Xtimate™ HPLC Columns

Introduction of Xtimate™

Xtimate™ is Welch Materials 'new premium HPLC column series. Xtimate™ is the product of several years of continuous research on advanced surface modification at Welch Materials, Inc. There are two types of Xtimate HPLC columns, those based on Hybrid Silica-Polymer packing materials, and those based on pure polymer media.

Compared to mid-range priced Ultisil® series of premium quality, hybrid silica-polymer particles based Xtimate™ HPLC columns are our next generation products with superior performance, especially excellent peak shape for strong bases, and extended lifetime at high pH range, making those columns most universal HPLC columns for a wide pH range applications.

Hybrid silica-polymer particles based Xtimate™ particles are based on our best seller Ultisil® series ultra high purity silica particles, but the surface is further modified with a unique hybrid organic/inorganic polymer using our state-of-art SmoothCoat™ surface modification technique; as a result, the hybrid silica-polymer particles based Xtimate™ particles exhibit both silica particle properties of high mechanic strength and high efficiency and organic polymer properties of inertness and resistance to alkali dissolution. Hybrid silica-polymer particles based Xtimate™ HPLC columns represent our world leading technology of high premium and high quality HPLC columns in the market.

Besides hybrid surface on silica materials, we also developed PS/DVB polymer based materials for saccharide separation in Xtimate™ columns, including Saccharide-H and Saccharide-Ca.

Hybrid Particles Based Xtimate™

Characteristics of hybrid particles based Xtimate™ columns:

- Wide pH range from 1.0 to 12.5
- Silica particle properties of high mechanic strength and high efficiency and organic polymer properties of inertness and resistance to alkali dissolution
- Long column lifetime：5 times of similar product such as Gemini
- Excellent peak shape for strong bases

Hybrid particles based Xtimate™ HPLC columns are designed for wide pH application, especially for high pH application because of their unprecedented long lifetime at high pH. Hybrid particles based Xtimate™ HPLC columns can be used at any mobile phase composition and high temperature condition. They don 't exhibit phase collapse even at 100% aqueous mobile phase condition. Even under extreme conditions, the hybrid particles based Xtimate™ HPLC columns will still exhibit excellent performance, making hybrid particles based Xtimate™ HPLC columns the most reliable solution for the most difficult separation.

Hybrid Particles Based Xtimate™ Technology

Totally porous silica particles usually have properties which fit for chromatographic materials, such as high surface area, strong mechanical strength, high efficiency and high reproducibility. But they also have their limits. They suffer peak tailing due to secondary surface silanols activity and short lifetime due to the hydrolysis of C18 siloxane bond at low pH and dissolution of base silica at high pH.

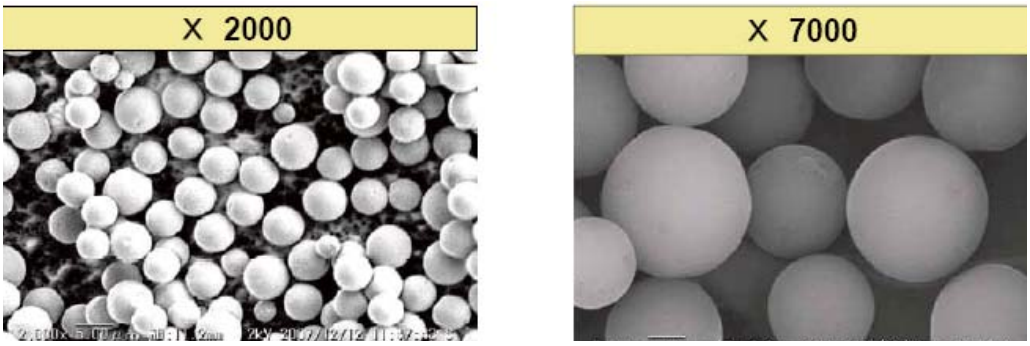
Polymer-based materials are also used for HPLC packing. They are chemically stable at pH 1-14, and surface inert because they don 't have secondary silanols interaction problem. But they suffer weak mechanical strength and low surface area and low column efficiency problems.

