 5μm | 2.1 × 100mm |
| HCA050U021X15079A | 5μm | 2.1 × 150mm |
| HCA050U021X20079A | 5μm | 2.1 × 200mm |
| HCA050U021X25079A | 5μm | 2.1 × 250mm |
| HCA050U046X05079A | 5μm | 4.6 × 50mm |
| HCA050U046X10079A | 5μm | 4.6 × 100mm |
| HCA050U046X15079A | 5μm | 4.6 × 150mm |
| HCA050U046X20079A | 5μm | 4.6 × 200mm |
| HCA050U046X25079A | 5μm | 4.6 × 250mm |

# Phenyl

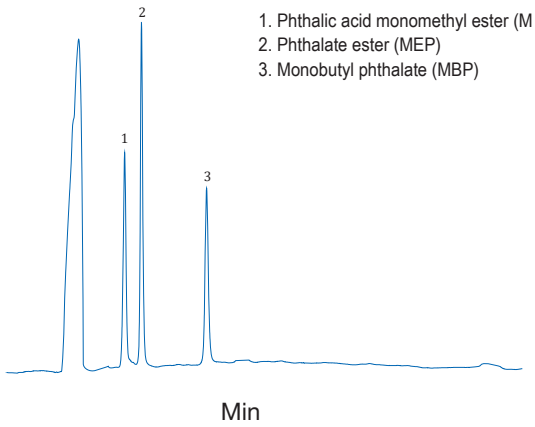
[ Analysis for compounds with cyclic structure ]

- Bonded phenylpropyl groups
- Interactions with π-π of aromatic compound
- Unique selectivity for compounds with cyclic structure
- good reproducibility




Phenyl column bonded phenylpropyl group, with surface coverage is 3.0 μmol/m2. Phenyl exhibits a unique selectivity for aromatic compounds, due to a possibility for π-π interactions between the phenyl bonded phase and the solute.

**O-phthalic monoester acid** No.03223




| | |
|---|---|
| Column: | Phenyl 4.6 × 150mm, 5μm (HCA050U046X15037A) |
| Mobile phase: | acetonitrile / water / acetic acid(45/55/0.2) |
| Flow rate: | 0.8 mL/min |
| Detection: | 228 nm |
| Column temperature: | 25 ℃ |

Ordering Information:

| Product Code | Particle size | diameter × length |
|---|---|---|
| HCA050U021X05037A | 5μm | 2.1 × 50mm |
| HCA050U021X10037A | 5μm | 2.1 × 100mm |
| HCA050U021X15037A | 5μm | 2.1 × 150mm |
| HCA050U021X25037A | 5μm | 2.1 × 250mm |
| HCA050U046X05037A | 5μm | 4.6 × 50mm |
| HCA050U046X10037A | 5μm | 4.6 × 100mm |
| HCA050U046X15037A | 5μm | 4.6 × 150mm |
| HCA050U046X25037A | 5μm | 4.6 × 250mm |

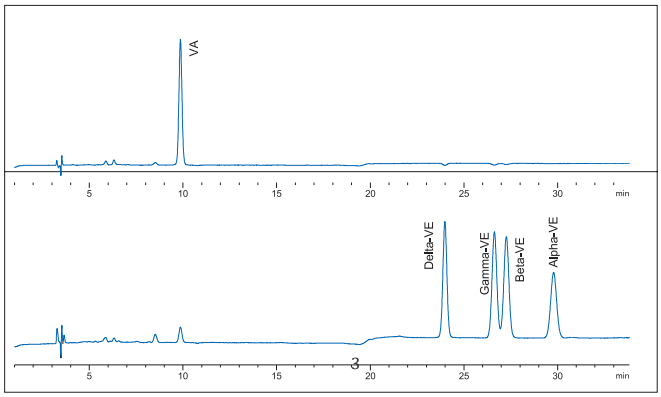
# C30

[ Applicable to Carotenoid Separation ]

- Unique C30 bonded phase, offering diverse selectivity
- High shape selectivity for structurally similar isomers

