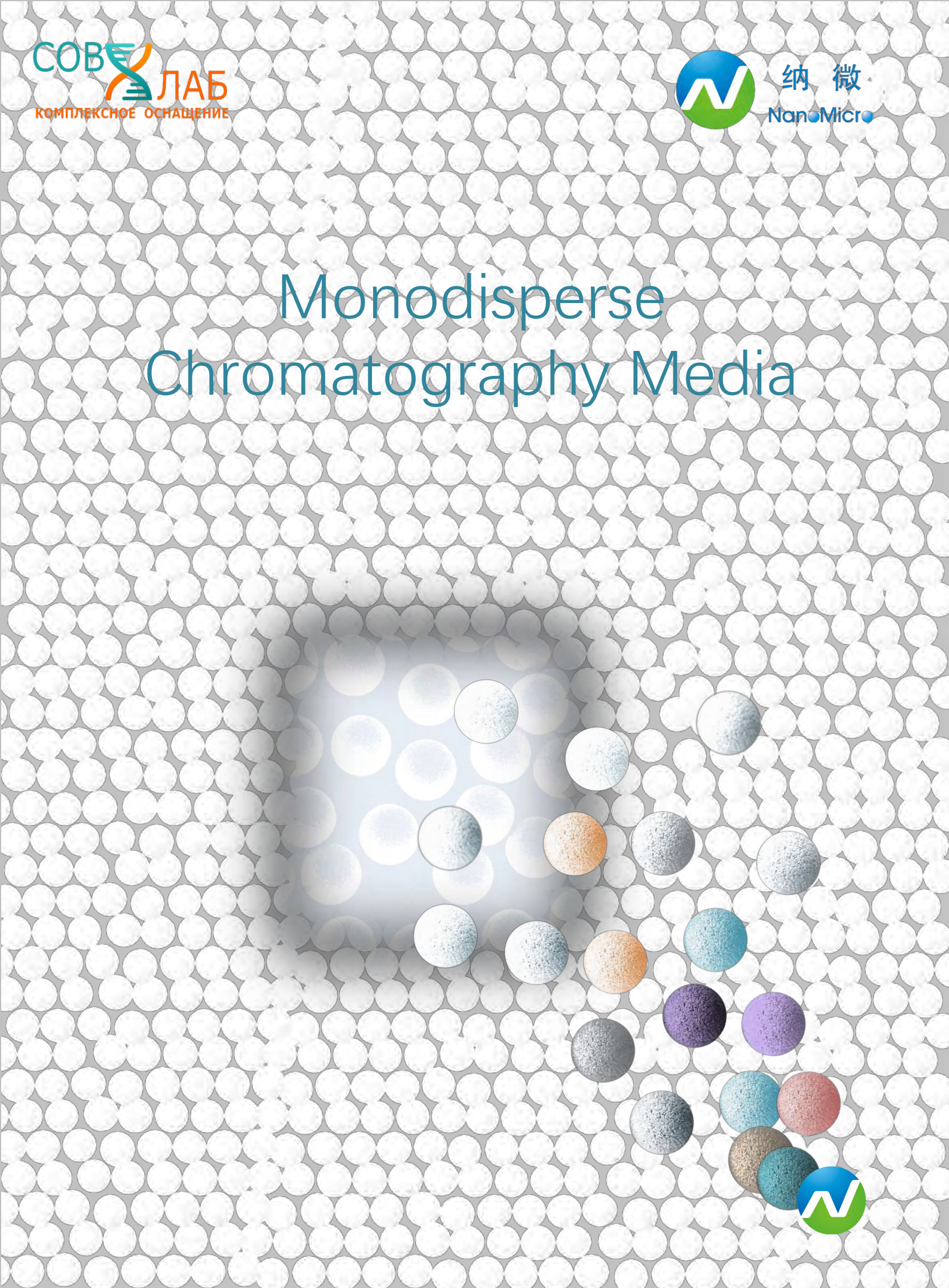
СОВЛАБ
КОМПЛЕКСНОЕ ОСНАЩЕНИЕ

纳 微
NanoMicro

Monodisperse Chromatography Media



Contents

About NanoMicro

Our Development

Established in Biobay, Suzhou in 2007, NanoMicro is leading the world in the manufacture of Mono-disperse Silica and Polymeric Chromatography Media with two ISO9001-certified production sites, one in Nanopolis (13000 sqm) and another in Changshu (26000 sqm) to ensure security of supply for our customers. The maximum production capacity is 110,000L or 24000 kg per year with batch sizes up to 200kg or 1000L.