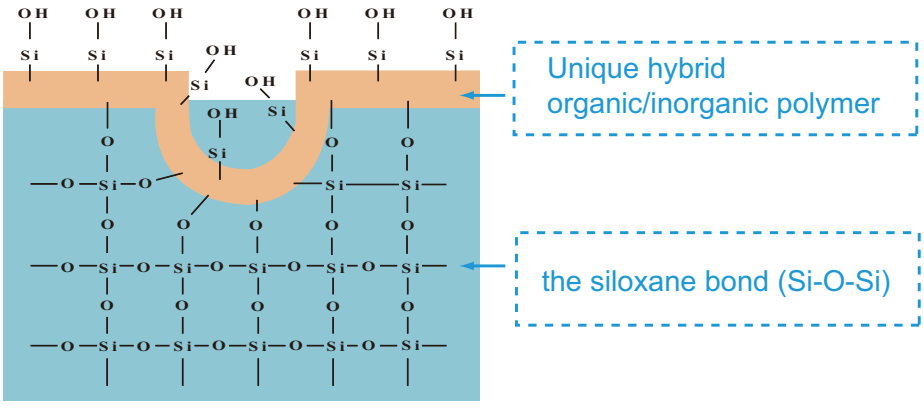
So it is very important to have HPLC hybrid packing materials which have both silica properties of high surface area and excellent particle strength and polymer properties of chemical stability of a wide pH range and lack of surface silanols activity. Such materials have good lifetime in a wide range of pH, unique selectivity, and excellent peak shape for polar, acidic and basic compounds.

In order to meet broad application of chromatographer 's need and to further improve the lifetime and performance of our HPLC columns, especially at high pH, we developed a unique SmoothCoat™ technique, which allows us to uniformly and chemically apply a hybrid layers onto silica surface before bonding. The hybrid layer is ~2 nm thick, which totally block the access of analytes to surface silanols. As a result, the hybrid particles based Xtimate™ particles not only keep silica particle properties of high mechanic strength and high efficiency, but also exhibit organic polymer properties of surface inertness, resistance of alkali dissolution, and exceptional peak shape of strong bases because of lack of silica surface silanols. The lifetime of hybrid Xtimate™ particles is extremely enhanced, with pH range from 1.0 to 12.5.

Another important improvement of hybrid particles based Xtimate™ packing materials is our new bonding process. We further improved surface bonding coverage for hybrid particles based Xtimate™ over Ultisil® materials by using a new organic silane with a more reactive leaving group for bonding and endcapping. Because of combination of hybrid surface and better bonding and endcapping, the hybrid particles based Xtimate™ columns have excellent of peak shape for strong bases and extensive surface bonding, besides exceptional long lifetime.

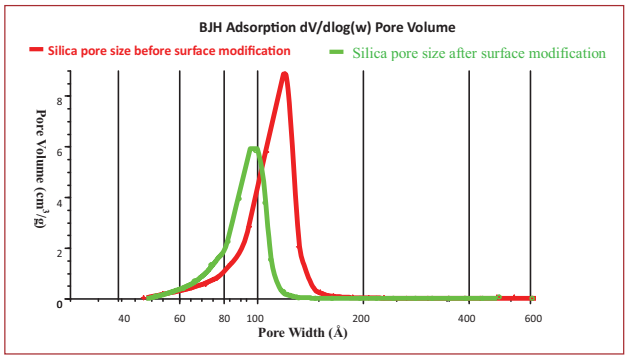
Smooth surface of the silica particles





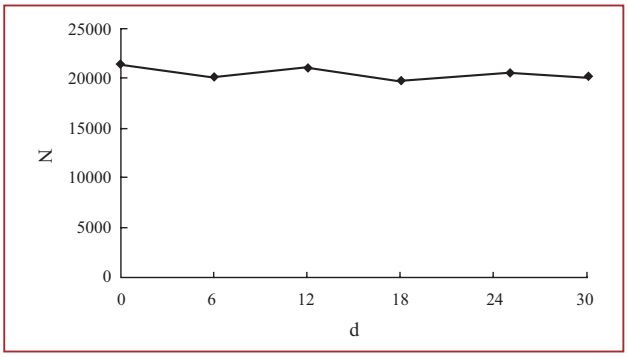
Pore size graph

The pore size of hybrid particles based Xtimate™ particles is 4 nm smaller than the original particles, indicating 2 nm hybrid coating on the pores.