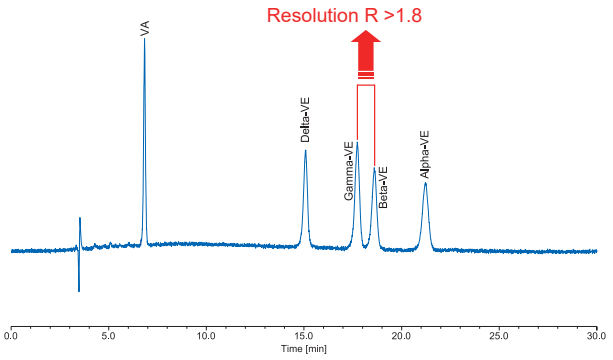
C30 is bonded with unique C30 functional groups, suitable for the separation of polar substances (such as sugars and nucleic acids) and lipophilic compounds (such as vitamin E and carotenoids).

## Determination of vitamins A and E GB5009.82—2016




| | |
|---|---|
| Column: | C30, 4.6 x 250mm, 5μm (HCA050U046X25052A) |
| Flow rate: | 0.8ml/min |
| Column temperature | 20℃ |
| Injection volume | 10μl |
| Detector: | UV, vitamin A at 325nm; vitamin E at 294nm |
| Mobile phase | A: Methanol B: Water |
| Gradient conditions | |

| Time（min） | Flow Rate | Water(%) | Methanol(%) |
|---|---|---|---|
| 0.0 | 0.8 | 4 | 96 |
| 12.0 | 0.8 | 4 | 96 |
| 12.5 | 1.0 | 4 | 96 |
| 17.0 | 1.0 | 0 | 100 |
| 30.0 | 1.0 | 0 | 100 |
| 31.0 | 0.8 | 4 | 96 |
| 33.0 | 0.8 | 4 | 96 |



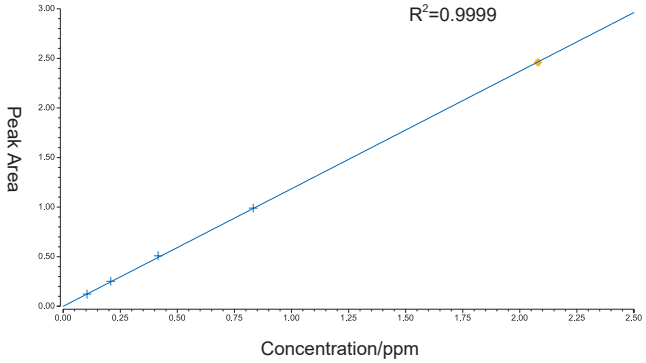

| | |
|---|---|
| Column: | C30, 4.6 x 250mm, 3μm (HCA030U046X25053A) |
| Flow rate: | 0.8ml/min |
| Column temperature | 20℃ |
| Injection volume | 10μl |
| Detector: | UV, 294nm |
| Mobile phase | 100% Methanol |

## Determination of Lutein GB5009.248—2016

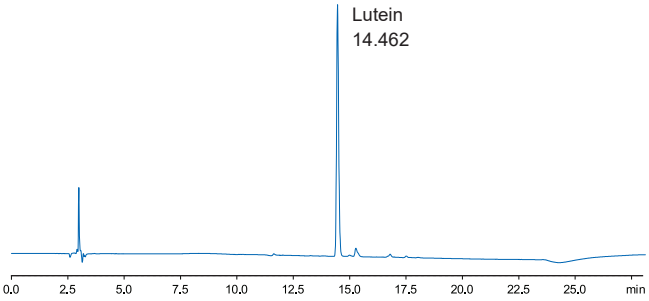
| | |
|---|---|
| Column: | C30, 4.6 x 250mm, 5μm (HCA050U046X25052A) |
| Flow rate: | 1.0ml/min |
| Column temperature | 30℃ |
| Injection volume | 50μl |
| Detector: | UV, vitamin A at 325nm; vitamin E at 294nm |
| Mobile phase | A:Methanol : Water (88:12, volume ratio, containing 0.1% BHT)<br>B:Tert-butyl methyl ether(containing 0.1% BHT) |
| Gradient conditions | |

| Time（min） | A（%） | B（%） |
|---|---|---|
| 0 | 85 | 15 |
| 5 | 85 | 15 |
| 18 | 60 | 40 |
| 18.1 | 85 | 15 |
| 25 | 85 | 15 |