2019

18000m^2 State-of-the-Art Manufacturing Facility at Changshu

2016

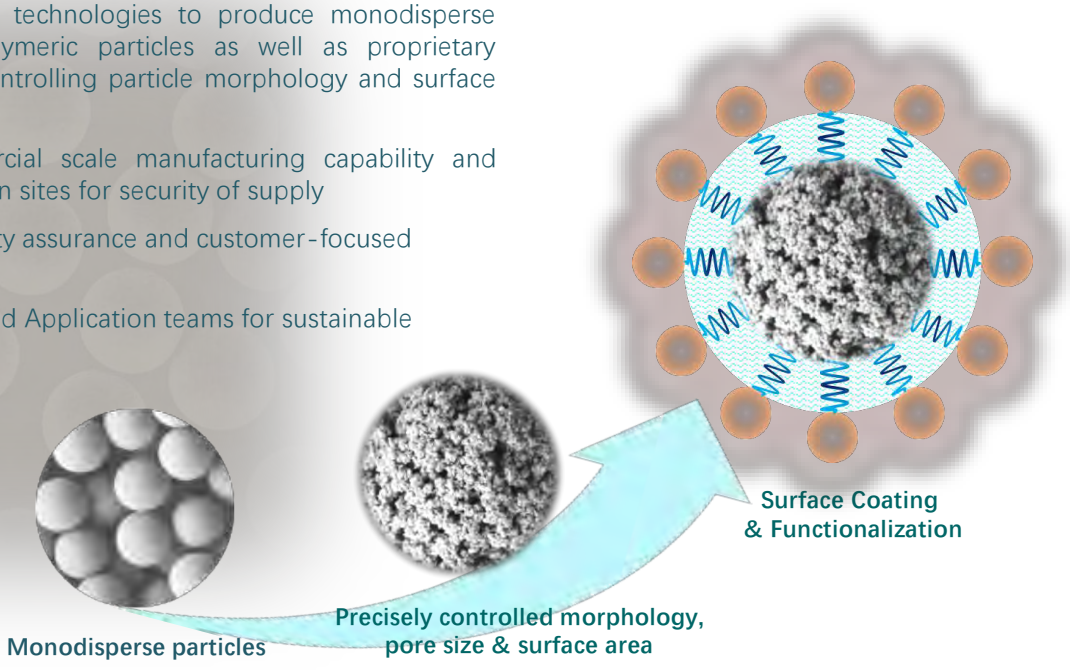
Built 13000 sqm world class R&D and Manufacturing Facility at Nanopolis, Suzhou Industrial Park

2007

Dr Biwang Jiang founded NanoMicro at Biobay, Suzhou Industrial Park

Our Core Technologies & Competence

- World leading technologies to produce monodisperse silica and polymeric particles as well as proprietary expertise in controlling particle morphology and surface chemistry
- Large commercial scale manufacturing capability and dual production sites for security of supply
- Rigorous quality assurance and customer-focused culture
- Strong R&D and Application teams for sustainable innovation



