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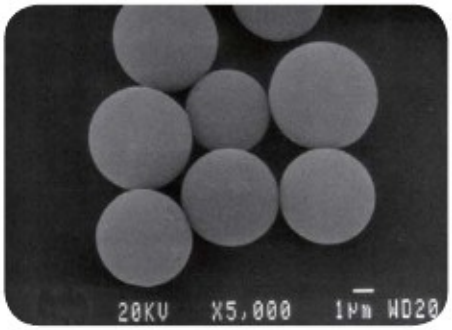
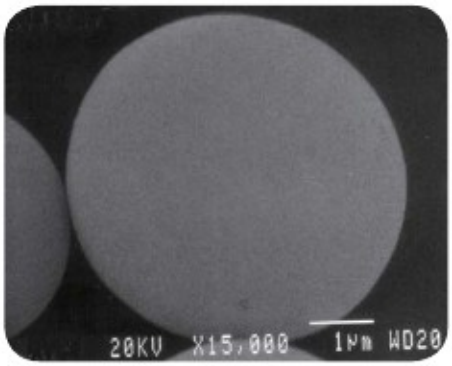
Analytical HPLC Columns

Ultisil® HPLC Columns

Ultisil® Column for Ultisil Performance

Welch Materials manufactures next generation Ultisil® HPLC columns (also called Ultisil® in China market) for chemists in the fields of pharmaceuticals, food, drug control, environmental, agrochemicals, cosmetics and academic labs. Ultisil® columns provide the best performance in peak shape, efficiency and resolution. We offer a full line of HPLC columns to meet HPLC separation and purification needs from analytical to preparative scale. Through continuous innovation, Welch Materials offers customers the best tools and solutions for separation, purification, and analysis of organic and bioorganic compounds.





SEM Pictures of Ultisil® Particles

Ultisil® HPLC Columns Properties:

- Ultra high purity (purity > 99.999% SiO_2) porous silica particles
- High performance over wide pH range from pH 1.5 to 10.0
- Proprietary surface modification for smooth, uniform and inert silica surface
- Long column lifetime and more injections
- Unique bonding chemistry and endcapping technology
- Exceptional lot-to-lot reproducibility
- Excellent peak shape, especially for polar, acidic and basic compounds
- Available in analytical and prep types, of all dimensions and sample sizes
- Series of stationary reversed phase and normal phases for wide selectivity
- Best value – high premium products with very competitive price

Ultisil® Packing Materials

Our Ultisil® HPLC columns are made from spherical, totally porous, and ultra high purity (>99.999%) type B silica particles. Our proprietary surface modification before bonding generates a very smooth and uniform surface with less acidic surface silanols.

Ultra pure and totally porous type B silica

- Ultra pure, spherical, and totally porous silica
- Narrow pore size and particles size distribution
- Proprietary surface modification to ensure uniform and inert surface
- High surface area for strong retention of hydrophobic and polar compounds
- Enhanced mechanical stability
- Range of particle size from 3μm to 10μm for analytical to preparative applications

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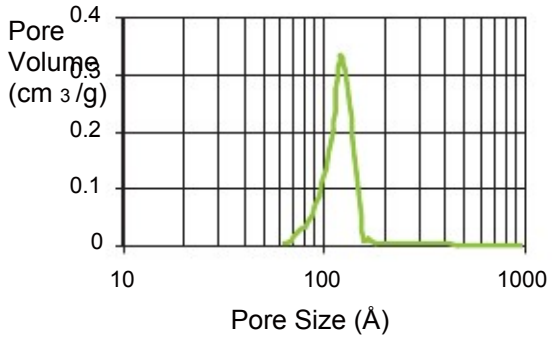
Ultisil® Pore Size Distribution



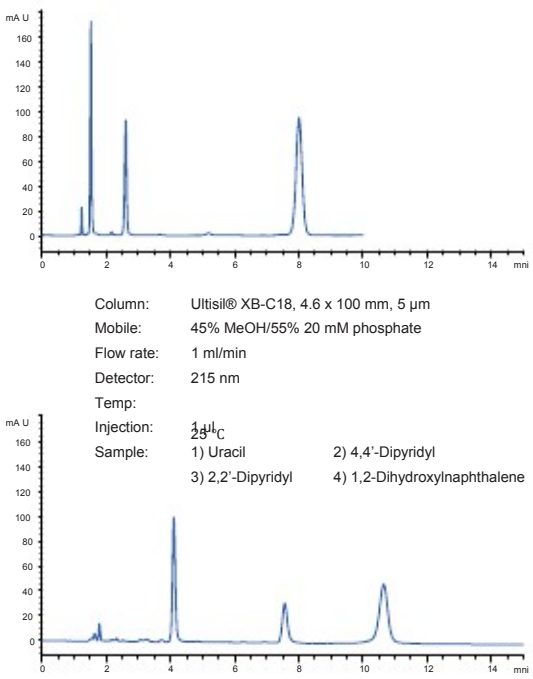
Pore size 120 Å

Narrow pore size distribution

Total absence of performance-degrading micro pores (< 40 Å)

High resolution for analytical application and high loading capacity for preparative application.

Trace Amount Metal Contents Test Using Chelating Compounds

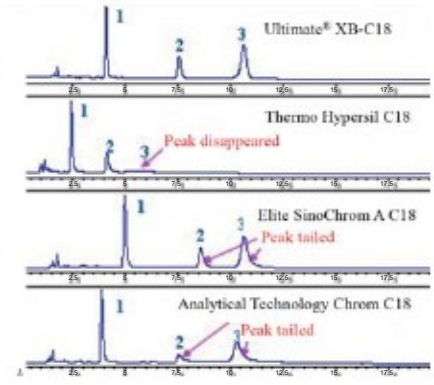


Column:	Ultisil® XB-C18, 4.6 x 100 mm, 5 µm
Mobile:	45% MeOH/55% 20 mM phosphate
Flow rate:	1 ml/min
Detector:	215 nm
Temp:	25 °C
Injection:	1 µl
Sample:	1) Uracil 2) 4,4'-Dipyridyl 3) 2,2'-Dipyridyl 4) 1,2-Dihydroxylnaphthalene

A useful chromatographic test of trace amount of metal contents in the column is to compare the peak symmetry of one pair of positional isomers, 4,4'-dipyridyl and 2,2'-dipyridyl, and one neutral chelating reagent, 2,2-dihydroxylnaphthalene. 4,4'-dipyridyl, which cannot form chelating complex with metal, is used as a reference. 2,2'-dipyridyl and 2,2-dihydroxylnaphthalene, which are chelating reagents, are sensitive to trace amount metal in silica. When type A silica based C18 column or other so-called type B silica with higher metal content column is used, the peaks of 2,2'-dipyridyl and 2,2-dihydroxylnaphthalene would tail or even totally disappear.

The figure shows the chromatogram of separation of chelating compounds using Ultisil® XB-C18 column. All these three compounds on Ultisil® XB-C18 show excellent peak shapes at pH 2.7 and 7.6, indicating no metal contents in the column at all.

Comparison with other brands



Column:	4.6 x 100 mm, 5 µm		
Mobile:	45% MeOH/55% 20 mM phosphate		
Flow rate:	1 ml/min	Detector:	215 nm
Temp:	25 °C	Injection:	1 µl
Sample:	1) 4,4'-Dipyridyl 2) 2,2'-Dipyridyl 3) 1,2-Dihydroxylnaphthalene		

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Ultisil® XB Series HPLC Columns

Ultisil® XB series HPLC column is designed for most LC method development, including a wide range of different phases (C18, C8, Phenyl, C4, C1, and CN as reverse phases, and CN, SiO_2, NH_2, and Diol as normal phases). All the phases are made from monomeric organic silane to ensure exceptional batch-to-batch reproducibility and fast mass transfer. The different selectivity of XB series phases allows customers to select the best column to achieve optimal separation.

The Physical Characteristics of Ultisil® Phases

Phase	XB-C18	XB-C8	XB-Phenyl	XB-CN	XB-NH_2	XB-SiO_2	XB-CN	XB-Diol
Particle Size	3, 5, 10 μm	3, 5, 10 μm	3, 5, 10 μm	3, 5, 10 μm	3, 5, 10 μm	3, 5, 10 μm	3, 5, 10 μm	3, 5, 10 μm
Pore Size	120 Å	120 Å	120 Å	120 Å	120 Å	120 Å	120 Å	120 Å
Surface Area	320m_2/g	320m_2/g	320m_2/g	320m_2/g	320m_2/g	320m_2/g	320m_2/g	320m_2/g
Carbon Loading	17%	12%	13%	7%	6%	0	7%	8%
End-capping	Yes	Yes	Yes	Yes	No	No	No	No
pH stability	1.5-10.0	1.5-10.0	1.5-10.0	1.5-9.0	/	/	1.5-9.0	/

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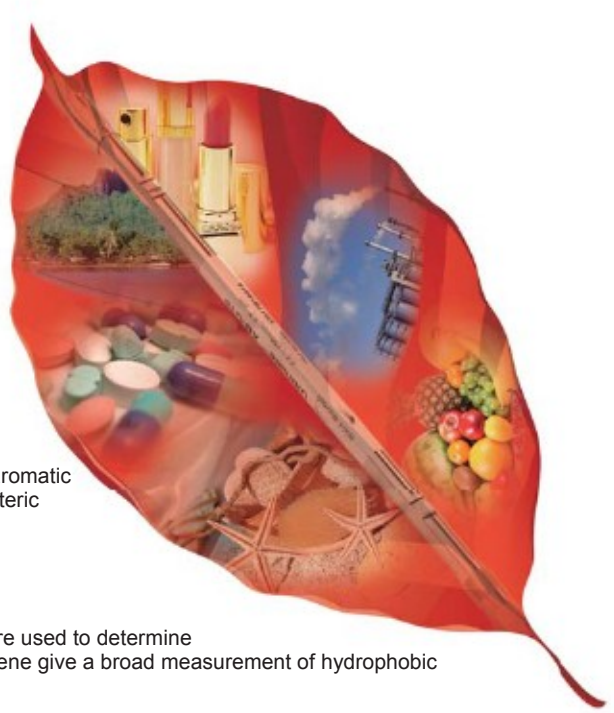
Ultisil® XB-C18——The most universal C18 column

- The most universal C18 for most application
- High surface area coverage and exhaustive endcapping
- Excellent peak shape for polar compounds and strong bases
- Exceptional batch-to-batch and column-to-column reproducibility
- Available in dimensions from analytical to preparative for all sample sizes

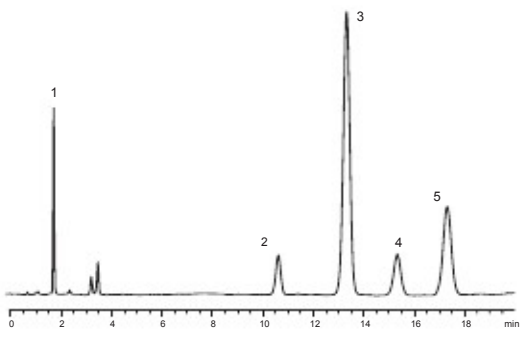


Ultisil® XB-C18 columns, featuring high surface coverage and exhaustive end-capping, are an excellent choice as a general-purpose C18 column for a wide variety of organic compounds. The bonding chemistry is optimized specifically for our base material. Our proprietary double end-capping leads to optimal performance with neutral, polar, acidic, basic, and chelating compounds.

Steric Selectivity: Steric selectivity refers to the ability of the stationary phase to recognize and differentiate between molecules with similar structures but different shapes. The nature and orientation of alkyl ligand can affect the extent to which steric selectivity plays a part in a separation. Steric selectivity is also indicative of the silica surface area and ligand coverage of bonding chemistry, and provides a characteristic by which different HPLC packings can be compared. Polyaromatic hydrocarbons such as o-terphenyl and triphenylene are most used to characterize steric selectivity due to their relative ability to bend and twist out of shape.

Hydrophobicity: Hydrophobic retention and selectivity, as well as steric selectivity, are used to determine hydrophobicity characteristic. The capacity factors of amylbenzene and 1-butylbenzene give a broad measurement of hydrophobic retention and selectivity.