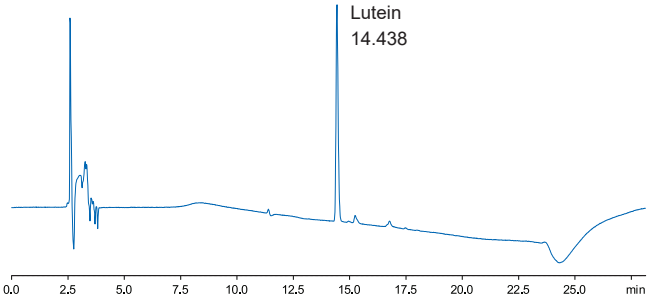
Standard Curve




Sample Chromatogram：




Sample Chromatogram：



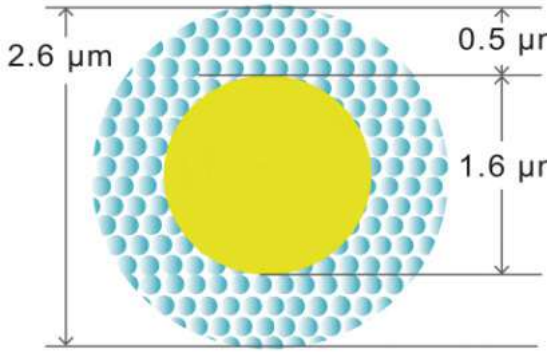

## Ordering Information:

| Packings | Product Code | diameter × length |
|---|---|---|
| C30 | HCA050U046X25052A | 4.6 × 250mm,5um |
| C30 | HCA030U046X25053A | 4.6 × 250mm,5um |
| C30 Guard Cartrideg Kit | HCA050U040X02052KA | 1 Holder and 1 Cartridge,5 μm,4.0 *20 mm |
| C30 Guard Cartrideg | HCA050U040X02052A | 4.0×20mm, 5μm |

# C18 HPLC Column

[ Applicable to Carotenoid Separation ]

- High column efficiency, low column pressure
- High-throughput rapid analysis
- Compatible with UHPLC and HPLC
- High reproducibility

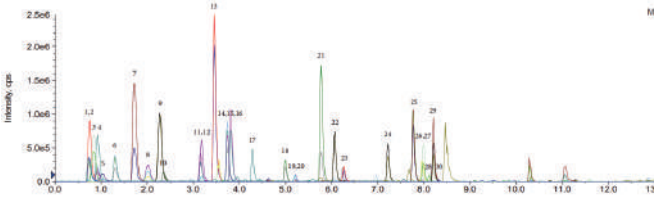



Shell is a nucleoparticle silica chromatography column with a particle size of 2.6 μm. It consists of a solid spherical core with a diameter of 1.6 μm and a porous shell layer with a thickness of 0.5 μm. It possesses equal column efficiency and separation performance to sub-2 μm UHPLC columns while only requiring half the column pressure. This allows it to be used on both UHPLC and HPLC instruments, enabling ultra-fast separation with shorter analysis times and higher separation efficiency.solute.