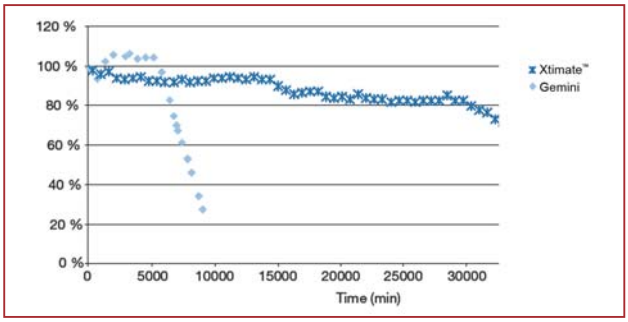


Lifetime Test at Extreme Condition

After lifetime test at pH 11.5 condition for a month, the hybrid particles based Xtimate™ column shows no apparent efficiency drop.



Lifetime test comparison: 5 times longer than Gemini.

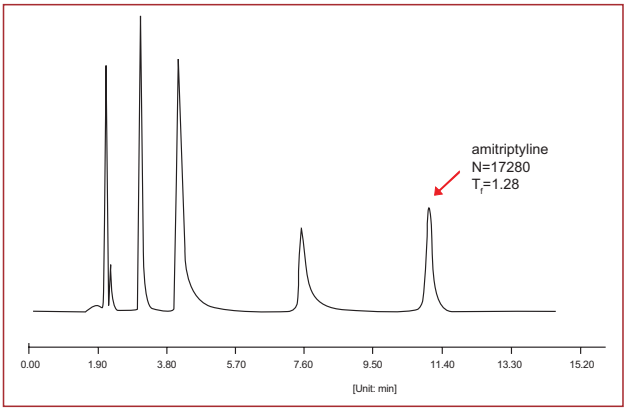


Columns: Xtimate™ C18, 5 µm, 150 x 4.6 mm / Gemini ,C18, 5 µm, 150 x 4.6 mm
Mobile Phase: A: 10 mM Ammonium Bicarbonate pH 10.5
B: 90:10 Acetonitrile/buffer
Gradient: 0 % to 100 % B in 10 min. 100 % B last 7 min.
0 % B last 3 min.
Flow: 1.0 mL/min
Temp: 50 °C
Detector: UV @ 254 nm

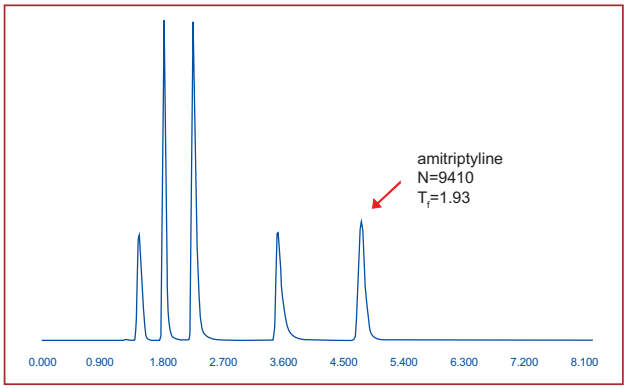
Unprecedented Peak Shape

At mid pH, the strong bases usually exhibit bad tailing due to the secondary interaction between the analytes and the surface silaols. Because of our SmoothCoating™ technique, the hybrid layer totally covers the surface silanols and blocks the access of analytes to surface silanols. The improved bonding and endcapping further reduce silanol activity. As a result, hybrid particles based Xtimate™ columns show unprecedented peak shape.

The detection of amitriptyline by Xtimate™ C18



The detection of Amitriptyline by Symmetry



Hybrid Particles Based Xtimate™ Phases

The hybrid particles based Xtimate™ phases are bonded using our new improved bonding process over Ultisil® bonding process. We further improved surface bonding coverage for hybrid particles based Xtimate™ columns by using a new organic silane with a more reactive leaving group for bonding and endcapping. We provide a full family of hybrid particles based Xtimate™ reversed phases, including C18, C8, C4, Phenyl-Hexyl, CN, and more recent polar embedded phase, Polar-RP.