Steric Selectivity and Hydrophobicity Test



Column:	Ultisil® XB-C18, 4.6 x 150 mm, 5 µm	
Mobile:	80% MeOH/20% water	
Flow rate:	1 ml/min	
Detector:	254 nm	
Temp:	25 °C	
Injection:	1µl	
Sample:	1) Uracil	2) Butylbenzene
	3) Triphenylene	4) Amylbenzene
	5) o-Terphenyl	

Hydrogen Bonding Capacity: The selectivity index α of caffeine and phenol provides an indication of residual silanol groups and hydrogen bonding interactions that occur at the silica surface. Phenol is used only as a marker in the test and eliminates other column effects when the caffeine capacity factor is measured relative to it. The value of α (caffeine/phenol), which equals to K'(caffeine)/K'(phenol), is depended on the hydrogen bonding capacity of the phase. The α > 0.6 is said to represent a high capacity for hydrogen bonding, and an α < 0.6 is said to represent a low capacity for hydrogen bonding. Ultisil® XB-C18 phase has α value of 0.45, showing very hydrogen bonding activity.

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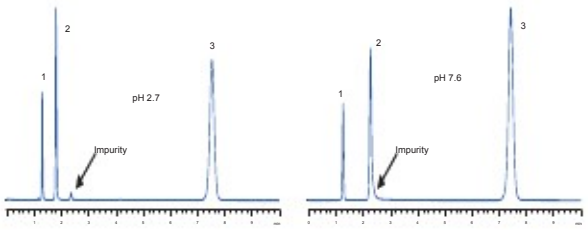
Ion Exchange Capacity at pH 2.7 and 7.6

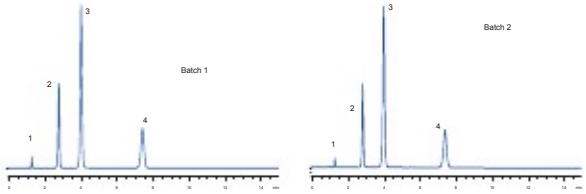


Column: Ultisil® XB-C18, 4.6 x 100 mm, 5 µm
Mobile: 30% MeOH; 70% 20 phosphate
Flow rate: 1 ml/min
Detector: 215 nm
Temp:
Injection: 1 µl
Sample: 1) Uracil 2) Benzylamine
3) Phenol

We use Tanaka et al mixture containing benzylamine and phenol to investigate ion exchange behavior of Ultisil® XB-C18 at pH 2.7 and 7.6. The relative retention of benzylamine to phenol shows important ion exchange characteristics of the packing. The peak of the strong base, benzylamine, is symmetric at both pH 2.7 and 7.6, indicating the uniformity of ion-exchange sites on the surface.

Analysis of Acids: Ultisil® XB-C18 phase also provides excellent performance for organic acids.

Hydrogen Bonding Capacity and Batch-to-Batch Reproducibility

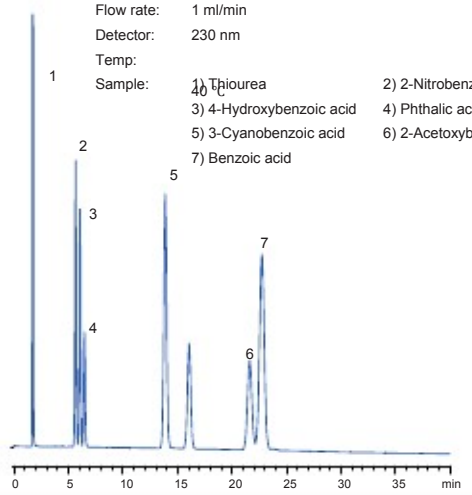


Column: Ultisil® XB-C18, 4.6 x 100 mm, 5 µm
Mobile: 30% MeOH/70% water
Flow rate: 1 ml/min
Detector: 215 nm
Temp:
Injection: 1 µl
Sample: 1) Uracil 2) Theophylline
3) Caffeine 4) Phenol

Ion Exchange Capacity: At pH < 3, the majority of silanol groups (Si-OH) are un-dissociated, and therefore do not contribute to retention of protonated amines. However, if the surface silanols are not uniform and there are some very acidic silanols left on the silica surface, those acidic silanols will be still in dissociated form (SiO-), which will contribute to the retention of protonated amines by ion exchange interaction and also cause peak tailing. At pH > 7, all of the surface silanol groups are dissociated to form ion exchange (SiO-) sites that increase the retention of protonated amines. To accurately determine the ion exchange character of a bonded phase, retention of amines should be measured at both high and low pH. The peak shapes of amines also show the uniformity of the surface silanol groups.

Separation of Organic Acids

Column: Ultisil® XB-C18, 4.6 x 150 mm, 5 µm
Mobile: 25% MeOH/75% 20mM phosphate, pH 2.7
Flow rate: 1 ml/min
Detector: 230 nm
Temp:
Sample: 1) Thiourea 2) 2-Nitrobenzoic acid
3) 4-Hydroxybenzoic acid 4) Phthalic acid
5) 3-Cyanobenzoic acid 6) 2-Acetoxybenzoic acid
7) Benzoic acid



Analysis of Strong Bases at Middle pH: The analysis of strong basic compounds at mid pH provides a further evaluation of the quality of C18 phase because strong basic compounds such as tricyclic antidepressants (TCAs) are notorious for poor peak shapes and irreversible adsorption on traditional C18 packings. The separation of TCAs at pH 7.0 is one of the most important performance comparisons to clearly distinguish the difference of quality of the columns from manufacturers. Ultisil® XB-C18 column provides the best peak shape and resolution of these antidepressants. The high surface coverage and minimal ion and uniform ion exchange sites of the surface contribute to the excellent peak shape and chromatographic performance.

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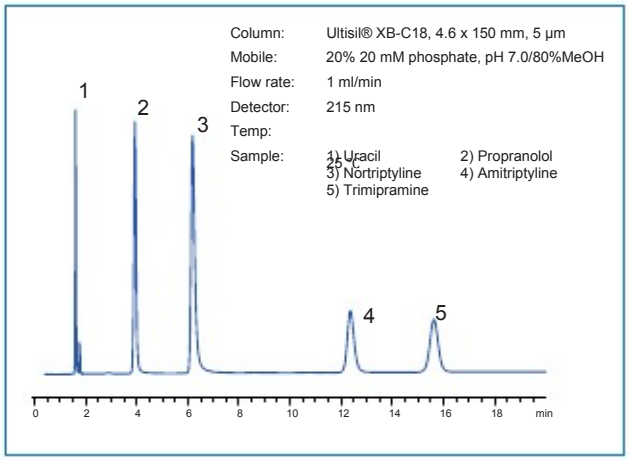
Separation of tricyclic antidepressants (TCAs) at pH 7.0



Ultisil® AQ-C18 Column

No phase collapse; suitable for high aqueous mobile phase

Endcapped for excellent peak shape of polar, acidic and basic compounds

Less retentive than XB-C18 for non-polar compounds

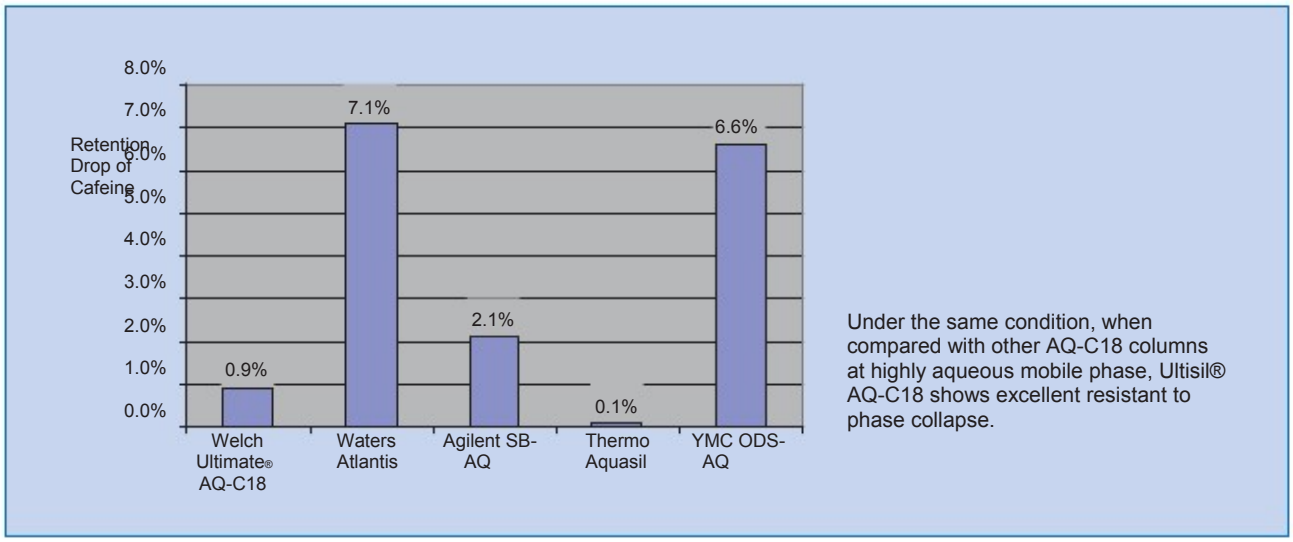
Increased retention for polar and water soluble compounds

Excellent for applications for water soluble compounds that typically cannot be retained on traditional C18 phase, including biomolecules, metabolites, pharmaceutical degradants such as organic acids, water-soluble vitamins, oligosaccharides, amino acids, and small peptides and nucleotides.

Ultisil® AQ-C18 columns are designed to show extended retention and selectivity for hydrophilic and polar compounds, which are either not or poorly retained on other phases.

‘phaseA proprietary bonding chemistry avoids so-called collapse’ even if 100% water is used, which conventional, C18 columns exhibit at high water contents in the mobile phase. The AQ-C18 phase is fully end-capped to ensure the best peak shapes of polar and basic compounds and longer lifetime. Typical applications are separations of water soluble compounds that cannot be retained on traditional C18 phase. Examples include biomolecules, metabolites, and pharmaceutical degradants such as organic acids, water-soluble vitamins, oligosaccharides, amino acids, and small peptides and nucleotides.

Phase collapse comparison with other brands



Under the same condition, when compared with other AQ-C18 columns at highly aqueous mobile phase, Ultisil® AQ-C18 shows excellent resistant to phase collapse.

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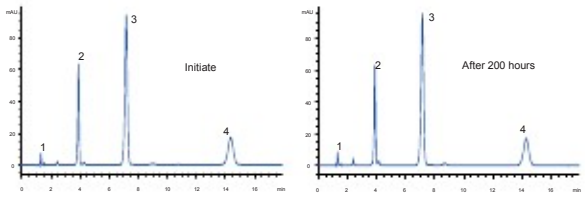
No Phase Collapse Under 100% Aqueous Mobile Phase

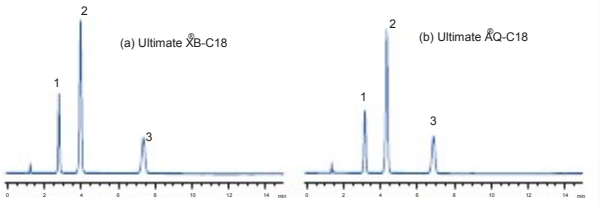


Column: Ultisil® AQ-C18, 4.6 x 100 mm, 5 µm
Mobile: 10% ACN/90% 50 mM phosphate, pH 3.5
Flow rate: 1 ml/min
Detector: 215 nm
Temp: 25 °C
Sample: 1) Uracil 2) Theophylline, 3) Caffeine 4) Phenol

Increased Retention of Polar Compounds:

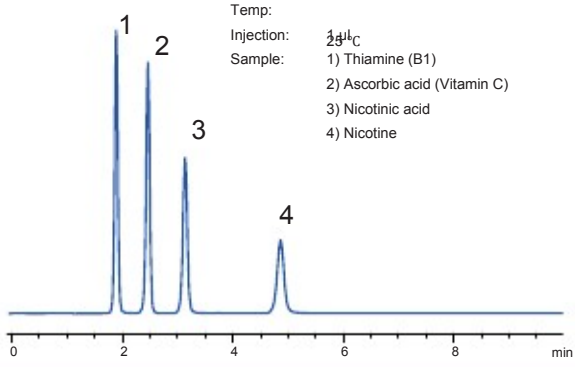
Polar compounds can be difficult to retain on conventional C18 column as they tend to elute at or very close to the void volume. Ultisil® AQ-C18 phase provides additional analyte-ligand interaction and shows increased retention of polar compounds, especially for earlier eluting peaks. Compared with Ultisil® XB-C18 phase, Ultisil® AQ-C18 is less hydrophobic. The neutral compounds have less retention while highly polar compounds have longer retention, which provides Ultisil® AQ-C18 phase an alternative selectivity than Ultisil® XB-C18 phase.