HTraditional Chinese Medicine Pesticide Residues - Pharmacopoeia

1.CAAGACGCAA
2.CAACCAACGT
3. GGTGATCAAC
4.CCCTGAACAA
5. CGTGTATTGG
6. GGTCCTATAC

1.Methamidophos
2.Temidiphos ethyl sulfoxide
3.Carbaryl
4.Temidiphospropyl sulfoxide
5.Ethyl parathion
6.3-Hydroxycarbofuran
7.Thiophos
8.Benxllithium thiosulfate
9.Phosphanil
10.Temidiphos
11.Benxllithium sulfoxide
12.Metsulfuron methyl
13.Carbofuran
14.Chlorsulfuron
15.Metyl para-phosphorus sulfoxide
16.Aminopropyl sulfuron
17.Ethyl parathion
18.Terbutyl thiophosphate sulfoxide
19.Metyl para-phosphorus sulfoxide
20.Nitrifurazone
21.Benxllithium
22.Fenthion
23.Terbutyl thiophosphate sulfoxide
24.Clorophene
25.Thioclorophen
26.Methyl isothiophosphate
27.Ciclophen
28.Dieldrin
29.Fenvalerate
30.Metyl para-phosphorus



Column: C18 2.1 × 100mm, 2.6um (HCA026U021X100I1A)

Mobile phase: A phase 0.1% formic acid solution (containing 5mmol/L ammonium formate)
B phase acetonitrile - 0.1% formic acid solution (containing 5mmol/L ammonium formate) (95:5)
wacetic acid(45/55/0.2)

Flow rate: 0.3ml/min

Temperature 40℃

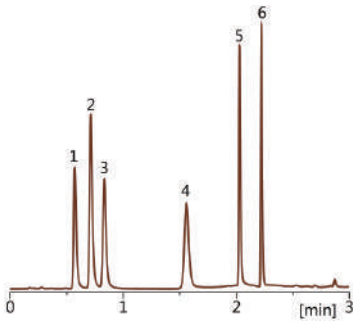
Ionization mod ESI, positive ion mode analysis

modetemperature: Multi-reaction monitoring (MRM)

| Time(min) | A(%) | B(%) |
|---|---|---|
| 0~1 | 70 | 30 |
| 1~12 | 70~0 | 30~100 |
| 12~14 | 0 | 100 |

HTraditional Chinese Medicine Pesticide Residues - Pharmacopoeia

1.Sulfadiazine
2.Sulfathiazole
3.Sulfamerazine
4.Sulfamethoxypyidazine
5.Sulfamethoxazole
6.Sulfaquinoxaline




Column: C18, 2.1mm×50mm, 2.6μm, (HCA026U021X050I1A)

Mobile phase A: Acetonitrile ; B: 0.1% Formic Acid

Flow rate: 1.0ml/min

Detector: 254nm

Temperature 40℃

| Time(min) | A(%) | B(%) |
|---|---|---|
| 0 | 10 | 90 |
| 2 | 90 | 10 |

Ordering Information:

| Packings | Product Code | Particle size | diameter × length |
|---|---|---|---|
| C18 | HCA026U021X050I1A | 2.6μm | 2.1 × 50mm |
| C18 | HCA026U021X100I1A | 2.6μm | 2.1 × 100mm |
| C18 | HCA026U046X100I1A | 2.6μm | 4.6 × 100mm |
| C18 | HCA026U046X050I1A | 2.6μm | 4.6 × 50mm |

More Information:

| Packings | Product Code | Particle size | diameter × length |
|---|---|---|---|
| PFP | HCA026U021X100I3A | 2.6μm | 4.6 × 50mm |

# Silica

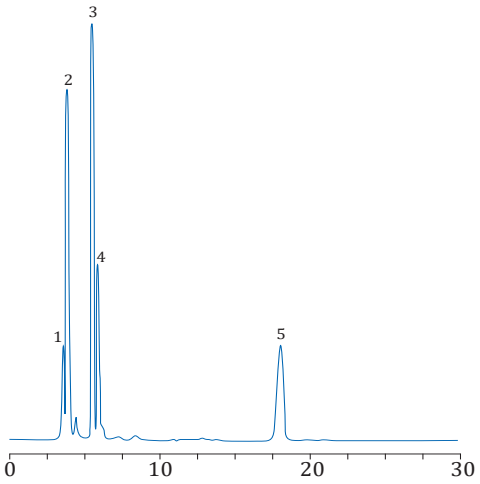
[ Non- bonded silica, normal phase ]

- Spherical silica, non- bonded
- For non-polar and medium polar organic compounds
- Ultra pure, low metal impurity
- Symmetrical peak shape

None bonded high-purity silica, metal impurity content <10ppm, high mechanical strength. Silica is fit for separation of non-polar and media polar organic compounds to achieve sharp peak shape and high reproducibility for columns.

