

HyperSol

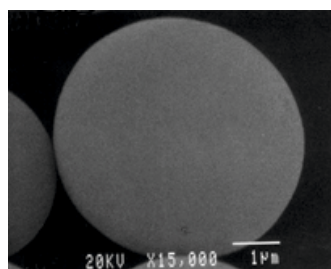
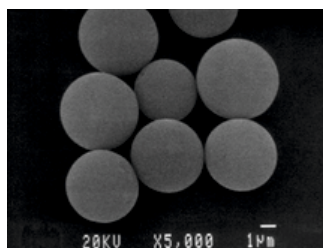
The full coverage bonded HyperSol silica packing provides exceptionally high stability and high efficiency. Proprietary surface modification to ensure uniform and inert surface of column. HyperSol is ultra pure (purity > 99.999% SiO₂) spherical, and totally porous silica. Narrow Pore Size (120Å) and Particles size distribution. enhance chromatography separation.

- High surface area for strong retention of hydrophobic and polar compounds
- Enhanced mechanical stability
- Range of particle size from 3 µm to 10 µm for analytical to preparative applications

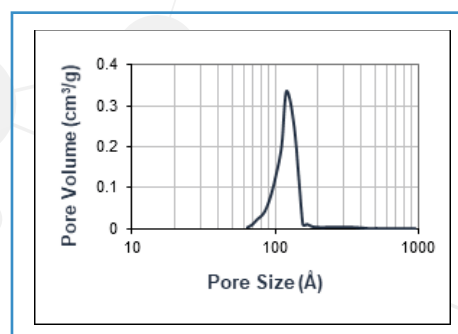


These columns are suitable for analysis of acidic, neutral and basic organic compound as well as pharmaceuticals API, formulations and peptides.

SEM Pictures of HyperSol Particles



The pictures show the uniformity of the particle sizes and smoothness of particle surface, which enables more uniform packing with less channeling effect. This leads to lower back pressure and the higher column efficiency. Our silica has a surface area of 320 m²/g with a controlled mean pore size of 120 Å.

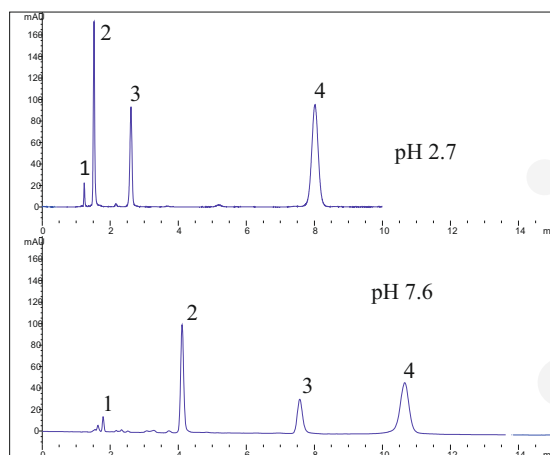


Trace Amount Metal Contents Test

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,) one neutral chelating reagent (, 2,2-dihydroxynaphthalene. 4,4'-dipyridyl), which cannot form chelating complex with metal- is used as a reference. Chelating reagents are (2,2'-dipyridyl and 2,2-dihydroxynaphthalene,) are sensitive to trace amount metal contents in silica. Type A sil or type B silica based C18 column with higher metal content column are analyzed by using standards of 2,2'-dipyridyl and 2,2-dihydroxynaphthalene peaks would tail or even totally disappear.

Trace Amount Metal Contents

Test Using Chelating Compounds below fig needs to be replaced

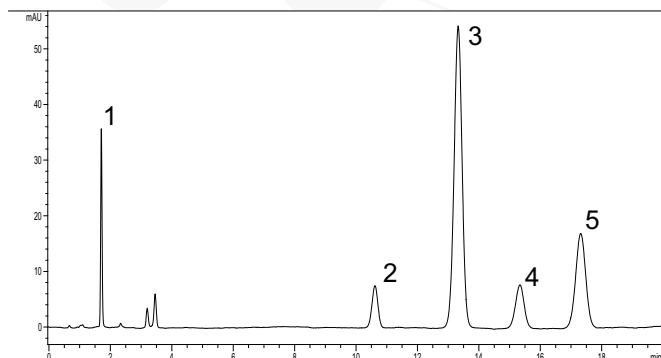


- Develop and improve analytical HPLC method
- Excellent performance, exceptionally rugged USP phases
- Exceptional lot-to-lot reproducibility