Comparison of Selectivity of Ultisil® XB-C18 and AQ-C18



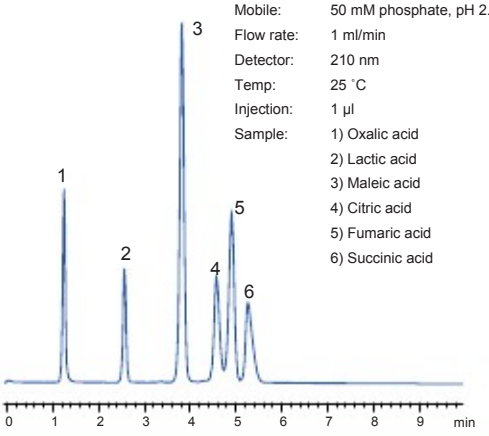
Column: 4.6 x 100 mm, 5 µm
(a) Ultisil® XB-C18 (b) Ultisil® AQ-C18
Mobile: 30% MeOH/70% water
Flow rate: 1 ml/min
Detector: 215 nm
Temp: 25 °C
Sample: 1) Theophylline 2) Caffeine 3) Phenol

Separation of Water-Soluble Vitamins



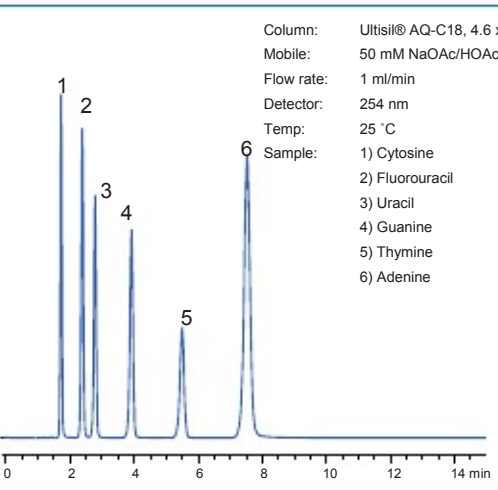
Column: Ultisil® AQ-C18, 4.6 x 100 mm, 5 µm
Mobile: 50 mM phosphate, pH 3.0
Flow rate: 1 ml/min
Detector: 254 nm
Temp: 25 °C
Injection: 1 µl
Sample: 1) Thiamine (B1)
2) Ascorbic acid (Vitamin C)
3) Nicotinic acid
4) Nicotine

Separation of Organic Acids



Column: Ultisil® AQ-C18, 4.6 x 100 mm, 5 µm
Mobile: 50 mM phosphate, pH 2.5
Flow rate: 1 ml/min
Detector: 210 nm
Temp: 25 °C
Injection: 1 µl
Sample: 1) Oxalic acid
2) Lactic acid
3) Maleic acid
4) Citric acid
5) Fumaric acid
6) Succinic acid

Separation of Basic Nucleotides and Purines



Column: Ultisil® AQ-C18, 4.6 x 100 mm, 5 µm
Mobile: 50 mM NaOAc/HOAc, pH 4.6
Flow rate: 1 ml/min
Detector: 254 nm
Temp: 25 °C
Sample: 1) Cytosine
2) Fluorouracil
3) Uracil
4) Guanine
5) Thymine
6) Adenine

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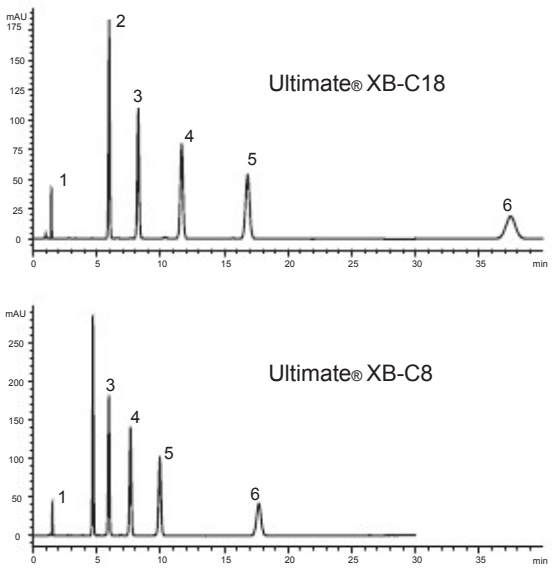
Ultisil® XB-C8 --- Less Retentive than XB-C18

- Selectivity choices for method development optimization
- Good peak shape for basic, acidic and neutral compounds
- High performance over a wide pH range
- Particle sizes from 3 to 10 µm
- Long lifetime with extra dense bonding and double endcapping

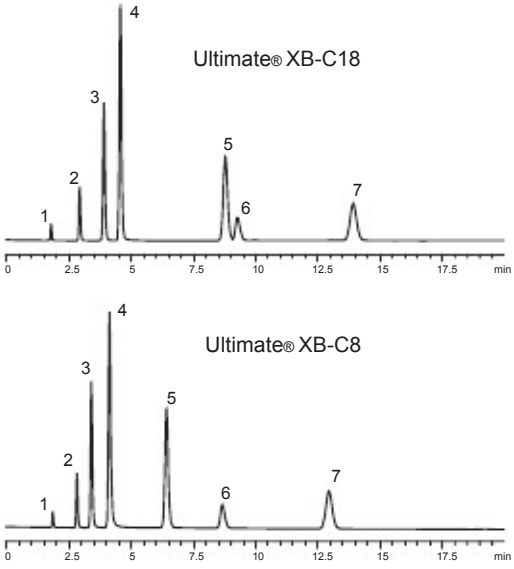
The XB-C8 phase is less retentive than XB-C18 phase, more useful for compounds that are too strongly retained on C18 phase, and for LC/MS applications, where the long retention is not required. When separating neutral or other highly retained compounds, using XB-C8 can save analytical time. However, when separating polar compounds, XB-C8 column provides alternative selectivity than XB-C18 column.

Comparison of Retention of XB-C18 and XB-C8 on Neutral Compounds



Column: 4.6 x 150 mm, 5 µm
Mobile: 30% water/70% ACN
Temperature: 25 ˚C
Flow: 1 ml/min
Detector: 215 nm
Sample: 1) Urasil 2) Ethylbenzene
3) Propylbenzene 4) Butylbenzene
5) Amylbezene 6) Heptylbenzene

Comparison of Retention of XB-C18 and XB-C8 on Polar Compounds



Column: Ultisil® XB-C18 and XB-C8, 4.6 x 150 mm, 5 µm
Mobile: 78% 20 mM phosphate, pH 2.7 22% MeOH
Flow: 1 ml/min
Detector: 215 nm
Temp: 40 ˚C
Samples: 1) Thiourea 2) Benzylamine
3) 3-Aminoquinoline 4) Phthalazine
5) Caffeine 6) 4-Ethylaniline
7) Benzyl alcohol

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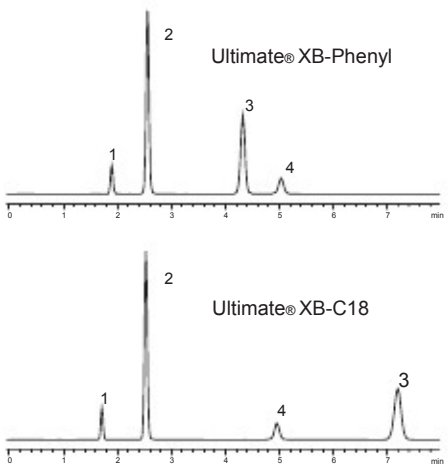
Ultisil® XB-Phenyl ---- Different Selectivity to Alkyl Phase

- High surface coverage and exhaustive double end-capping
- Excellent for aromatic, polar compounds and difficult pharmaceuticals
- Different selectivity to XB-C18, XB-C8 and XB-CN
- Exceptional batch-to-batch and column-to-column reproducibility
- Available in dimensions from analytical to preparative for all sample sizes

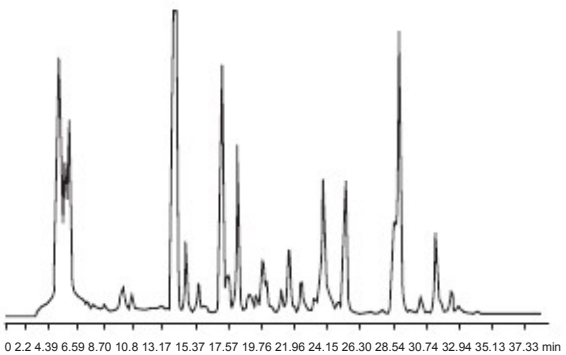
Ultisil® XB Phenyl phase is less retentive than conventional C18 and C8 phases, but more retentive than standard cyano phase. Due to their ability to participate in π-π interactions, XB-Phenyl columns may actually more retentive than C18 or C8 columns towards certain polar aromatic compounds, depending on running conditions. The selectivity for highly polar aromatics, which are poorly retained on alkyl-bonded phases, combined with the reduced retentivity towards non-polar compounds, makes XB-Phenyl an excellent choice for the analysis of complex mixtures of polar and non-polar analytes.

Unique Selectivity for Aromatic Compounds of Ultisil® XB-Phenyl Phase



Column:	Ultisil® XB-Phenyl, 4.6 x 150 mm, 5 µm
Mobile:	70% MeOH/30% water
Flow:	1 ml/min
Detector:	254 nm
Temp:	24 ˚C
Sample:	1) Urasil2) Phenol 3) Toluene4) 1-Chloro-4-nitrobenzne

Application for the analysis of Kadsura Japonica



Column:	Ultisil® XB-Phenyl, 5µm, 4.6×250mm
Detector:	254 nm
Mobile Phase:	A:Methanol B:water
Gradient:	0~40min 40~60%A
Temperature:	30˚C
Flow:	1.0 ml/min

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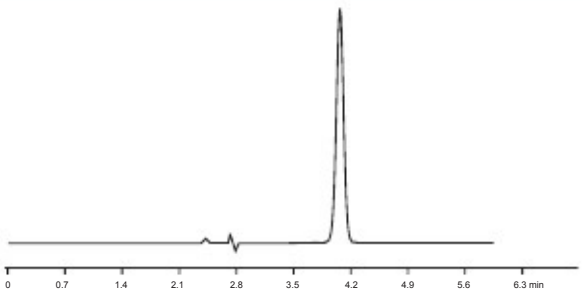
Ultisil® XB-CN

- Low hydrophobicity, for rapid elution of hydrophobic molecules
- Can be used in both Reverse Phase and Normal Phase analysis
- Unique selectivity for polar compounds
- Retention and separation of strongly basic analytes, including quaternary ammonium salts, with excellent peak shapes
- Compatibility with highly aqueous mobile phases
- Exceptional batch-to-batch and column-to-column reproducibility
- Exceptional stability and column lifetime, from pH 1.5 to 9
- Available in dimensions from analytical to preparative for all sample sizes

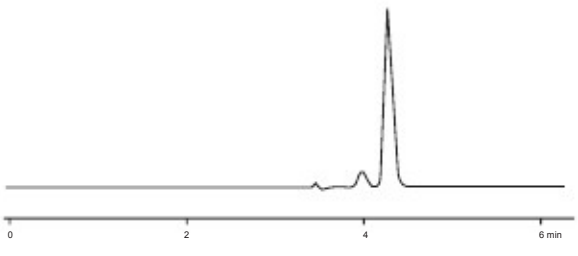
Ultisil® XB-CN columns are based on our proprietary bonding and end-capping techniques to ensure excellent sharp peaks and reproducibility for the analysis of basic compounds. Due to stable bonding chemistry and excellent surface coverage, the columns exhibit exceptional stability at low pH compared to other cyano phases. Ultisil® XB-CN columns offer unique selectivity due to dipole-dipole and dipole-induced dipole interactions, which are very useful for separation of a wide range of pharmaceuticals and peptides. They show excellent peak shapes for basic compounds and are a good first choice for compounds typically considered difficult to analyze.