## Fat-soluble vitamins No.03224

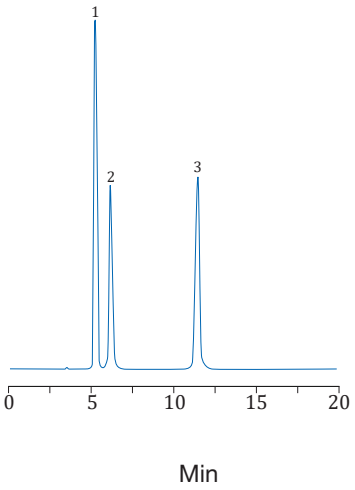
1.Vitamin A palmitate
2.Vitamin K1
3.Vitamin E
4.Vitamin K3
5.Vitamin D




| | |
|---|---|
| Column: | Silica 4.6 × 150mm, 5μm (HCA050U046X15076A) |
| Mobile phase: | n-hexane / chloroform (60/40) |
| Flow rate: | 1.0 mL/min |
| Detection: | 254 nm |
| Column temperature: | 25 ℃ |

## Steroid No.03225

1.Estrone
2.Estradiol
3.Estriol




| | |
|---|---|
| Column: | Silica 4.6 × 150mm, 5μm (HCA050U046X15076A) |
| Mobile phase: | n-hexane / ethanol (85/15) |
| Flow rate: | 1.0 mL/min |
| Detection: | 270 nm |
| Column temperature: | 40 ℃ |

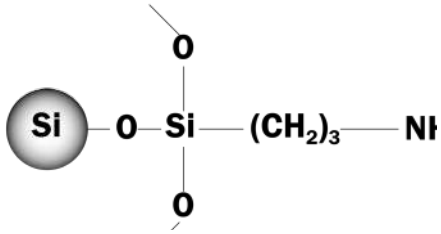
Ordering Information:

| Product Code | Particle size | diameter × length |
|---|---|---|
| HCA030U021X05066A | 3μm | 2.1 × 50mm |
| HCA030U021X10066A | 3μm | 2.1 × 100mm |
| HCA030U021X15066A | 3μm | 2.1 × 150mm |
| HCA030U021X20066A | 3μm | 2.1 × 200mm |
| HCA030U021X25066A | 3μm | 2.1 × 250mm |
| HCA030U046X05066A | 3μm | 4.6 × 50mm |
| HCA030U046X10066A | 3μm | 4.6 × 100mm |
| HCA030U046X15066A | 3μm | 4.6 × 150mm |
| HCA030U046X20066A | 3μm | 4.6 × 200mm |
| HCA030U046X25066A | 3μm | 4.6 × 250mm |
| HCA050U021X05076A | 5μm | 2.1 × 50mm |
| HCA050U021X10076A | 5μm | 2.1 × 100mm |
| HCA050U021X15076A | 5μm | 2.1 × 150mm |
| HCA050U021X20076A | 5μm | 2.1 × 200mm |
| HCA050U021X25076A | 5μm | 2.1 × 250mm |
| HCA050U046X05076A | 5μm | 4.6 × 50mm |
| HCA050U046X10076A | 5μm | 4.6 × 100mm |
| HCA050U046X15076A | 5μm | 4.6 × 150mm |
| HCA050U046X20076A | 5μm | 4.6 × 200mm |
| HCA050U046X25076A | 5μm | 4.6 × 250mm |

# $NH_2$

[ Both Normal and reverse phase mode ]

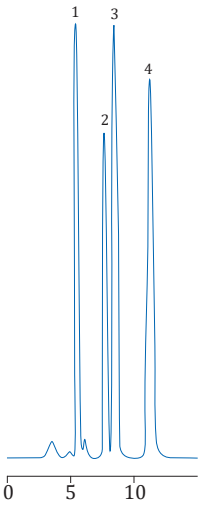
- Bonded aminopropyl group
- Suitable for normal and reverse phase mode
- Separate sugars in reverse mode




Aminopropyl stationary phase serves as a weak anion exchanger and offer polar selectivity under reversed phase and normal phase conditions.