Packing Material	Partical Size (µm)	Pore Size (Å)	Surface Area (m ² /g)	Carbon Load %	End Capping	pH Stability
HyperSol 18	3, 5, 10 µm	120	320 m ² /g	17	Yes	2.5–9.5
HyperSol C8	3, 5, 10 µm	120	320 m ² /g	17	Yes	2.5–9.5
HyperSol AQ C18	3, 5, 10 µm	120	320 m ² /g	17	Yes	2.5–9.5

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

Steric Selectivity and Hydrophobicity Test



Column	HyperSolC 18, 4.6 x 150 mm, 5 µm
Mobile Phase	80% MeOH / 20% water
Flow Rate	1 ml/min
Detector	254 nm
Temp	25 °C
Sample	1) Uracil 2) Butylbenzene 3) Triphenylene 4) Amylbenzene 5) o-Terphenyl

Steric Selectivity:

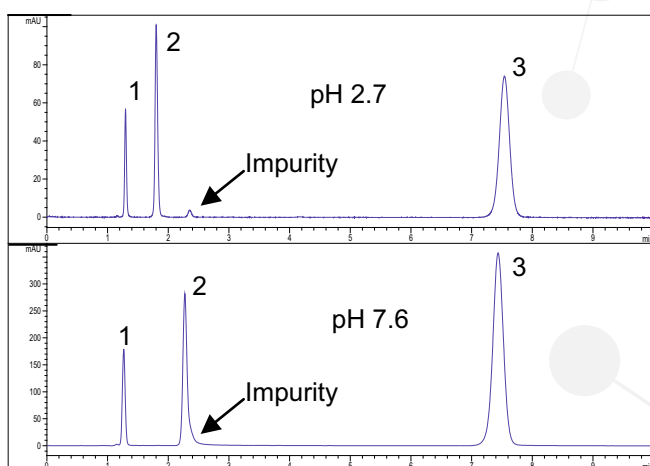
Steric selectivity refers to the ability of the stationary phase to recognize the difference between the similar structures but different shapes of molecules.

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.

Ion Exchange Capacity at pH 2.7 and 7.6



Column	HyperSol C18, 4.6 x 100 mm, 5 µm
Mobile Phase	30% MeOH 70% 20 phosphate
Flow Rate	1 ml/min
Detector	215 nm
Temp	25 °C
Sample	1) Uracil 2) Benzylamine 3) Phenol

Ion Exchange Capacity

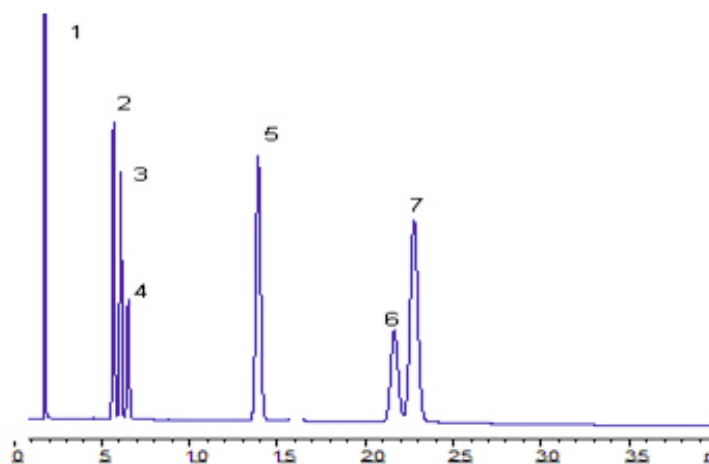
the majority of silanol groups (Si-OH) are un-dissociated at pH < 3 which, do not contribute to retention of protonated amines. However, if the surface silanols are not uniform and there are some very acidic silanols left on the silica surface, those acidic silanols will be still in dissociated form (SiO⁻), which will contribute to the retention of protonated amines by ion exchange interaction and also cause peak tailing. all of the surface silanol at pH > 7, groups are dissociated to form ion exchange (SiO⁻) sites that increase the retention of protonated amines.