Application for the analysis of Diphenhydramine Hydrochloride



Column: μm, 4.6×250mmUltisil® XB-CN, 5
Detector: 258nm
Mobile Phase: ACN/ Water/ TEA=50/50/3 (pH6.5)
Temperature:
Flow rate: 1.0ml/min
20 ℃

Application for the analysis of Esmolol Hydrochloride



Column： μUltisil® XB-CN, 5 m, 4.6×250mm
Detector： 280nm
Mobile Phase： MeOH/Acetic Acid/0.14％CH3COONa＝60:1:40
Flow rate： 1.0ml/min
Temperature： 25 ℃

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Ordering Information

Dimensions	Particle Size	XB-C18	AQ-C18	XB-C8	XB-C4	XB-C1	XB-Phenyl	XB-CN
1.0×20mm	3µm	Ult3B18102	Ult3Q18102	Ult3B8102	Ult3B4102	Ult3B1102	Ult3P102	Ult3CN102
1.0×33mm	3µm	Ult3B18103	Ult3Q18103	Ult3B8103	Ult3B4103	Ult3B1103	Ult3P103	Ult3CN103
1.0×50mm	3µm	Ult3B18105	Ult3Q18105	Ult3B8105	Ult3B4105	Ult3B1105	Ult3P105	Ult3CN105
1.0×100mm	3µm	Ult3B18110	Ult3Q18110	Ult3B8110	Ult3B4110	Ult3B1110	Ult3P110	Ult3CN110
1.0×150mm	3µm	Ult3B18115	Ult3Q18115	Ult3B8115	Ult3B4115	Ult3B1115	Ult3P115	Ult3CN115
2.1×33mm	3µm	Ult3B18203	Ult3Q18203	Ult3B8203	Ult3B4203	Ult3B1203	Ult3P203	Ult3CN203
2.1×50mm	3µm	Ult3B18205	Ult3Q18205	Ult3B8205	Ult3B4205	Ult3B1205	Ult3P205	Ult3CN205
2.1×75mm	3µm	Ult3B18207	Ult3Q18207	Ult3B8207	Ult3B4207	Ult3B1207	Ult3P207	Ult3CN207
2.1×100mm	3µm	Ult3B18210	Ult3Q18210	Ult3B8210	Ult3B4210	Ult3B1210	Ult3P210	Ult3CN210
2.1×150mm	3µm	Ult3B18215	Ult3Q18215	Ult3B8215	Ult3B4215	Ult3B1215	Ult3P215	Ult3CN215
2.1×200mm	3µm	Ult3B18220	Ult3Q18220	Ult3B8220	Ult3B4220	Ult3B1220	Ult3P220	Ult3CN220
2.1×250mm	3µm	Ult3B18225	Ult3Q18225	Ult3B8225	Ult3B4225	Ult3B1225	Ult3P225	Ult3CN225
3.0×33mm	3µm	Ult3B18303	Ult3Q18303	Ult3B8303	Ult3B4303	Ult3B1303	Ult3P303	Ult3CN303
3.0×50mm	3µm	Ult3B18305	Ult3Q18305	Ult3B8305	Ult3B4305	Ult3B1305	Ult3P305	Ult3CN305
3.0×100mm	3µm	Ult3B18310	Ult3Q18310	Ult3B8310	Ult3B4310	Ult3B1310	Ult3P310	Ult3CN310
3.0×150mm	3µm	Ult3B18315	Ult3Q18315	Ult3B8315	Ult3B4315	Ult3B1315	Ult3P315	Ult3CN315
3.0×200mm	3µm	Ult3B18320	Ult3Q18320	Ult3B8320	Ult3B4320	Ult3B1320	Ult3P320	Ult3CN320
3.0×250mm	3µm	Ult3B18325	Ult3Q18325	Ult3B8325	Ult3B4325	Ult3B1325	Ult3P325	Ult3CN325
3.0×300mm	3µm	Ult3B18330	Ult3Q18330	Ult3B8330	Ult3B4330	Ult3B1330	Ult3P330	Ult3CN330
4.0×33mm	3µm	Ult3B184003	Ult3Q184003	Ult3B84003	Ult3B44003	Ult3B14003	Ult3P4003	Ult3CN4003
4.0×50mm	3µm	Ult3B184005	Ult3Q184005	Ult3B84005	Ult3B44005	Ult3B14005	Ult3P4005	Ult3CN4005
4.0×100mm	3µm	Ult3B184010	Ult3Q184010	Ult3B84010	Ult3B44010	Ult3B14010	Ult3P4010	Ult3CN4010
4.0×150mm	3µm	Ult3B184015	Ult3Q184015	Ult3B84015	Ult3B44015	Ult3B14015	Ult3P4015	Ult3CN4015
4.0×200mm	3µm	Ult3B184020	Ult3Q184020	Ult3B84020	Ult3B44020	Ult3B14020	Ult3P4020	Ult3CN4020
4.0×250mm	3µm	Ult3B184025	Ult3Q184025	Ult3B84025	Ult3B44025	Ult3B14025	Ult3P4025	Ult3CN4025
4.0×300mm	3µm	Ult3B184030	Ult3Q184030	Ult3B84030	Ult3B44030	Ult3B14030	Ult3P4030	Ult3CN4030
4.6×33mm	3µm	Ult3B18403	Ult3Q18403	Ult3B8403	Ult3B4403	Ult3B1403	Ult3P403	Ult3CN403
4.6×50mm	3µm	Ult3B18405	Ult3Q18405	Ult3B8405	Ult3B4405	Ult3B1405	Ult3P405	Ult3CN405
4.6×100mm	3µm	Ult3B18410	Ult3Q18410	Ult3B8410	Ult3B4410	Ult3B1410	Ult3P410	Ult3CN410
4.6×150mm	3µm	Ult3B18415	Ult3Q18415	Ult3B8415	Ult3B4415	Ult3B1415	Ult3P415	Ult3CN415
4.6×200mm	3µm	Ult3B18420	Ult3Q18420	Ult3B8420	Ult3B4420	Ult3B1420	Ult3P420	Ult3CN420
4.6×250mm	3µm	Ult3B18425	Ult3Q18425	Ult3B8425	Ult3B4425	Ult3B1425	Ult3P425	Ult3CN425
4.6×300mm	3µm	Ult3B18430	Ult3Q18430	Ult3B8430	Ult3B4430	Ult3B1430	Ult3P430	Ult3CN430
2.1×33mm	5µm	Ult5B18203	Ult5Q18203	Ult5B8203	Ult5B4203	Ult5B1203	Ult5P203	Ult5CN203
2.1×50mm	5µm	Ult5B18205	Ult5Q18205	Ult5B8205	Ult5B4205	Ult5B1205	Ult5P205	Ult5CN205
2.1×75mm	5µm	Ult5B18207	Ult5Q18207	Ult5B8207	Ult5B4207	Ult5B1207	Ult5P207	Ult5CN207
2.1×100mm	5µm	Ult5B18210	Ult5Q18210	Ult5B8210	Ult5B4210	Ult5B1210	Ult5P210	Ult5CN210

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Dimensions	Particle Size	XB-C18	AQ-C18	XB-C8	XB-C4	XB-C1	XB-Phenyl	XB-CN
2.1×150mm	5µm	Ult5B18215	Ult5Q18215	Ult5B8215	Ult5B4215	Ult5B1215	Ult5P215	Ult5CN215
2.1×200mm	5µm	Ult5B18220	Ult5Q18220	Ult5B8220	Ult5B4220	Ult5B1220	Ult5P220	Ult5CN220
2.1×250mm	5µm	Ult5B18225	Ult5Q18225	Ult5B8225	Ult5B4225	Ult5B1225	Ult5P225	Ult5CN225
3.0×33mm	5µm	Ult5B18303	Ult5Q18303	Ult5B8303	Ult5B4303	Ult5B1303	Ult5P303	Ult5CN303
3.0×50mm	5µm	Ult5B18305	Ult5Q18305	Ult5B8305	Ult5B4305	Ult5B1305	Ult5P305	Ult5CN305
3.0×100mm	5µm	Ult5B18310	Ult5Q18310	Ult5B8310	Ult5B4310	Ult5B1310	Ult5P310	Ult5CN310
3.0×150mm	5µm	Ult5B18315	Ult5Q18315	Ult5B8315	Ult5B4315	Ult5B1315	Ult5P315	Ult5CN315
3.0×200mm	5µm	Ult5B18320	Ult5Q18320	Ult5B8320	Ult5B4320	Ult5B1320	Ult5P320	Ult5CN320
3.0×250mm	5µm	Ult5B18325	Ult5Q18325	Ult5B8325	Ult5B4325	Ult5B1325	Ult5P325	Ult5CN325
3.0×300mm	5µm	Ult5B18330	Ult5Q18330	Ult5B8330	Ult5B4330	Ult5B1330	Ult5P330	Ult5CN330
4.0×33mm	5µm	Ult5B184003	Ult5Q184003	Ult5B84003	Ult5B44003	Ult5B14003	Ult5P4003	Ult5CN4003
4.0×50mm	5µm	Ult5B184005	Ult5Q184005	Ult5B84005	Ult5B44005	Ult5B14005	Ult5P4005	Ult5CN4005
4.0×100mm	5µm	Ult5B184010	Ult5Q184010	Ult5B84010	Ult5B44010	Ult5B14010	Ult5P4010	Ult5CN4010
4.0×125mm	5µm	Ult5B184012	Ult5Q184012	Ult5B84012	Ult5B44012	Ult5B14012	Ult5P4012	Ult5CN4012
4.0×150mm	5µm	Ult5B184015	Ult5Q184015	Ult5B84015	Ult5B44015	Ult5B14015	Ult5P4015	Ult5CN4015
4.0×200mm	5µm	Ult5B184020	Ult5Q184020	Ult5B84020	Ult5B44020	Ult5B14020	Ult5P4020	Ult5CN4020
4.0×250mm	5µm	Ult5B184025	Ult5Q184025	Ult5B84025	Ult5B44025	Ult5B14025	Ult5P4025	Ult5CN4025
4.0×300mm	5µm	Ult5B184030	Ult5Q184030	Ult5B84030	Ult5B44030	Ult5B14030	Ult5P4030	Ult5CN4030
4.6×33mm	5µm	Ult5B18403	Ult5Q18403	Ult5B8403	Ult5B4403	Ult5B1403	Ult5P403	Ult5CN403
4.6×50mm	5µm	Ult5B18405	Ult5Q18405	Ult5B8405	Ult5B4405	Ult5B1405	Ult5P405	Ult5CN405
4.6×75mm	5µm	Ult5B18407	Ult5Q18407	Ult5B8407	Ult5B4407	Ult5B1407	Ult5P407	Ult5CN407
4.6×100mm	5µm	Ult5B18410	Ult5Q18410	Ult5B8410	Ult5B4410	Ult5B1410	Ult5P410	Ult5CN410
4.6×125mm	5µm	Ult5B18412	Ult5Q18412	Ult5B8412	Ult5B4412	Ult5B1412	Ult5P412	Ult5CN412
4.6×150mm	5µm	Ult5B18415	Ult5Q18415	Ult5B8415	Ult5B4415	Ult5B1415	Ult5P415	Ult5CN415
4.6×200mm	5µm	Ult5B18420	Ult5Q18420	Ult5B8420	Ult5B4420	Ult5B1420	Ult5P420	Ult5CN420
4.6×250mm	5µm	Ult5B18425	Ult5Q18425	Ult5B8425	Ult5B4425	Ult5B1425	Ult5P425	Ult5CN425
4.6×300mm	5µm	Ult5B18430	Ult5Q18430	Ult5B8430	Ult5B4430	Ult5B1430	Ult5P430	Ult5CN430
3.0×150mm	10µm	Ult10B18315	Ult10Q18315	Ult10B8315	Ult10B4315	Ult10B1315	Ult10P315	Ult10CN315
3.0×200mm	10µm	Ult10B18320	Ult10Q18320	Ult10B8320	Ult10B4320	Ult10B1320	Ult10P320	Ult10CN320
3.0×250mm	10µm	Ult10B18325	Ult10Q18325	Ult10B8325	Ult10B4325	Ult10B1325	Ult10P325	Ult10CN325
3.0×300mm	10µm	Ult10B18330	Ult10Q18330	Ult10B8330	Ult10B4330	Ult10B1330	Ult10P330	Ult10CN330
4.0×150mm	10µm	Ult10B184015	Ult10Q184015	Ult10B84015	Ult10B44015	Ult10B14015	Ult10P4015	Ult10CN4015
4.0×200mm	10µm	Ult10B184020	Ult10Q184020	Ult10B84020	Ult10B44020	Ult10B14020	Ult10P4020	Ult10CN4020
4.0×250mm	10µm	Ult10B184025	Ult10Q184025	Ult10B84025	Ult10B44025	Ult10B14025	Ult10P4025	Ult10CN4025
4.0×300mm	10µm	Ult10B184030	Ult10Q184030	Ult10B84030	Ult10B44030	Ult10B14030	Ult10P4030	Ult10CN4030
4.6×150mm	10µm	Ult10B18415	Ult10Q18415	Ult10B8415	Ult10B4415	Ult10B1415	Ult10P415	Ult10CN415
4.6×200mm	10µm	Ult10B18420	Ult10Q18420	Ult10B8420	Ult10B4420	Ult10B1420	Ult10P420	Ult10CN420
4.6×250mm	10µm	Ult10B18425	Ult10Q18425	Ult10B8425	Ult10B4425	Ult10B1425	Ult10P425	Ult10CN425
4.6×300mm	10µm	Ult10B18430	Ult10Q18430	Ult10B8430	Ult10B4430	Ult10B1430	Ult10P430	Ult10CN430