## Tocopherol isomers No.03227

1. α -Tocopherol
2. α -Tocopherol
3. α -Tocopherol
4. α -Tocopherol

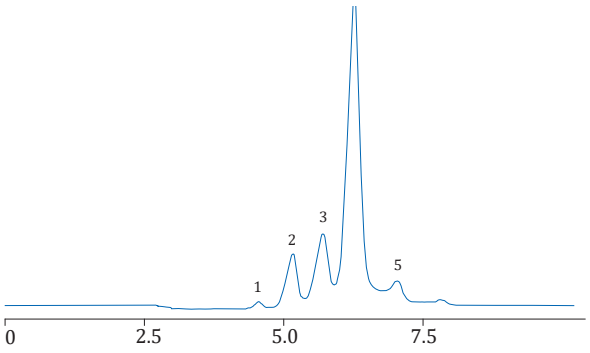



Min

| | |
|---|---|
| Column: | $NH_2$ 4.6 x 150mm, 5μm (HCA050U046X15077A) |
| Mobile phase: | n-hexane / ethyl acetate (70/30) |
| Flow rate: | 1.0 mL/min |
| Detection: | 295 nm |
| Column temperature: | 40 ℃ |

## Carbonhydrates No.03226

1.Glucose
2.Maltose
3.Maltotriose
4.
Maltotetraose
5.Matlopentaos




Min

| | |
|---|---|
| Column: | $NH_2$ 4.6 x 150mm, 5μm (HCA050U046X15077A) |
| Mobile phase: | acetonitrile / water (50/50) |
| Flow rate: | 1.0 mL/min |
| Detection: | RID |
| Column temperature: | 40 ℃ |

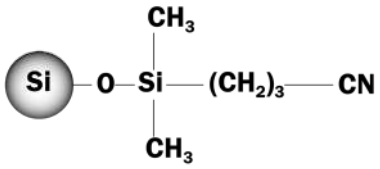
Ordering Information:

| Product Code | Particle size | diameter × length |
|---|---|---|
| HCA030U021X05067A | 3μm | 2.1 × 50mm |
| HCA030U021X10067A | 3μm | 2.1 × 100mm |
| HCA050U021X15067A | 3μm | 2.1 × 150mm |
| HCA030U021X20067A | 3μm | 2.1 × 200mm |
| HCA030U021X25067A | 3μm | 2.1 × 250mm |
| HCA030U046X05067A | 3μm | 4.6 × 50mm |
| HCA030U046X10067A | 3μm | 4.6 × 100mm |
| HCA030U046X15067A | 3μm | 4.6 × 150mm |
| HCA030U046X20067A | 3μm | 4.6 × 200mm |
| HCA030U046X25067A | 3μm | 4.6 × 250mm |
| HCA050U021X05077A | 5μm | 2.1 × 50mm |
| HCA050U021X10077A | 5μm | 2.1 × 100mm |
| HCA050U021X15077A | 5μm | 2.1 × 150mm |
| HCA050U021X20077A | 5μm | 2.1 × 200mm |
| HCA050U021X25077A | 5μm | 2.1 × 250mm |
| HCA050U046X05077A | 5μm | 4.6 × 50mm |
| HCA050U046X10077A | 5μm | 4.6 × 100mm |
| HCA050U046X15077A | 5μm | 4.6 × 150mm |
| HCA050U046X20077A | 5μm | 4.6 × 200mm |
| HCA050U046X25077A | 5μm | 4.6 × 250mm |

## CN

[ Can be used for normal or reverse phase separation ]

- Bonded cyanopropyl
- Can be used for normal or reverse phase separation
- High column efficiency and good reproducibility




CN is cyanide propyl boned silica column with n-electron interaction and unshared electron pair hydrogen bonding.Can be used for both reverse phase and normal phase mode. When used for reverse mode, having different selectivity from C18 and C8 columns; when used for normal phase mode, retention is lower retention than non-bonded silica gel column.