Tanaka et al mixture containing benzylamine and phenol is analyzed to investigate ion exchange behavior of HyperSol 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, indicates the uniformity of ion-exchange sites on the surface.

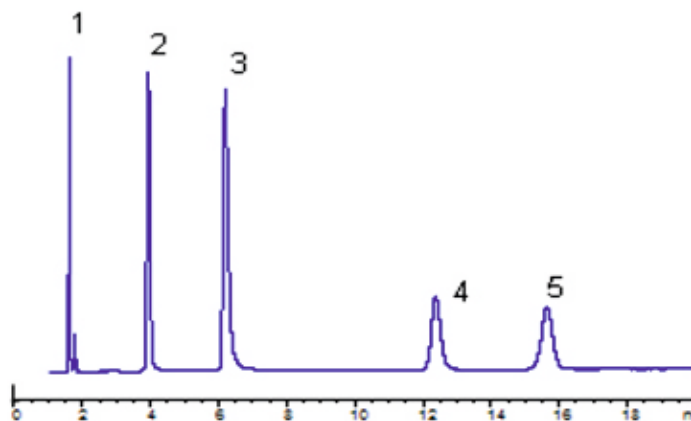
Applications

Separation of Organic Acids

Column	HyperSol C18, 4.6 x 150 mm, 5 µm
Mobile Phase	25% MeOH / 75% 20mM phosphate, pH 2.7
Flow Rate	1 ml/min
Detector	230 nm
Temp	40 °C
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



Separation of tricyclic antidepressants (TCAs) at pH 7.0

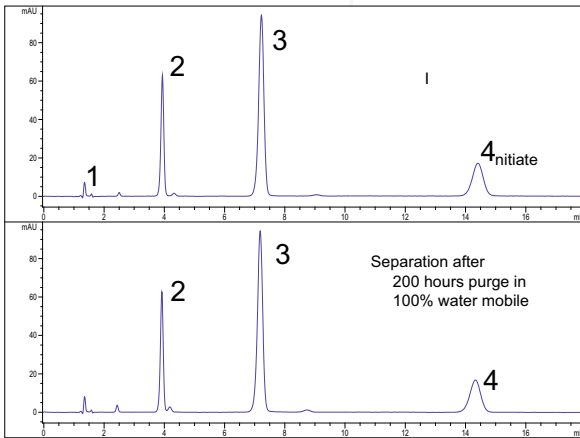


Column	HyperSol C18, 4.6 x 150 mm, 5 µm
Mobile Phase	20% 20 mM phosphate/80%MeOH, pH 7.0
Flow Rate	1 ml/min
Detector	215 nm
Temp	40 °C
Sample	1) Uracil 2) Propranolol 3) Nortriptyline 4) Amitriptyline 5) Trimipramine

- Phase stability is improved significantly which is suitable for high aqueous mobile phase
- Endcapped for excellent peak shape of polar, acidic and basic compounds
- Increased retention for polar and water soluble compounds
- Excellent for water soluble compounds that typically cannot be retained on traditional C18 phase

Phase collapse research

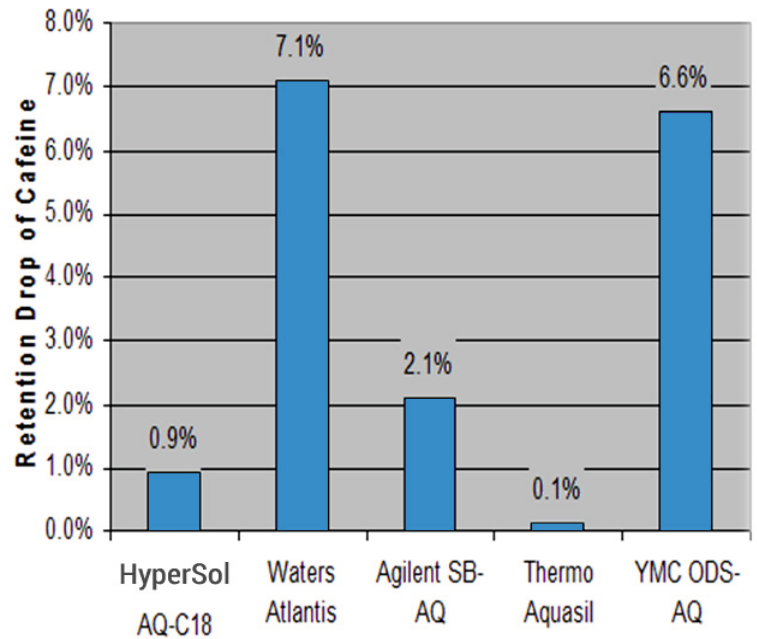
No Phase Collapse Under 100% Aqueous Mobile Phase