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Ultisil® Normal Phase HPLC columns

Our Ultisil® normal phase HPLC columns are made from spherical, totally porous, and ultra high purity (>99.999%) type B silica particles. Our proprietary surface modification before bonding generates a very smooth and uniform surface with less acidic surface silanols. We offer a full line of phases including XB-NH_2, XB-CN, XB-Silica, XB-Diol to provide a wide range of selectivity.

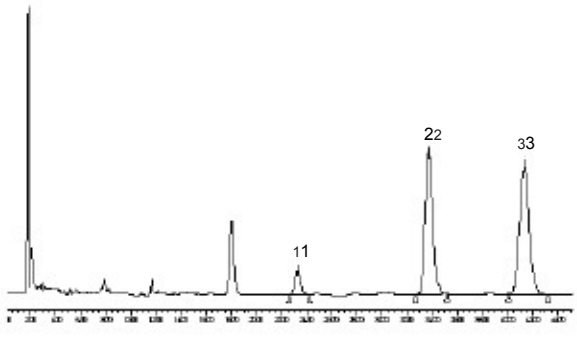
Ultisil® XB-Silica

Ultra high purity silica (>99.999%)

Smoothpak proprietary surface modification to ensure less acidic and uniform surface silanols

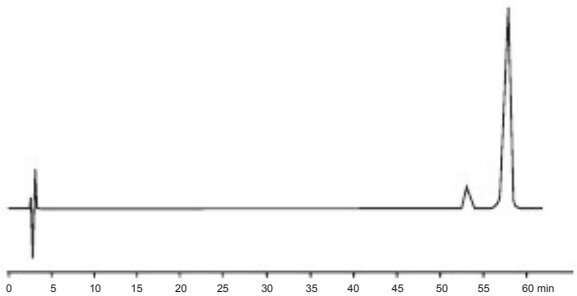
Ultisil® XB-Silica columns is applied with ultra high purity (>99.999%) type B silica particles, and there is no metal contents in the column. Just like the XB-CN column, the XB-SiO_2 column can be use in the normal and reverse phase. We could get good result for the analysis of polar compounds which always leads to peak tailing.

The application for VD_2



Column : μm, 4.6×250mmUltisil® SiO_2, 5
Detector : 254 nm
Mobile Phase : Hexane/ IPA = 997/ 3
Temp : 30 C
Flow : 2.0 mL/min
Sample : 1) Façade VD_2 2) Internal Standerd 3) VD_2

The application for Retinol Acetate



Column : μUltisil® SiO_2, 5 m, 4.6×250mm
Detector : 326nm
Mobile Phase : Hexane/ IPA = 99.8/ 0.2
Temp : 16 C
Flow : 1.0ml/min

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Ultisil® XB-NH_2 columns are used in normal phase LC analysis mostly.

Propyl-amino silane phase bonded to Ultisil® Silica

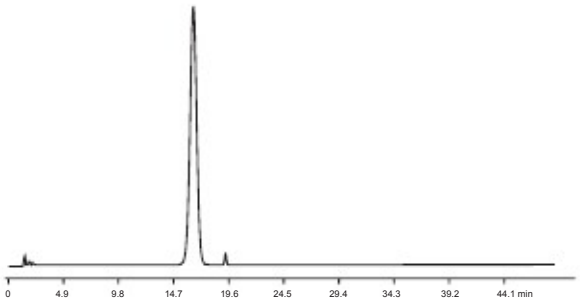
Used for normal phase and weak anion-exchange, and for reversed-phase HPLC of polar compounds

For applications in aggressive normal phase mode with aqueous eluent

Vitamins A and D are separated in the normal-phase mode

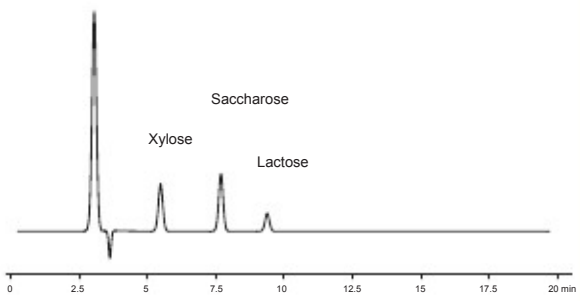
Carbohydrates and sugars are separated in the reversed-phase mode on XB-NH_2

Application for Acarbose



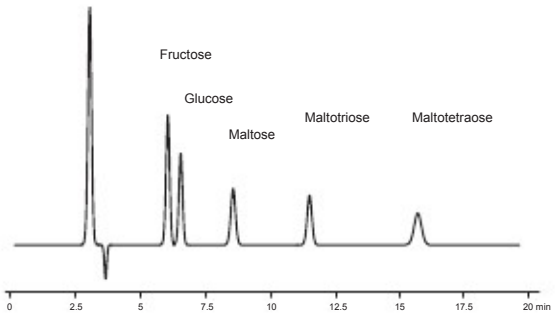
Column : μm, 4.6×250mmUltisil® XB-NH_2, 5
Detector : 210nm
Mobile Phase : ACN/PBS = 75/25
Temp : 35℃
Flow : 1.8ml/min

The Analysis of Xylose, Saccharose and Lactose



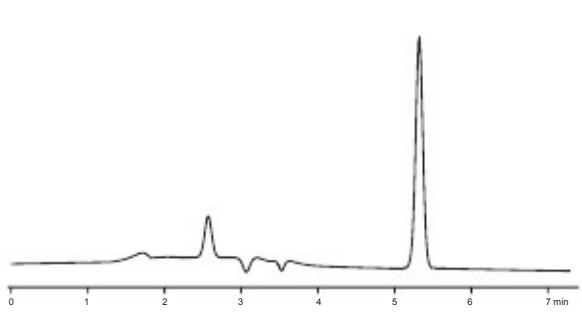
Column: μUltisil® XB-NH_2, 5 m, 4.6×250mm
Detector: RID
Mobile Phase: ACN: Water = 65: 35
Temp: 30℃
Flow: 1.0 ml/min

The application for Fructose, Glucose, Maltose, Maltotriose and Maltotetraose



Column: μm, 4.6×250mmUltisil® XB-NH_2, 5
Detector: RID
Mobile Phase: ACN: Water = 65: 35
Temp: Flow: 1.0 ml/min
30℃;

The detection of Matrine



Column: Ultisil® XB-NH_2, 5μm, 4.6×250mm
Detector: 220nm
Mobile Phase: ACN/3%H_3PO_4/Ethanol = 80/10/10
Temp: 25℃
Flow: 1.0 ml/min

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Ultisil® XB-Diol

More stable than the traditional normal phase columns, such as Silica, Amine

Could be used in reverse phase analysis

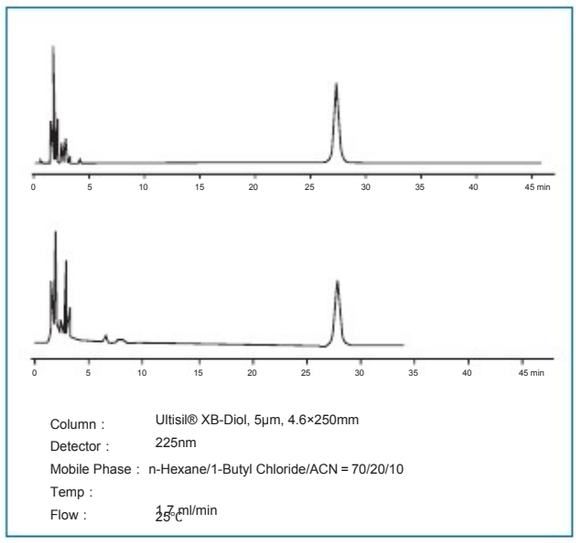
Similar polarity to Amine

Good selectivity without excessive retention

Improved peak shape versus bare silica

For normal-phase chromatography, the Ultisil® product line offers new Di-ol bonded silica packing materials. Ultisil® XB-Diol may also be used as a polar sorbent in normal phase. Like bare silica, Ultisil® XB-Diol has the ability to form hydrogen bonds and has the capacity to separate structure isomers. Since most of its surface is covered with organic functions, the Ultisil® XB-Diol absorbs less water, which leads to a more reproducible activity. It is also the sorbent of choice when working in normal phase in the presence of water. It has a different selectivity than bare silica gel, and slight modification in the composition of solvent mixture may be necessary to obtain a similar retention.

Application of Tacrolimus Using Ultisil® XB-Diol Column



Column : Ultisil® XB-Diol, 5μm, 4.6×250mm
Detector : 225nm
Mobile Phase : n-Hexane/1-Butyl Chloride/ACN = 70/20/10
Temp : 25°C
Flow : 1.7 ml/min

The Ultisil® XB-Diol column is more stable than the traditional normal phase columns, such as NH_2, SiO_2. Compared with NH_2/SiO_2 column, the Diol column is not sensitive with water. The Ultisil® XB-Diol column could also be used in reverse phase analysis.