In 2010, we developed a different phenyl phase, a Phenyl-Hexyl phase, just for Xtimate™ to provide different selectivity. Xtimate™ Phenyl-Hexyl columns have unique selectivity for compounds with aromatic groups providing superior resolution for these samples. Xtimate™ Phenyl-Hexyl can also provide optimum separations of moderately polar compounds where typical alkyl phases (C18 and C8) do not provide adequate resolution. The longer hexyl group provides extra hydrocarbon interaction and longer retention than typical phenylpropyl phase; it also provides phase better chemical stability.

In 2011, we also add polar embedded phase, Polar-RP on Xtimate™ particles, to further improve peak shape for very polar and strong basic compounds and provide different selectivity than C18 phase.

- Xtimate™ C18
- Xtimate™ C8
- Xtimate™ C4
- Xtimate™ CN
- Xtimate™ Phenyl-Hexyl (new in 2010)
- Xtimate™ Polar-RP (new in 2011)

Xtimate™ HPLC column uses 316L stainless steel tube, as shown in Figure 1, and the Quick-Seal columns format, which allows for hand-tight connections. You can quickly change columns without the need for wrenches

Quick-Seal columns use a cartridge style change-out procedure. This quick-connect feature is made possible by a swivel connector in the Quick-Seal end fitting. The swivel allows the end fitting to remain attached to the HPLC system while the packed and sealed cartridge tube is replaced. There are three primary benefits to using Quick-Seal Columns:

- Time — no tools are needed to change the column
- Money — the end fittings are reusable.
- Aggravation — the frequency of making capillary connection is reduced.

Attention: The column is packed under high pressure. One should never remove the frit cap from the packed and sealed modular tube, or risk the loss of column performance.

Ordering Information

Dimension	Particle Size	C18	C8	C4	NH_2	Phenyl-Hexyl	CN	Polar-RP
2.1×30mm	3μm	Xt3B18203	Xt3B8203	Xt3B4203	Xt3NH203	Xt3P203	Xt3CN203	Xt3PC203
2.1×50mm	3μm	Xt3B18205	Xt3B8205	Xt3B4205	Xt3NH205	Xt3P205	Xt3CN205	Xt3PC205
2.1×100mm	3μm	Xt3B18210	Xt3B8210	Xt3B4210	Xt3NH210	Xt3P210	Xt3CN210	Xt3PC210
2.1×150mm	3μm	Xt3B18215	Xt3B8215	Xt3B4215	Xt3NH215	Xt3P215	Xt3CN215	Xt3PC215
2.1×200mm	3μm	Xt3B18220	Xt3B8220	Xt3B4220	Xt3NH220	Xt3P220	Xt3CN220	Xt3PC220
2.1×250mm	3μm	Xt3B18225	Xt3B8225	Xt3B4225	Xt3NH225	Xt3P225	Xt3CN225	Xt3PC225
3.0×30mm	3μm	Xt3B18303	Xt3B8303	Xt3B4303	Xt3NH303	Xt3P303	Xt3CN303	Xt3PC303
3.0×50mm	3μm	Xt3B18305	Xt3B8305	Xt3B4305	Xt3NH305	Xt3P305	Xt3CN305	Xt3PC305
3.0×100mm	3μm	Xt3B18310	Xt3B8310	Xt3B4310	Xt3NH310	Xt3P310	Xt3CN310	Xt3PC310
3.0×150mm	3μm	Xt3B18315	Xt3B8315	Xt3B4315	Xt3NH315	Xt3P315	Xt3CN315	Xt3PC315
3.0×200mm	3μm	Xt3B18320	Xt3B8320	Xt3B4320	Xt3NH320	Xt3P320	Xt3CN320	Xt3PC320
3.0×250mm	3μm	Xt3B18325	Xt3B8325	Xt3B4325	Xt3NH325	Xt3P325	Xt3CN325	Xt3PC325
3.0×300mm	3μm	Xt3B18330	Xt3B8330	Xt3B4330	Xt3NH330	Xt3P330	Xt3CN330	Xt3PC330
4.0×30mm	3μm	Xt3B184003	Xt3B84003	Xt3B44003	Xt3NH4003	Xt3P4003	Xt3CN4003	Xt3PC4003
4.0×50mm	3μm	Xt3B184005	Xt3B84005	Xt3B44005	Xt3NH4005	Xt3P4005	Xt3CN4005	Xt3PC4005
4.0×100mm	3μm	Xt3B184010	Xt3B84010	Xt3B44010	Xt3NH4010	Xt3P4010	Xt3CN4010	Xt3PC4010
4.0×150mm	3μm	Xt3B184015	Xt3B84015	Xt3B44015	Xt3NH4015	Xt3P4015	Xt3CN4015	Xt3PC4015
4.0×200mm	3μm	Xt3B184020	Xt3B84020	Xt3B44020	Xt3NH4020	Xt3P4020	Xt3CN4020	Xt3PC4020
4.0×250mm	3μm	Xt3B184025	Xt3B84025	Xt3B44025	Xt3NH4025	Xt3P4025	Xt3CN4025	Xt3PC4025
4.0×300mm	3μm	Xt3B184030	Xt3B84030	Xt3B44030	Xt3NH4030	Xt3P4030	Xt3CN4030	Xt3PC4030
4.6×30mm	3μm	Xt3B18403	Xt3B8403	Xt3B4403	Xt3NH403	Xt3P403	Xt3CN403	Xt3PC403
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4.6×150mm	3μm	Xt3B18415	Xt3B8415	Xt3B4415	Xt3NH415	Xt3P415	Xt3CN415	Xt3PC415
4.6×200mm	3μm	Xt3B18420	Xt3B8420	Xt3B4420	Xt3NH420	Xt3P420	Xt3CN420	Xt3PC420
4.6×250mm	3μm	Xt3B18425	Xt3B8425	Xt3B4425	Xt3NH425	Xt3P425	Xt3CN425	Xt3PC425
4.6×300mm	3μm	Xt3B18430	Xt3B8430	Xt3B4430	Xt3NH430	Xt3P430	Xt3CN430	Xt3PC430