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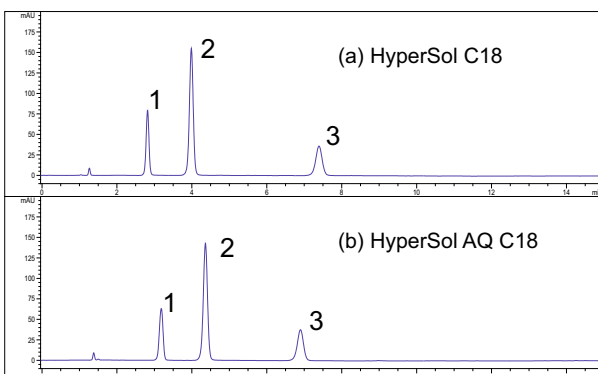
Column	HyperSol AQ-C18 4.6 x 100 mm, 5 µm
Mobile Phase	10%ACN/90% 50 mM phosphate, pH 3.5
Flow Rate	1 ml/min
Detector	215 nm
Temp	25 °C
Sample	1) Uracil 2) Theophylline 3) Caffeine 4) Phenol

Phase collapse comparison with other brands



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

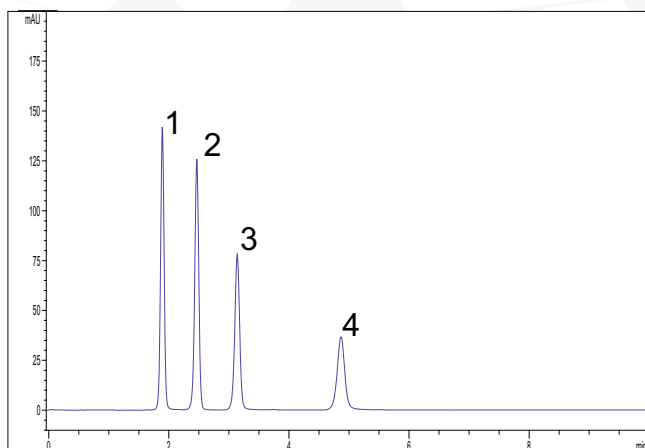
Comparison of Selectivity of HyperSol C18 and HyperSol AQ-C18



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

Applications

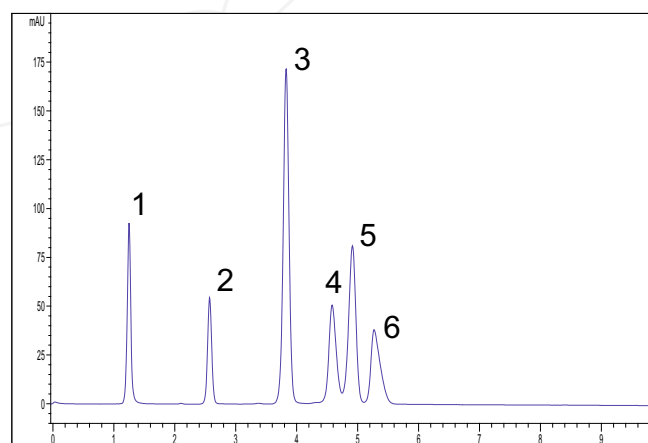
Separation of Water-Soluble Vitamins



Column	HyperSol AQ-C18, 4.6 x 100 mm, 5 µm
Mobile Phase	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