Ordering Information

Dimensions	Particle Size	XB-NH_2	XB-SiO_2	XB-Diol	XB-CN
2.1×30mm	3μm	Ult3NH203	Ult3Si203	Ult3Di203	Ult3NCN203
2.1×50mm	3μm	Ult3NH205	Ult3Si205	Ult3Di205	Ult3NCN205
2.1×100mm	3μm	Ult3NH210	Ult3Si210	Ult3Di210	Ult3NCN210
2.1×150mm	3μm	Ult3NH215	Ult3Si215	Ult3Di215	Ult3NCN215
2.1×200mm	3μm	Ult3NH220	Ult3Si220	Ult3Di220	Ult3NCN220
2.1×250mm	3μm	Ult3NH225	Ult3Si225	Ult3Di225	Ult3NCN225
3.0×30mm	3μm	Ult3NH303	Ult3Si303	Ult3Di303	Ult3NCN303
3.0×50mm	3μm	Ult3NH305	Ult3Si305	Ult3Di305	Ult3NCN305
3.0×100mm	3μm	Ult3NH310	Ult3Si310	Ult3Di310	Ult3NCN310
3.0×150mm	3μm	Ult3NH315	Ult3Si315	Ult3Di315	Ult3NCN315
3.0×200mm	3μm	Ult3NH320	Ult3Si320	Ult3Di320	Ult3NCN320
3.0×250mm	3μm	Ult3NH325	Ult3Si325	Ult3Di325	Ult3NCN325
3.0×300mm	3μm	Ult3NH330	Ult3Si330	Ult3Di330	Ult3NCN330
4.0×30mm	3μm	Ult3NH4003	Ult3Si4003	Ult3Di4003	Ult3NCN4003
4.0×50mm	3μm	Ult3NH4005	Ult3Si4005	Ult3Di4005	Ult3NCN4005

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Dimensions	Particle Size	XB-NH_2	XB-SiO_2	XB-Diol	XB-CN
4.0×100mm	3µm	Ult3NH4010	Ult3Si4010	Ult3Di4010	Ult3NCN4010
4.0×150mm	3µm	Ult3NH4015	Ult3Si4015	Ult3Di4015	Ult3NCN4015
4.0×200mm	3µm	Ult3NH4020	Ult3Si4020	Ult3Di4020	Ult3NCN4020
4.0×250mm	3µm	Ult3NH4025	Ult3Si4025	Ult3Di4025	Ult3NCN4025
4.0×300mm	3µm	Ult3NH4030	Ult3Si4030	Ult3Di4030	Ult3NCN4030
4.6×30mm	3µm	Ult3NH403	Ult3Si403	Ult3Di403	Ult3NCN403
4.6×50mm	3µm	Ult3NH405	Ult3Si405	Ult3Di405	Ult3NCN405
4.6×100mm	3µm	Ult3NH410	Ult3Si410	Ult3Di410	Ult3NCN410
4.6×150mm	3µm	Ult3NH415	Ult3Si415	Ult3Di415	Ult3NCN415
4.6×200mm	3µm	Ult3NH420	Ult3Si420	Ult3Di420	Ult3NCN420
4.6×250mm	3µm	Ult3NH425	Ult3Si425	Ult3Di425	Ult3NCN425
4.6×300mm	3µm	Ult3NH430	Ult3Si430	Ult3Di430	Ult3NCN430

Dimensions	Particle Size	XB-NH_2	XB-SiO_2	XB-Diol	XB-CN
2.1×30mm	5µm	Ult5NH203	Ult5Si203	Ult5Di203	Ult5NCN203
2.1×50mm	5µm	Ult5NH205	Ult5Si205	Ult5Di205	Ult5NCN205
2.1×100mm	5µm	Ult5NH210	Ult5Si210	Ult5Di210	Ult5NCN210
2.1×150mm	5µm	Ult5NH215	Ult5Si215	Ult5Di215	Ult5NCN215
2.1×200mm	5µm	Ult5NH220	Ult5Si220	Ult5Di220	Ult5NCN220
2.1×250mm	5µm	Ult5NH225	Ult5Si225	Ult5Di225	Ult5NCN225
3.0×30mm	5µm	Ult5NH303	Ult5Si303	Ult5Di303	Ult5NCN303
3.0×50mm	5µm	Ult5NH305	Ult5Si305	Ult5Di305	Ult5NCN305
3.0×100mm	5µm	Ult5NH310	Ult5Si310	Ult5Di310	Ult5NCN310
3.0×150mm	5µm	Ult5NH315	Ult5Si315	Ult5Di315	Ult5NCN315
3.0×200mm	5µm	Ult5NH320	Ult5Si320	Ult5Di320	Ult5NCN320
3.0×250mm	5µm	Ult5NH325	Ult5Si325	Ult5Di325	Ult5NCN325
3.0×300mm	5µm	Ult5NH330	Ult5Si330	Ult5Di330	Ult5NCN330
4.0×30mm	5µm	Ult5NH4003	Ult5Si4003	Ult5Di4003	Ult5NCN4003
4.0×50mm	5µm	Ult5NH4005	Ult5Si4005	Ult5Di4005	Ult5NCN4005
4.0×100mm	5µm	Ult5NH4010	Ult5Si4010	Ult5Di4010	Ult5NCN4010
4.0×150mm	5µm	Ult5NH4015	Ult5Si4015	Ult5Di4015	Ult5NCN4015
4.0×200mm	5µm	Ult5NH4020	Ult5Si4020	Ult5Di4020	Ult5NCN4020
4.0×250mm	5µm	Ult5NH4025	Ult5Si4025	Ult5Di4025	Ult5NCN4025
4.0×300mm	5µm	Ult5NH4030	Ult5Si4030	Ult5Di4030	Ult5NCN4030
4.6×30mm	5µm	Ult5NH403	Ult5Si403	Ult5Di403	Ult5NCN403
4.6×50mm	5µm	Ult5NH405	Ult5Si405	Ult5Di405	Ult5NCN405
4.6×100mm	5µm	Ult5NH410	Ult5Si410	Ult5Di410	Ult5NCN410
4.6×150mm	5µm	Ult5NH415	Ult5Si415	Ult5Di415	Ult5NCN415
4.6×200mm	5µm	Ult5NH420	Ult5Si420	Ult5Di420	Ult5NCN420
4.6×250mm	5µm	Ult5NH425	Ult5Si425	Ult5Di425	Ult5NCN425
4.6×300mm	5µm	Ult5NH430	Ult5Si430	Ult5Di430	Ult5NCN430

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Dimensions	Particle Size	XB-NH_2	XB-SiO_2	XB-Diol	XB-CN
3.0×100mm	10µm	Ult10NH310	Ult10Si310	Ult10Di310	Ult10NCN310
3.0×150mm	10µm	Ult10NH315	Ult10Si315	Ult10Di315	Ult10NCN315
3.0×200mm	10µm	Ult10NH320	Ult10Si320	Ult10Di320	Ult10NCN320
3.0×250mm	10µm	Ult10NH325	Ult10Si325	Ult10Di325	Ult10NCN325
3.0×300mm	10µm	Ult10NH330	Ult10Si330	Ult10Di330	Ult10NCN330
4.0×100mm	10µm	Ult10NH4010	Ult10Si4010	Ult10Di4010	Ult10NCN4010
4.0×150mm	10µm	Ult10NH4015	Ult10Si4015	Ult10Di4015	Ult10NCN4015
4.0×200mm	10µm	Ult10NH4020	Ult10Si4020	Ult10Di4020	Ult10NCN4020
4.0×250mm	10µm	Ult10NH4025	Ult10Si4025	Ult10Di4025	Ult10NCN4025
4.0×300mm	10µm	Ult10NH4030	Ult10Si4030	Ult10Di4030	Ult10NCN4030
4.6×100mm	10µm	Ult10NH410	Ult10Si410	Ult10Di410	Ult10NCN410
4.6×150mm	10µm	Ult10NH415	Ult10Si415	Ult10Di415	Ult10NCN415
4.6×200mm	10µm	Ult10NH420	Ult10Si420	Ult10Di420	Ult10NCN420
4.6×250mm	10µm	Ult10NH425	Ult10Si425	Ult10Di425	Ult10NCN425
4.6×300mm	10µm	Ult10NH430	Ult10Si430	Ult10Di430	Ult10NCN430

Ultisil® Ion Exchange HPLC columns

Ultisil® ion exchange columns are available for both Strong Anion Exchange (SAX) and Strong Cation Exchange (SCX) columns. The SCX/SAX columns are silica based with high resolution and high efficiency. Ultisil® SAX is a polar bonded phase, consisting of an ammonium-functionalized silane, while Ultisil® SCX is a classical strong cation exchange, consisting of a covalently bonded aromatic sulfonic acid moiety.

Organic modifiers such as acetonitrile and methanol may be used with SAX and SCX columns, within organic/buffer solubility constraints

Retention can be controlled by varying pH, ionic strength and organic modifier content

Stable pH range from 2.0 to 7.0

Ordering Information

Dimensions	Particle Size	SCX	SAX
2.1×150mm	3µm	UltBSC215	Ult3BSA215
4.6×150mm		Ult3BSC415	Ult3BSA415
4.6×250mm		Ult3BSC425	Ult3BSA425
4.6×300mm		Ult3BSC430	Ult3BSA430
7.8×300mm		Ult3BSC730	Ult3BSA730
2.1×150mm	5µm	Ult5BSC215	Ult5BSA215
4.6×150mm		Ult5BSC415	Ult5BSA415
4.6×250mm		Ult5BSC425	Ult5BSA425
4.6×300mm		Ult5BSC430	Ult5BSA430
7.8×300mm		Ult5BSC730	Ult5BSA730

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Ultisil® LP HPLC Columns

LP is abbreviation for Low pH. LP phases are designed for use at low pH condition. LP phase consists of two very bulky hydrophobic protective groups to prevent siloxane bond from hydrolysis at low pH condition. So the LP column is extremely stable in very low pH mobile phase and at high temperature, even at the lowest pH 1.0, making it the most stable C18 for low pH application in the market. Because LP phase is not endcapped and has more surface silanols, LP phase has more retention for some early eluted polar compounds, and provides some different selectivity than traditional C18. LP-C18 is the most polar C18 among all the C18 products of Welch.

The characteristics of LP Columns:

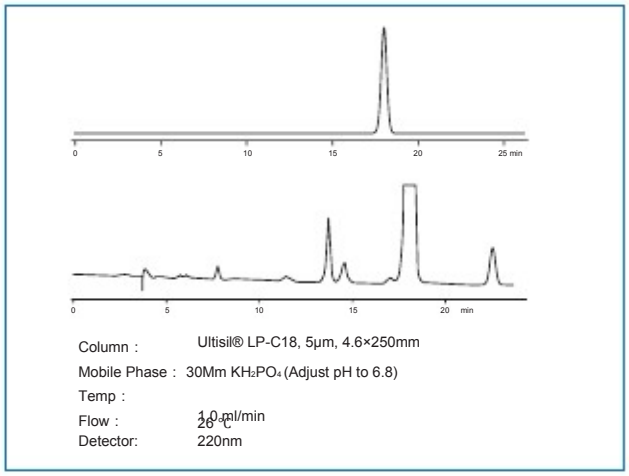
- LP-C18 and LP-C8
- Endure 100% water as the mobile phase
- Exceptional lifetime at low pH (1.0-8.0)
- Not end-capped
- Best peak shape for polar compounds analysis

Phase	LP-C18	LP-C8
Particle Size	3μm, 5μm, 10μm	3μm, 5μm, 10μm
Pore Size	120Å	120Å
Surface Area	320 m_2/g	320 m_2/g
Carbon Loading	10%	5.5%
End-capping	No	No
pH Range	1.0-8.0	1.0-8.0

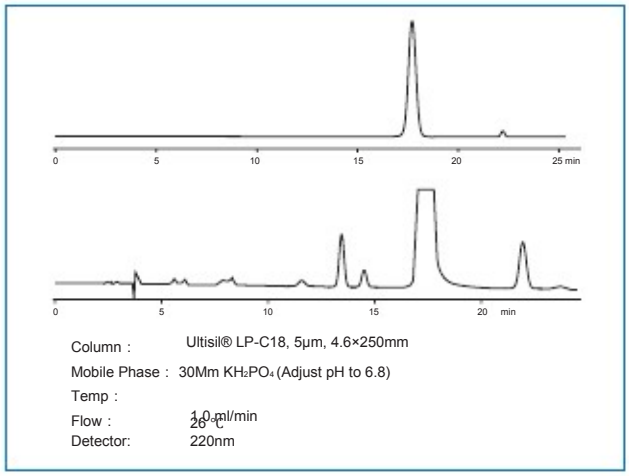
Comparison among LP-C18, AQ-C18 and XB-C18