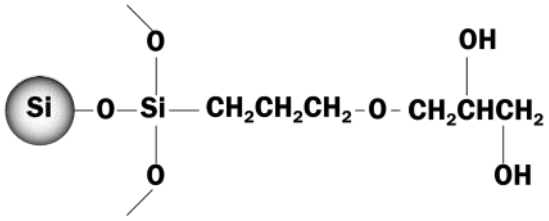
Ordering Information:

| Product Code | Particle size | diameter × length |
|---|---|---|
| HCA030U021X15034A | 3μm | 2.1 × 150mm |
| HCA050U021X05033A | 5μm | 2.1 × 50mm |
| HCA050U021X10033A | 5μm | 2.1 × 100mm |
| HCA050U021X15033A | 5μm | 2.1 × 150mm |
| HCA050U021X20033A | 5μm | 2.1 × 200mm |
| HCA050U021X25033A | 5μm | 2.1 × 250mm |
| HCA050U046X05033A | 5μm | 4.6 × 50mm |
| HCA050U046X10033A | 5μm | 4.6 × 100mm |
| HCA050U046X15033A | 5μm | 4.6 × 150mm |
| HCA050U046X20033A | 5μm | 4.6 × 200mm |
| HCA050U046X25033A | 5μm | 4.6 × 250mm |

## Diol

[ Suitable for normal phase separation ]

- Bonded group of 1,2 - dihydroxy-propyl ether propionate
- Normal phase separation
- Good reproducibility




Diol bonded 1,2 - dihydroxy-propyl ether propionate group, coverage of 4.0 micromol / m², can interact with polar compounds. diol is able to distinguish compounds from slight difference, also can separate biological molecules based on size exclusion mechanism.

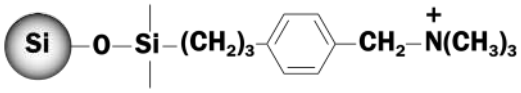
Ordering Information:

| Product Code | Particle size | diameter × length |
|---|---|---|
| HCA030U021X05036A | 3μm | 2.1 × 50mm |
| HCA030U021X10036A | 3μm | 2.1 × 100mm |
| HCA030U021X15036A | 3μm | 2.1 × 150mm |
| HCA030U021X25036A | 3μm | 2.1 × 250mm |
| HCA030U046X05036A | 3μm | 4.6 × 50mm |
| HCA030U046X10036A | 3μm | 4.6 × 100mm |
| HCA030U046X15036A | 3μm | 4.6 × 150mm |
| HCA030U046X25036A | 3μm | 4.6 × 250mm |
| HCA050U021X05035A | 5μm | 2.1 × 50mm |
| HCA050U021X10035A | 5μm | 2.1 × 100mm |
| HCA050U021X15035A | 5μm | 2.1 × 150mm |
| HCA050U021X25035A | 5μm | 2.1 × 250mm |
| HCA050U046X05035A | 5μm | 4.6 × 50mm |
| HCA050U046X10035A | 5μm | 4.6 × 100mm |
| HCA050U046X15035A | 5μm | 4.6 × 150mm |
| HCA050U046X25035A | 5μm | 4.6 × 250mm |

# SAX

[ Suitable for analysis of acidic substances ]

- Strong anion exchange mode
- Suitable for analysis of acidic substances, including nucleotide and organic acids etc.
- High column efficiency, high batch stability, good columns reproducibility
- To adjust retention time of the analytes by changing buffer concentration of mobile phase
- Stable in high proportion of water mobile phase




SAX column are boned quaternary ammonium strong anion- exchange group in the high-purity silica matrix, having mixed chemical structure of quaternary ammonium and phenyl functional groups. This mixed-mode by strong anion exchange phase and hydrophobic phase is suitable for separation of aromatic or aliphatic carboxylic acids, sulfonic acids, nucleotides and acids etc.