Dimension	Particle Size	C18	C8	C4	NH_2	Phenyl-Hexyl	XB-CN	Polar- RP
2.1×30mm	5μm	Xt5B18203	Xt5B8203	Xt5B4203	Xt5NH203	Xt5P203	Xt5CN203	Xt5PC203
2.1×50mm	5μm	Xt5B18205	Xt5B8205	Xt5B4205	Xt5NH205	Xt5P205	Xt5CN205	Xt5PC205
2.1×100mm	5μm	Xt5B18210	Xt5B8210	Xt5B4210	Xt5NH210	Xt5P210	Xt5CN210	Xt5PC210
2.1×150mm	5μm	Xt5B18215	Xt5B8215	Xt5B4215	Xt5NH215	Xt5P215	Xt5CN215	Xt5PC215
2.1×200mm	5μm	Xt5B18220	Xt5B8220	Xt5B4220	Xt5NH220	Xt5P220	Xt5CN220	Xt5PC220
2.1×250mm	5μm	Xt5B18225	Xt5B8225	Xt5B4225	Xt5NH225	Xt5P225	Xt5CN225	Xt5PC225
3.0×30mm	5μm	Xt5B18303	Xt5B8303	Xt5B4303	Xt5NH303	Xt5P303	Xt5CN303	Xt5PC303
3.0×50mm	5μm	Xt5B18305	Xt5B8305	Xt5B4305	Xt5NH305	Xt5P305	Xt5CN305	Xt5PC305
3.0×100mm	5μm	Xt5B18310	Xt5B8310	Xt5B4310	Xt5NH310	Xt5P310	Xt5CN310	Xt5PC310
3.0×150mm	5μm	Xt5B18315	Xt5B8315	Xt5B4315	Xt5NH315	Xt5P315	Xt5CN315	Xt5PC315
3.0×200mm	5μm	Xt5B18320	Xt5B8320	Xt5B4320	Xt5NH320	Xt5P320	Xt5CN320	Xt5PC320
3.0×250mm	5μm	Xt5B18325	Xt5B8325	Xt5B4325	Xt5NH325	Xt5P325	Xt5CN325	Xt5PC325
3.0×300mm	5μm	Xt5B18330	Xt5B8330	Xt5B4330	Xt5NH330	Xt5P330	Xt5CN330	Xt5PC330
4.0×30mm	5μm	Xt5B184003	Xt5B84003	Xt5B44003	Xt5NH4003	Xt5P4003	Xt5CN4003	Xt5PC4003
4.0×50mm	5μm	Xt5B184005	Xt5B84005	Xt5B44005	Xt5NH4005	Xt5P4005	Xt5CN4005	Xt5PC4005
4.0×100mm	5μm	Xt5B184010	Xt5B84010	Xt5B44010	Xt5NH4010	Xt5P4010	Xt5CN4010	Xt5PC4010
4.0×150mm	5μm	Xt5B184015	Xt5B84015	Xt5B44015	Xt5NH4015	Xt5P4015	Xt5CN4015	Xt5PC4015
4.0×200mm	5μm	Xt5B184020	Xt5B84020	Xt5B44020	Xt5NH4020	Xt5P4020	Xt5CN4020	Xt5PC4020
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4.0×300mm	5μm	Xt5B184030	Xt5B84030	Xt5B44030	Xt5NH4030	Xt5P4030	Xt5CN4030	Xt5PC4030
4.6×30mm	5μm	Xt5B18403	Xt5B8403	Xt5B4403	Xt5NH403	Xt5P403	Xt5CN403	Xt5PC403
4.6×50mm	5μm	Xt5B18405	Xt5B8405	Xt5B4405	Xt5NH405	Xt5P405	Xt5CN405	Xt5PC405
4.6×100mm	5μm	Xt5B18410	Xt5B8410	Xt5B4410	Xt5NH410	Xt5P410	Xt5CN410	Xt5PC410
4.6×150mm	5μm	Xt5B18415	Xt5B8415	Xt5B4415	Xt5NH415	Xt5P415	Xt5CN415	Xt5PC415
4.6×200mm	5μm	Xt5B18420	Xt5B8420	Xt5B4420	Xt5NH420	Xt5P420	Xt5CN420	Xt5PC420
4.6×250mm	5μm	Xt5B18425	Xt5B8425	Xt5B4425	Xt5NH425	Xt5P425	Xt5CN425	Xt5PC425
4.6×300mm	5μm	Xt5B18430	Xt5B8430	Xt5B4430	Xt5NH430	Xt5P430	Xt5CN430	Xt5PC430