Column	LP-C18	AQ-C18	XB-C18
Particle Size	3μm,5μm,10μm	3μm,5μm,10μm	3μm,5μm,10μm
Pore Size	120Å	120Å	120Å
Area	320 m_2/g	320 m_2/g	320 m_2/g
Carbon Loading	10%	12%	17%
End-capping	No	Yes	Yes
Polar	High ⟶ Low		

The analysis of Decitabine



Column : Ultisil® LP-C18, 5μm, 4.6×250mm
Mobile Phase : 30Mm KH_2PO_4 (Adjust pH to 6.8)
Temp :
Flow : 1.0 ml/min
Detector: 220nm



Column : Ultisil® LP-C18, 5μm, 4.6×250mm
Mobile Phase : 30Mm KH_2PO_4 (Adjust pH to 6.8)
Temp :
Flow : 1.0 ml/min
Detector: 220nm

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Ordering Information

Dimensions	3µm		5µm	
	LP-C18	LP-C8	LP-C18	LP-C8
2.1×30mm	Ult3LP18203	Ult3LP8203	Ult5LP18203	Ult5LP8203
2.1×50mm	Ult3LP18205	Ult3LP8205	Ult5LP18205	Ult5LP8205
2.1×100mm	Ult3LP18210	Ult3LP8210	Ult5LP18210	Ult5LP8210
2.1×150mm	Ult3LP18215	Ult3LP8215	Ult5LP18215	Ult5LP8215
2.1×200mm	Ult3LP18220	Ult3LP8220	Ult5LP18220	Ult5LP8220
2.1×250mm	Ult3LP18225	Ult3LP8225	Ult5LP18225	Ult5LP8225
3.0×30mm	Ult3LP18303	Ult3LP8303	Ult5LP18303	Ult5LP8303
3.0×50mm	Ult3LP18305	Ult3LP8305	Ult5LP18305	Ult5LP8305
3.0×100mm	Ult3LP18310	Ult3LP8310	Ult5LP18310	Ult5LP8310
3.0×150mm	Ult3LP18315	Ult3LP8315	Ult5LP18315	Ult5LP8315
3.0×200mm	Ult3LP18320	Ult3LP8320	Ult5LP18320	Ult5LP8320
3.0×250mm	Ult3LP18325	Ult3LP8325	Ult5LP18325	Ult5LP8325
3.0×300mm	Ult3LP18330	Ult3LP8330	Ult5LP18330	Ult5LP8330
4.0×30mm	Ult3LP184003	Ult3LP84003	Ult5LP184003	Ult5LP84003
4.0×50mm	Ult3LP184005	Ult3LP84005	Ult5LP184005	Ult5LP84005
4.0×100mm	Ult3LP184010	Ult3LP84010	Ult5LP184010	Ult5LP84010
4.0×150mm	Ult3LP184015	Ult3LP84015	Ult5LP184015	Ult5LP84015
4.0×200mm	Ult3LP184020	Ult3LP84020	Ult5LP184020	Ult5LP84020
4.0×250mm	Ult3LP184025	Ult3LP84025	Ult5LP184025	Ult5LP84025
4.0×300mm	Ult3LP184030	Ult3LP84030	Ult5LP184030	Ult5LP84030
4.6×30mm	Ult3LP18403	Ult3LP8403	Ult5LP18403	Ult5LP8403
4.6×50mm	Ult3LP18405	Ult3LP8405	Ult5LP18405	Ult5LP8405
4.6×100mm	Ult3LP18410	Ult3LP8410	Ult5LP18410	Ult5LP8410
4.6×150mm	Ult3LP18415	Ult3LP8415	Ult5LP18415	Ult5LP8415
4.6×200mm	Ult3LP18420	Ult3LP8420	Ult5LP18420	Ult5LP8420
4.6×250mm	Ult3LP18425	Ult3LP8425	Ult5LP18425	Ult5LP8425
4.6×300mm	Ult3LP18430	Ult3LP8430	Ult5LP18430	Ult5LP8430

Ultisil® Chiral HPLC Columns

Welch Materials has four kinds of polymer coated chiral columns based on silica, including Ultisil® Chiral AD, Chiral AS, Chiral OD and Chiral OJ. 80% of all racemic compounds could be separated by those four chiral columns. Chiral AD and Chiral OD are the most used chiral columns.

Key characteristics of Ultisil® Chiral columns:

- Excellent resolution of racemates
- Fast and easy method development
- Durable and long lifetime
- Smooth transition from laboratory to development, pilot to commercial-scale production

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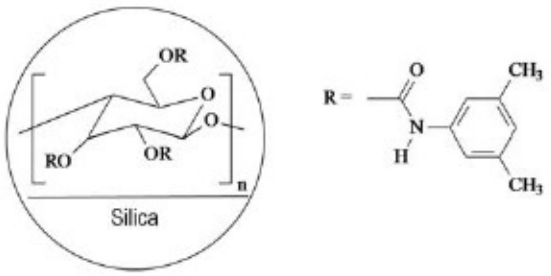
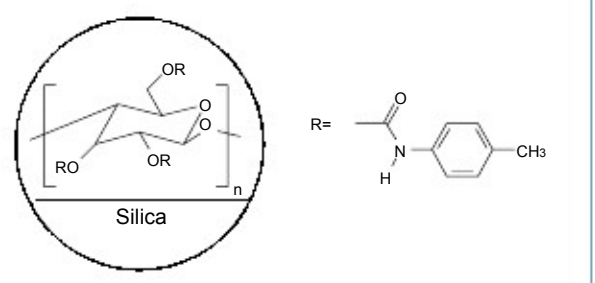
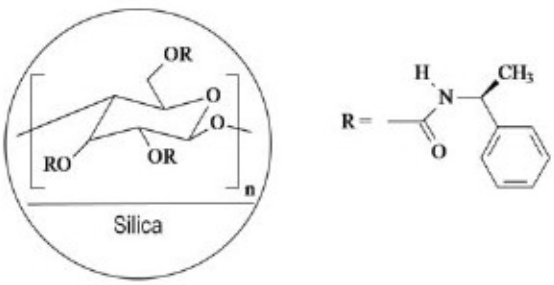
Chiral AD Stationary Phase:
Amylose-tris-3, 5-dimethylphenylcarbamate-coated silica



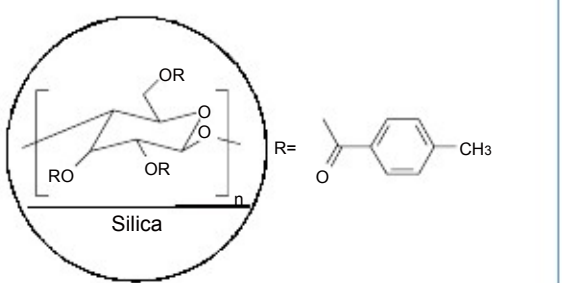
Chiral OD Stationary Phase:
cellulose-tris(3,5-dimethylphenyl carbamate) coated silica



Chiral AS Stationary Phase:
Amylose-tris-[(S)-α-phenylethyl]carbamate coated silica

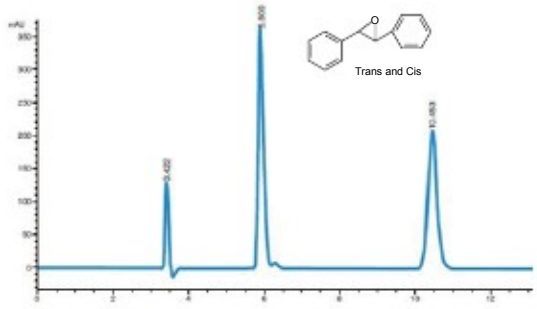


Chiral OJ Stationary Phase:
Cellulose-tris[4-Methylbenzoate] coated silica



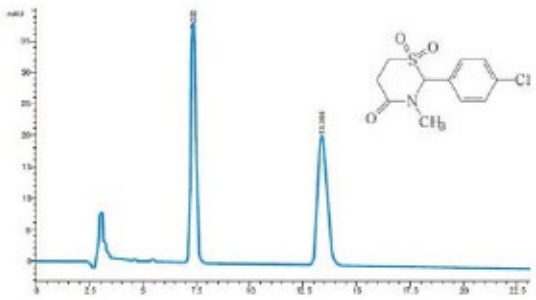
Application:

t1=5.9 min; t2=10.5 min; α=2.2; Rs=13.8



Sample:	trans-Stilbene oxide
Column:	Ultisil® Chiral AD, 4.6×150mm
Mobile phase:	n-Hexane/Isopropanol=90/10
Flow:	0.5ml/min
Detect.:	UV 254nm
Temp.:	250C

t1=7.3 min; t2=13.4 min; α=1.8; Rs=10.4



Sample:	Chlormezanone
Column:	Ultisil® Chiral OD,4.6×150mm
Mobile phase:	n-Hexane/Ethanol=50/50
Flow:	0.7ml/min
Detector:	UV254nm
Temp.:	25˚C

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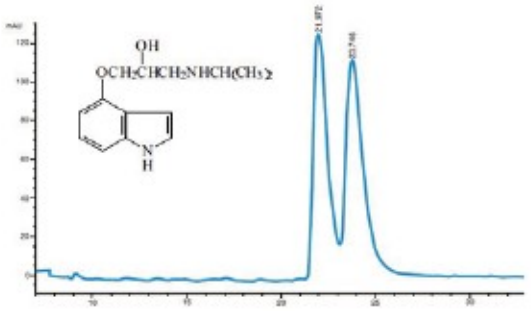
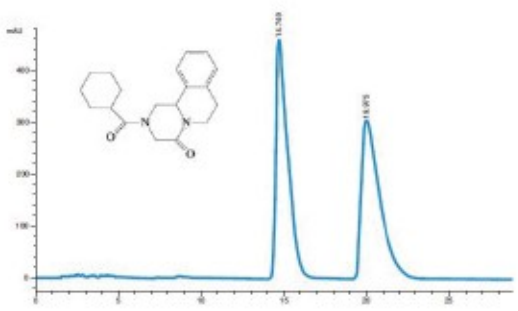
t1=22.0 min; t2=23.7 min; α=1.1; Rs=1.2



Sample: Pindolol
Column: Ultisil® Chiral AD, 4.6×150mm
Mobile phase: n-Hexane/Isopropanol/DEA=90/10/0.1
Flow: 0.5 ml/min
Detector: UV 220nm
Temp.: 25˚C

t1=14.7min; t2=20.0 min; α=1.4; Rs=3.2



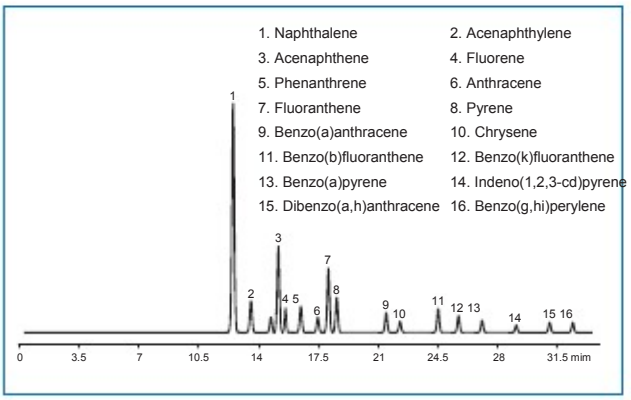
Sample: Praziquantel
Column: Ultisil® Chiral OD, 4.6×150mm
Mobile phase: n-Hexane/Isopropanol=90/10
Flow: 1.0ml/min
Detector: UV254nm
Temp.: 25˚C

Ordering Information

Dimensions	Particle Size	Chiral AD	Chiral OD	Chiral OJ	Chiral AS
4.6×150mm	5μm	Ult5AD415	Ult5OD415	Ult5OJ415	Ult5AS415
4.6×250mm	5μm	Ult5AD425	Ult5OD425	Ult5OJ425	Ult5AS425
4.6×150mm	10μm	Ult10AD415	Ult10OD415	Ult10OJ415	Ult10AS415
4.6×250mm	10μm	Ult10AD425	Ult10OD425	Ult10OJ425	Ult10AS425

Ultisil® PAH HPLC Columns

PAHs (Polycyclic Aromatic Hydrocarbon) are considered priority pollutants and the analysis of these potentially carcinogenic compounds in water, air, soil and food. The Ultisil® PAH columns separate all of the 16 PAHS in EPA method 610 quickly (less than 30 min) with high resolution. The Ultisil® PAH columns is silica based columns for PAHs analysis with best peak shape.