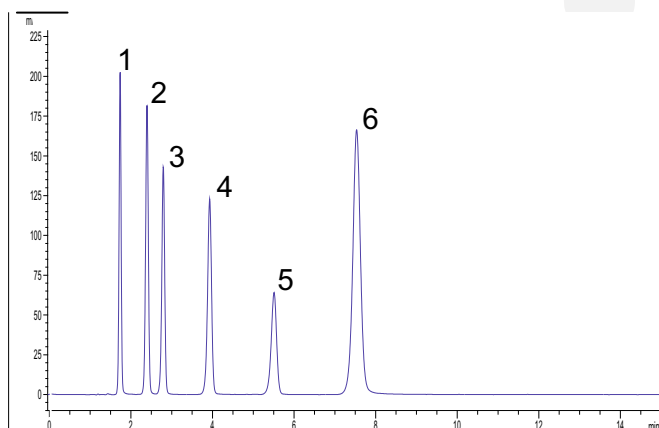
Column	HyperSol AQ-C18, 4.6 x 100 mm, 5 µm
Mobile Phase	50 mM phosphate, pH 2.5
Flow Rate	1 ml/min
Detector	210 nm
Temp	40 °C
Injection	1 µl
Sample	1) Oxalic acid 2) Lactic acid 3) Maleic acid, 4) Citric acid 5) Fumaric acid 6) Succinic acid

Separation of Organic Acid



Column	HyperSol AQ-C18, 4.6 x 100 mm, 5 µm
Mobile Phase	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

Separation of Basic Nucleotides and Purines

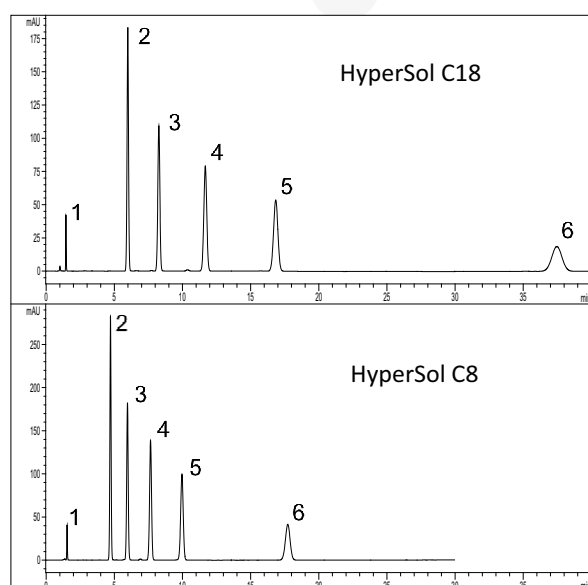


Less Retentive than HyperSol C18

The HyperSol C8 phase is, more useful for compounds that are too strongly retained on C18 phase, and it is very useful for LC/MS applications, where the long retention is not required. HyperSol C8 can save significant analytical time while separation of neutral or highly retained compounds at C18 column, However, when separating polar compounds, HyperSol C8 column provides alternative selectivity than HyperSol C18 column.

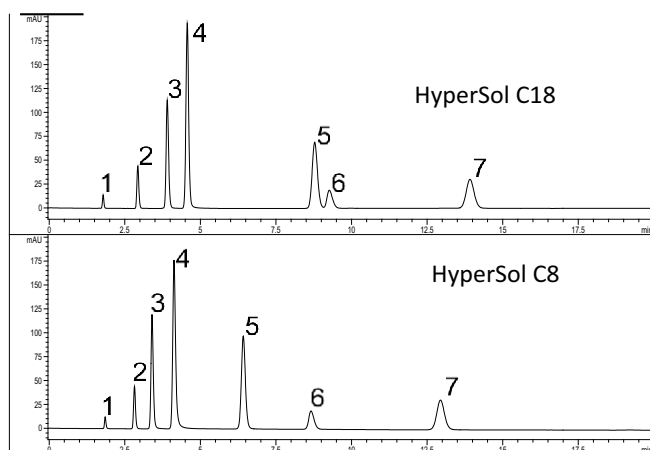
- Selectivity choices for method development optimization
- Good peak shape for basic, acidic and neutral compounds
- High performance over a wide pH range
- Particle sizes from 3 to 10 μm
- Long lifetime with extra dense bonding and double endcapping