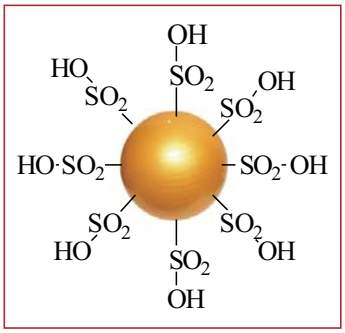
Polymer Particles Based Xtimate™

Xtimate™ Saccharide Columns

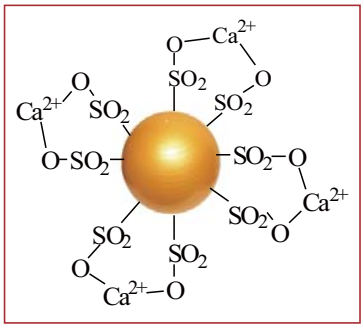
Besides hybrid surface on silica materials, we also developed PS/DVB polymer based materials for saccharide separation in Xtimate™ columns, including

- Saccharide-H
- Saccharide-Ca

Xtimate™ Saccharide phases are consisted of spherical, low cross-linking polystyrene/ divinylbenzene (PS/DVB) particles with their surfaces modified with sulfonic acid (-SO_3H), followed by chelating of calcium ions (Ca^{2+}) or other metal ions. Xtimate™ Saccharide columns have been specifically designed for high resolution separation of carbohydrates, organic acids, Ribavirin, peptides and nucleic acids. The separation mechanism for Xtimate™ Saccharide phases includes ion-exchange and hydrophilic interactions with the analytes. The separation mechanism could also be 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.