Ordering Information

	Particle Size	Dimensions	Part Number	Chiral OJ	Chiral AS
PAH	3μm	4.6×150mm	Ult3PA415	Ult5OJ415	Ult5AS415
	3μm	4.6×250mm	Ult3PA425	Ult5OJ425	Ult5AS425
	5μm	4.6×150mm	Ult5PA415	Ult10OJ415	Ult10AS415
	5μm	4.6×250mm	Ult5PA425	Ult10OJ425	Ult10AS425

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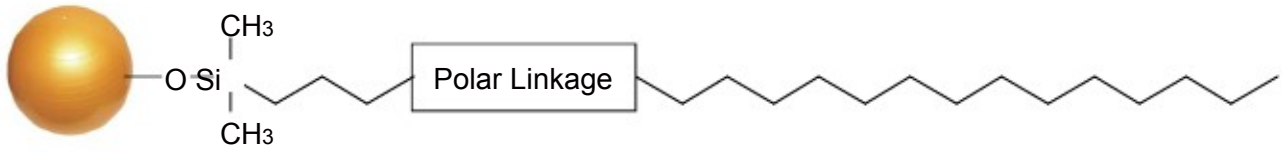
Ultisil® Polar Embedded HPLC Columns

Polar embedded phases have been developed for more than 10 years. The earlier development of polar embedded phase is on amide phase. The polar functional group close to the surface increases the wettability of phase, thus decreasing phase collapse, so that up to 95% water phase could be applied in the mobile phase. It also shields the effects of unreacted silanol groups, providing excellent peak shape for very polar and strong basic compounds and different selectivity than C18 phase. We provide two kinds of packing materials - Ultisil® Polar-RP and Ultisil® Phenyl-Ether.

Ultisil® Polar-RP HPLC Columns:



Different selectivity from traditional reverse phase such as C18 and C8, especially for the analysis of polar compounds

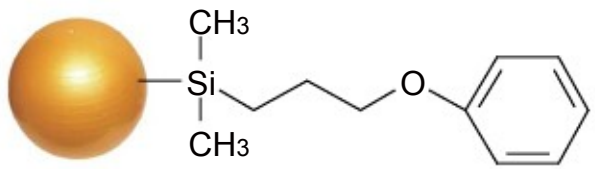
Exhibit at 100% water contents in the mobile phase, even better than the Ultisil® AQ-C18

‘shield’Excellent peak shape for the analysis of polar and basic compounds,

particularly at mid pH, due to theeffect of polar
linkage to silanol activity by forming hydrogen bonding

Ultisil® Phenyl-Ether HPLC Columns:

Improved polar & aromatic reversed phases selectivity that complements the more conventional C18 column chemistries



Better selectivity than phenyl phase for separation of nitrobenzene isomers

Improved peak shape of the highly acidic polar compound, and an alternative selectivity compared to other polar phases such as polar embedded phase

Compatible with 100% water mobile phase

Ordering Information

Dimensions	Particle Size	Ultisil® Polar-RP	Ultisil® Phenyl-Ether
2.1×150mm	μm3	Ult3BPC215	Ult3BPE215
4.6×150mm		Ult3BPC415	Ult3BPE415
4.6×250mm		Ult3BPC425	Ult3BPE425
4.6×300mm		Ult3BPC430	Ult3BPE430
2.1×150mm	5μm	Ult5BPC215	Ult5BPE215
4.6×150mm		Ult5BPC415	Ult5BPE415
4.6×250mm		Ult5BPC425	Ult5BPE425
4.6×300mm		Ult5BPC430	Ult5BPE430

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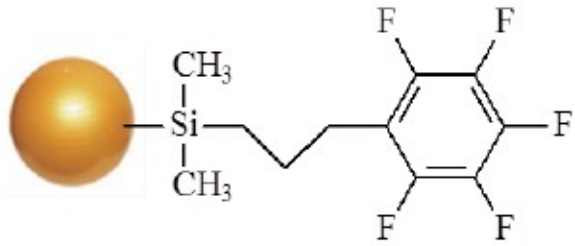
Ultisil® Fluorinated Phase HPLC Columns

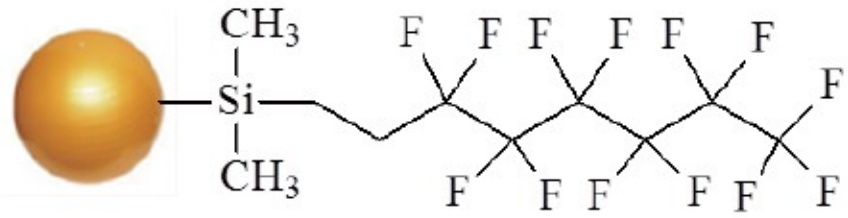
Ultisil® Fluorinated Phase has high selectivity and increased retention toward closely related compounds, not just for aromatic fluorinated compounds, but also for other nonaromatic halogenated compounds. It could be used as usual reverse phase and provide an alternative and complementary separation for many analytes performed on C8 or C18 columns. Fluorinated phase has better separation for the ion exchange and polar compounds than alkyl phase. Fluorinated phases can provide different elution orders, leading to enhance selectivity for difficult-to-separate compounds.

Ultisil® PF-Phenyl



Ultisil® PF-Phenyl is a phase primarily used in the separation of molecules bearing fluorine atoms, but may also be in the separation of non-fluorous compounds such as Taxol and its derivatives. Because of its phenyl ring, it has a higher selectivity for aromatics containing molecules compared to the other alkyl-fluorinated phase. Ultisil®PF-Phenyl can separate nitro-benzene isomers (para vs. ortho), which cannot be separated by traditional phenyl phase.

Ultisil® F-C8



Ultisil® F-C8 column has high selectivity and increased retention toward halogenated aromatic and alkyl compounds, just different from octal alkyl phase.

Ordering Information

Dimensions	Particle Size	Ultisil® PF-Phenyl	Ultisil® F-C8
2.1×150mm	μm3	Ult3BPF215	Ult3BFC215
4.6×150mm		Ult3BPF415	Ult3BFC415
4.6×250mm		Ult3BPF425	Ult3BFC425
4.6×300mm		Ult3BPF430	Ult3BFC430
2.1×150mm	5μm	Ult5BPF215	Ult5BFC215
4.6×150mm		Ult5BPF415	Ult5BFC415
4.6×250mm		Ult5BPF425	Ult5BFC425
4.6×300mm		Ult5BPF430	Ult5BFC430

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Ultisil® Amino Acid HPLC Columns

Our Ultisil® Amino Acid HPLC columns are made from spherical, totally porous, and ultra high purity (>99.999%) type B silica particles. Our proprietary surface modification before bonding generates a very smooth and uniform surface with less acidic surface silanol. Ultisil® Amino Acid columns provide the best performance in peak shape, efficiency and resolution for the analysis of 18 amino acids. Total sample preparing time can be achieved in as little as 30 min.

Sample components in the following elution order:

1. Aspartic Acid	2. Glutamic acid
3. Serine	4. Glycine
5. Histidine	6. Arginine
7. Threonine	8. Alanine
9. Proline	10. Cystine
11. Valine	12. Methionine
13. Isoleucine	14. Leucine
15. Tyrosine	16. Phenylalanine
17. Tryptophan	18. Lysine

Because most amino acids have no absorbance under UV detector, the sample should be derived before HPLC analysis. The Ultisil® amino acid analysis package including:

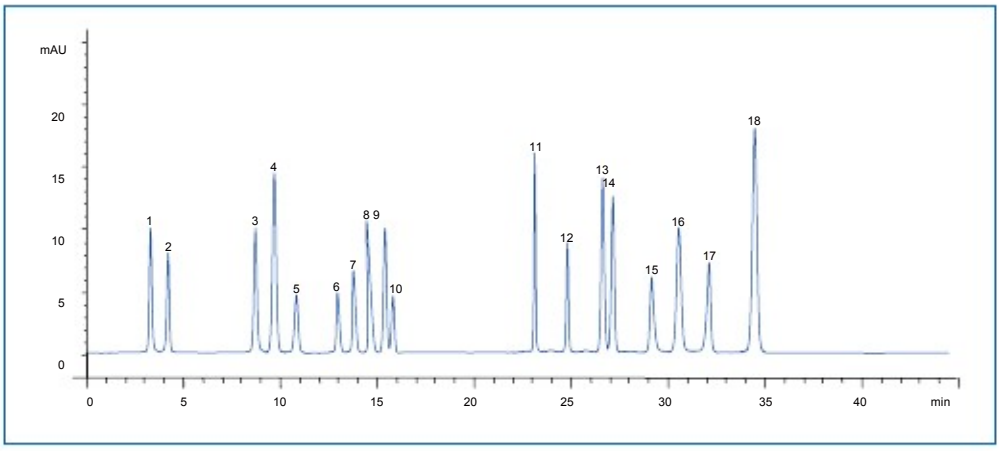
One Ultisil® Amino Acid HPLC column

Amino acid benchmark (18 kinds of amino acids)

Reagent for the derivitization

Amino acid analysis user manual

Quality Control Test Results for Amino Acids:



Ordering Information:

	Particle Size	Pore Size	Dimension	Part Number
Ultisil® Amino Acid	5μm	120Å	4.6×150mm	Ult5AA415
	5μm	120Å	4.6×200mm	Ult5AA420
	5μm	120Å	4.6×250mm	Ult5AA425
	5μm	120Å	4.6×300mm	Ult5AA430
Amino Acid Analysis Package (Including HPLC Column)	UltAA			

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Ultisil® C30 HPLC Columns

Carotenoids is a broad class of natural products, so far, over 600 kinds of carotenoids has been found, including different length of carbon chain compounds such as C40, C50 and C30 etc. It is well known as many biological functions, including cancer prevention and treatment function.

Compared to classical C18 stationary phases, C30 is much more hydrophobic and retainable. Even when pure organic eluent is applied, many sample solutes, for example carotenoids, are able to retain. Ultisil® C30 is designed for the separation of geometric isomer recognition, polar carotenes, polar and nonpolar xanthophylls, steroids, retinols and fat-soluble vitamins (A, D, K and E)

Characteristics of C30:

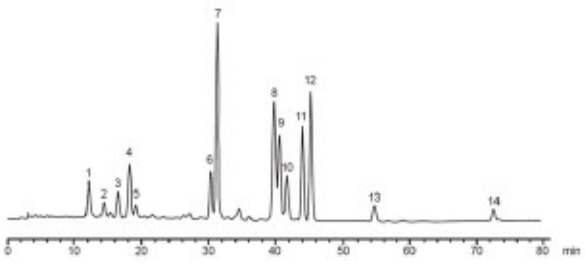
Polymeric C30 alkyl chains

Very lipophilic

Exceptional selectivity pattern for geometric isomers

1. Astaxanthin	2. Capsanthin
3. Lutein	4. Zeaxanthin
5. Canthaxanthin	6. β-Cryptoxanthin
7. Echinenone	8. 15-cis β-Carotene
9. 13-cis β-Carotene	10. α-Carotene
11. trans β-Carotene	12. 9-cis β-Carotene
13. δ-Carotene	14. Lycopene

Application for the analysis of Carotenoids:



Column: Ultisil® C30 (Carotenoids), 4.6x250mm
Mobile: A: MeOH/MTBE*/H_2O= 81/15/4,
B: MeOH/MTBE*/H_2O= 6/90/4
1-100 % B (90 min)
Flow rate: 1.0 ml/min
Detector: UV at 450 nm
Temperature: ambient
* MTBE: Methyl tert-butyl ether

Ordering Information

Particle Size	Dimension	Part Number
3µm	4.6x100mm	Ult3B30410
3µm	4.6x150mm	Ult3B30415
5µm	4.6x150mm	Ult5B30415
5µm	4.6x250mm	Ult5B30425
5µm	4.6x300mm	Ult5B30430

EXCLUSIVE STOCKISTS

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