Comparison of Retention of HyperSol C18 and HyperSol C8 on Neutral Compounds



Column	4.6 x 150 mm, 5 μm
Mobile Phase	30% water/70% ACN
Flow Rate	1 ml/min
Detector	215 nm
Temp	25 $^{\circ}\text{C}$
Sample	1) Uracil 2) Ethylbenzene 3) Propylbenzene 4) Butylbenzene 5) Amylbenzene 6) Heptylbenzene

Comparison of Retention of HyperSol C18 and HyperSol C8 on Polar Compounds



Column	4.6 x 150 mm, 5 μm
Mobile Phase	30% water/70% ACN
Flow Rate	1 ml/min
Detector	215 nm
Temp	25 $^{\circ}\text{C}$
Sample	1) Thiourea 2) Benzylamine 3) Aminoquinoline 4) Phthalazine 5) Caffeine 6) 4-Ethylaniline 7) Benzyl alcohol

Polymer Particles Based HyperSol

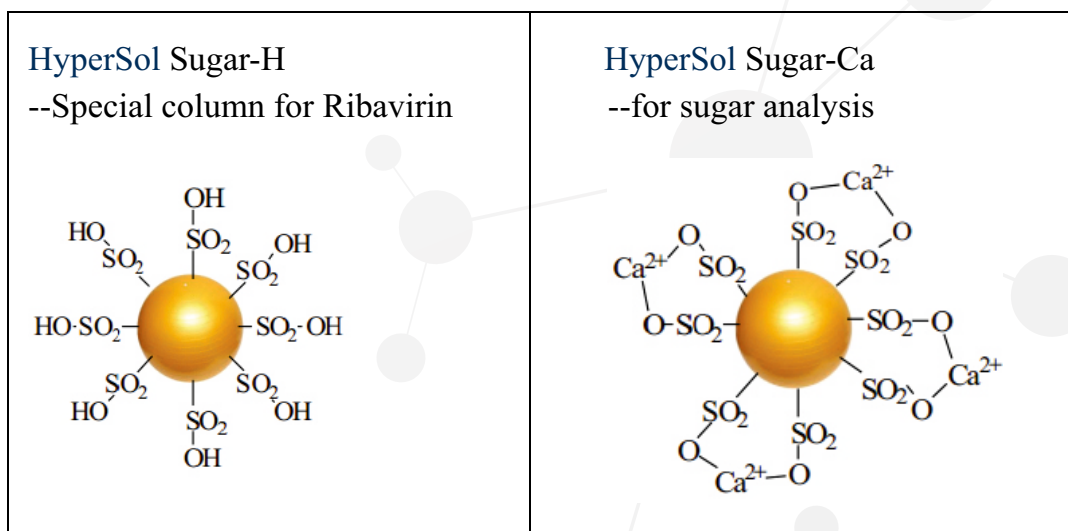
Sugar and Organic Acid Analysis

- Excellent resolution for analyte peak
- Excellent lot-to-lot reproducibility of column
- Highly cost effective compare to recommended alternative to Bio-Rad Aminex™, Waters Sugar-Pak™, Supelco Supelcogel™, Phenomenex REZEX™.

HyperSol Sugar Columns

HyperSol Sugar Columns contain low-linking sulfonated styrene-divinylbenzene spheres (PS/DVB) in 5, 8 and 10% cross-link forms as well as various ionic forms, including calcium, hydrogen. This columns specifically designed for high resolution separation of carbohydrates, organic acids, Ribavirin, peptides and nucleic acids.