Saccharide-H

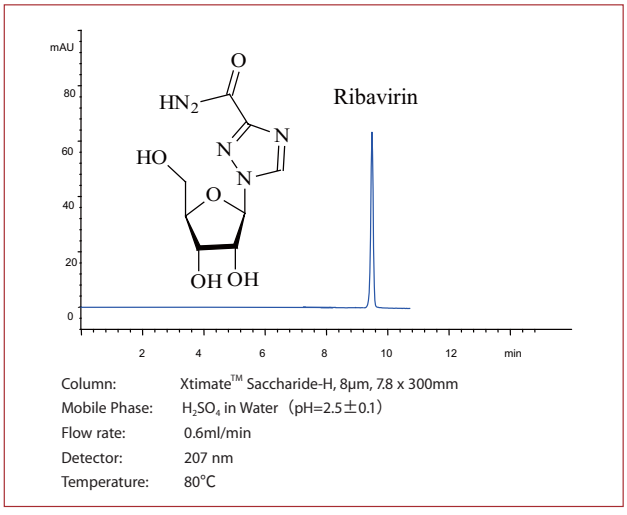


Saccharide-Ca

The PS/DVB support has cross-linking degree of 5%, 8% and 10%. The standard Saccharide packings for analytical applications are 5 μm uniform particles. The Saccharide resin of 8 μm is manufactured for preparative separation applications.

Characteristics of Xtimate™ Saccharide Columns

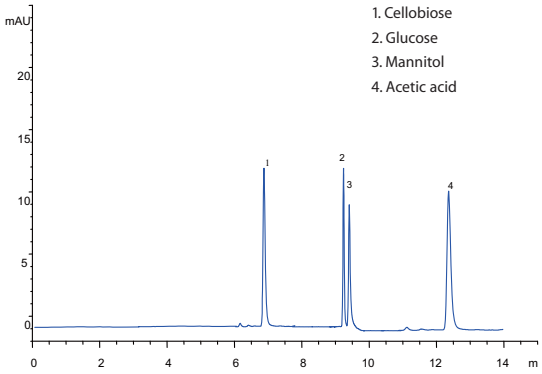
- Compatibility with most aqueous mobile phases, including pure water as the eluent.
- Wide operating-temperature range (20 – 90 ˚C)
- pH range (1-3) for Saccharide -H and (5-9) for Saccharide-Ca phase
- Analytical and preparative columns



Xtimate™ Saccharide-H Column

Xtimate™ Saccharide-H Column is packed with PS/DVB resins with the particle size of 5μm and 8μm. This Saccharide-H Column is used for the Ribavirin detection. 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.

Application for the separation of Cellobiose, Glucose, Mannitol and Acetic acid

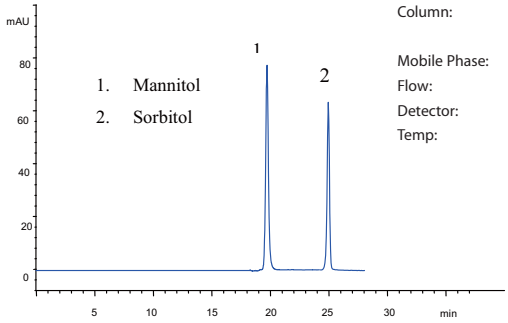


Column: Xtimate™ Saccharide-H, 8μm, 7.8 x 300mm
Mobile Phase: 9mM H_2SO_4
Flow: 0.5ml/min
Detector: UV

Xtimate™ Saccharide-Ca Column

Xtimate™ Saccharide -Ca Column is packed with Ca^{2+} modified PS/DVB resins with the particle size of 5μm and 8μm. The Saccharide -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: Xtimate™ Saccharide-Ca, 8μm, 7.8 x 300mm
Mobile Phase: Water
Flow: 0.5ml/min
Detector: RI
Temp: 80°C

Ordering Information

Dimension	Particle Size	Saccharide -Ca	Saccharide -H
7.8×150mm	5μm	Xt5Ca7815	Xt5H7815
7.8×250mm	5μm	Xt5Ca7825	Xt5H7825
7.8×300mm	5μm	Xt5Ca7830	Xt5H7830
7.8×150mm	8μm	Xt8Ca7815	Xt8H7815
7.8×250mm	8μm	Xt8Ca7825	Xt8H7825
7.8×300mm	8μm	Xt8Ca7830	Xt8H7830