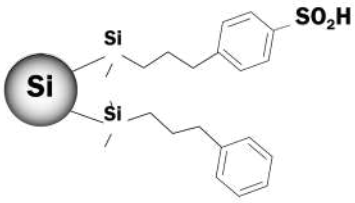
Ordering Information:

| Product Code | Particle size | diameter × length |
|---|---|---|
| HCA030U021X05020A | 3μm | 2.1 × 50mm |
| HCA030U021X10020A | 3μm | 2.1 × 100mm |
| HCA030U021X15020A | 3μm | 2.1 × 150mm |
| HCA030U021X25020A | 3μm | 2.1 × 250mm |
| HCA030U046X05020A | 3μm | 4.6 × 50mm |
| HCA030U046X10020A | 3μm | 4.6 × 100mm |
| HCA030U046X15020A | 3μm | 4.6 × 150mm |
| HCA030U046X25020A | 3μm | 4.6 × 250mm |
| HCA050U021X05021A | 5μm | 2.1 × 50mm |
| HCA050U021X10021A | 5μm | 2.1 × 100mm |
| HCA050U021X15021A | 5μm | 2.1 × 150mm |
| HCA050U021X25021A | 5μm | 2.1 × 250mm |
| HCA050U046X05021A | 5μm | 4.6 × 50mm |
| HCA050U046X10021A | 5μm | 4.6 × 100mm |
| HCA050U046X15021A | 5μm | 4.6 × 150mm |
| HCA050U046X25021A | 5μm | 4.6 × 250mm |

# SCX

[ Suitable for analysis of alkaline substances ]

- Strong cation exchange mode
- Fit for analysis of alkaline substances, especially amines
- high column efficiency, stable batch, good columns reproducibility




SCX is benzenesulfonic acid boned silica, having mixed chemical structure of sulfonic acid group and phenyl group. SCX is mixed mode of strong cation exchange phase and hydrophobic phase. Not only can be used for separation of cationic / basic and nitrogenous compounds, but also give appropriate reservation for a variety of weak cation, neutral organic compound. SCX is used for separation and determination of amines and polyamine compounds, such as alkaloids, peptides and components in cold medicines.

Ordering Information:

| Product Code | Particle size | diameter × length |
|---|---|---|
| HCA030U021X05022A | 3μm | 2.1 × 50mm |
| HCA030U021X10022A | 3μm | 2.1 × 100mm |
| HCA030U021X15022A | 3μm | 2.1 × 150mm |
| HCA030U021X25022A | 3μm | 2.1 × 250mm |
| HCA030U046X05022A | 3μm | 4.6 × 50mm |
| HCA030U046X10022A | 3μm | 4.6 × 100mm |
| HCA030U046X15022A | 3μm | 4.6 × 150mm |
| HCA030U046X25022A | 3μm | 4.6 × 250mm |
| HCA050U021X05023A | 5μm | 2.1 × 50mm |
| HCA050U021X10023A | 5μm | 2.1 × 100mm |
| HCA050U021X15023A | 5μm | 2.1 × 150mm |
| HCA050U021X25023A | 5μm | 2.1 × 250mm |
| HCA050U046X05023A | 5μm | 4.6 × 50mm |
| HCA050U046X10023A | 5μm | 4.6 × 100mm |
| HCA050U046X15023A | 5μm | 4.6 × 150mm |
| HCA050U046X25023A | 5μm | 4.6 × 250mm |
| HCA050U046X25045A | 5μm | 4.6 × 250mm |

*Note: HCA050U046X25045A is the original SCX column.*