The separation mechanism for HyperSol Sugar phases includes ion-exchange and hydrophilic interactions with the analytes. The separation mechanism due to size exclusion, ion exclusion, and ligand exchange. These multiple modes of interaction enable a unique capability to separate a variety of water soluble compounds



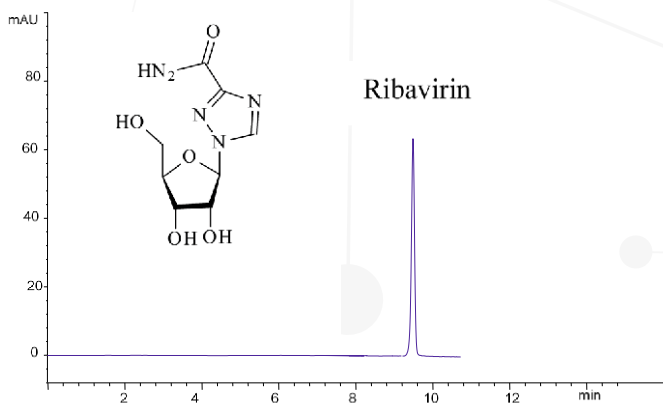
Characteristics of HyperSol Sugar Columns

- Compatibility with most aqueous mobile phases, including pure water as the eluent
- Wide operating-temperature range (20 – 90 °C)
- pH range (1-3) for Sugar -H and (5-9) for Sugar-Ca phase
- Analytical and preparative columns

HyperSol Sugar-H

Special column for Ribavirin

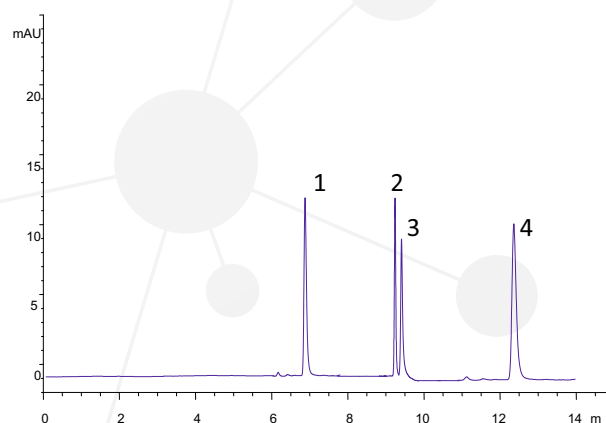
Ribavirin is an anti-viral drug used by many hospitals in the treatment of respiratory syncytial virus infection. It is considered by some physicians to be an effective and sometimes life-saving drug, but studies have also indicated that the drug may pose a reproductive risk to health care workers



Column	HyperSol Sugar-H, 8 μ m, 7.8 x 300mm
Mobile Phase	H ₂ SO ₄ in Water pH=2.5 \pm 0.1
Flow Rate	0.6ml/min
Detector	207 nm
Temp	80 °C

Separation of Cellobiose, Glucose, Mannitol and Acetic acid

Column	HyperSol Sugar-H, 8 μ m, 7.8 x 300mm
Mobile Phase	9mM H ₂ SO ₄
Flow Rate	0.5ml/min
Detector	UV

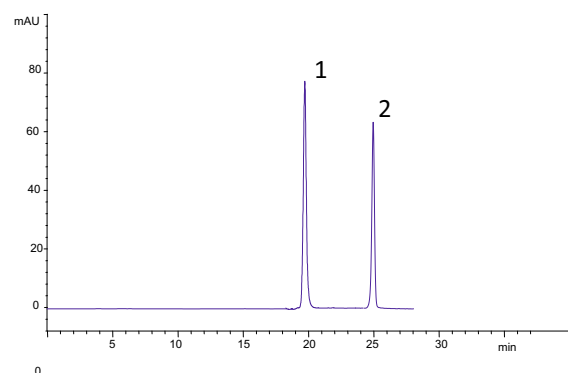


HyperSol Sugar Column

HyperSol Sugar-Ca

HyperSol Sugar-Ca Column is packed with Ca²⁺ modified PS/DVB resins with the particle size of 5 μ m and 8 μ m. The Sugar-Ca column is used for the analysis of sugar products such as hydrolysis of beet, cane, and starch in streams processing plants. Glucose, fructose, maltose, and maltotriose can be separated from higher oligomers found in typical corn syrups.

The separation of Mannitol and Sorbitol



Column	HyperSol Sugar-Ca, 8 μ m, 7.8 x 300mm
Mobile Phase	Water
Flow Rate	0.5ml/min
Detector	RI
Temp	80 °C