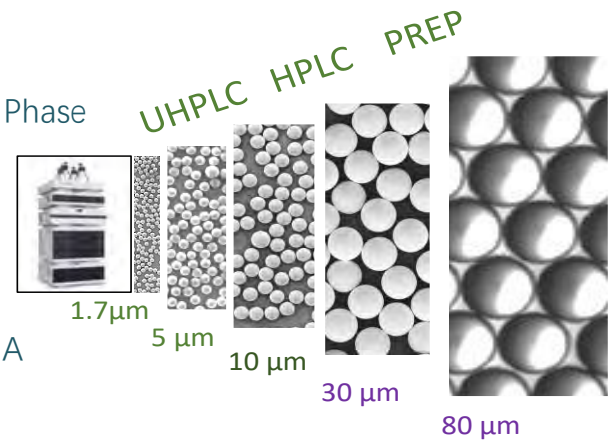
Our Major Products

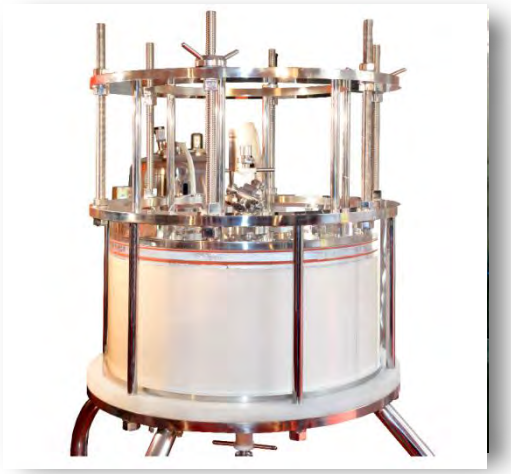
Monodisperse chromatography media of high performance for analytical UPLC & HPLC, preparative and process scale purification, as well as SPE sample preparation.

Matrices:

Silica | Polymeric

- Normal Phase
- RPC
- Chiral
- IEX
- HIC
- Affinity Protein A





Rigorous Manufacturing Process Results in Precise Media for Better Chromatographic Performance

Custom Resin & Chromatography Process Development

NanoMicro also provides services of custom chromatography media development and separation process development. Our dedicated R&D and Application team, "state-of-the art" pilot and manufacturing facilities, and rigorous quality assurance system, provide customers high quality services in a timely manner.

Production Trains

Advanced Process Control System

Application Lab

Our Quality Policy

NanoMicro takes pride in delivering innovative products and services to the highest quality standards. Within NanoMicro we are committed to:

- A clear focus on our customer's needs and satisfaction in all products and services.
- The maintenance of a Quality Management System including quality policies, objectives, and metrics that meet customer requirements while satisfying NanoMicro's business goals.
- Continual improvement in the effectiveness of NanoMicro's Quality Management System.
- Compliance with all applicable regulatory and statutory requirements

These commitments will be met through documented quality objectives, shared quality culture, commitment to performance, and unyielding integrity,


SGS

Certificate CN11/20612

The management system of

SUZHOU NANOMICRO TECHNOLOGY CO., LTD.

2 Baichuan Street, Suzhou Industrial Park, Jiangsu Province, P.R. China

Unified Social Credit Code 91320594667622406H

has been assessed and certified as meeting the requirements of

ISO 9001:2015

For the following activities

Design and manufacture of prepacked chromatographic columns and chromatographic column media (polymer and silica gel media)
Design and manufacture of microspheres used for electronic applications
Design and manufacture of nanometer and micron level standard particles

Further clarifications regarding the scope of this certificate and the applicability of ISO 9001:2015 requirements may be obtained by consulting the organisation

This certificate is valid from 9 December 2018 until 19 October 2020 and remains valid subject to satisfactory surveillance audits.
Recertification audit due a minimum of 60 days before the expiration date.
Issue 4. Certified since 22 October 2011

Authorised by

SGS United Kingdom Ltd
Rossmore Business Park Ellesmere Port Cheshire CH65 3EN UK
t +44 (0)151 350 6666 f +44 (0)151 350 6600 www.sgs.com
The certification information can be verified on the web site of Certification and Accreditation Administration of the People's Republic of China www.cnca.gov.cn

HC SGS 9001:2015 01/18

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SYSTEM CERTIFICATION ISO 9001 SGS

MEMBER OF MULTILATERAL RECOGNITION ARRANGEMENT IAF

UKAS MANAGEMENT SYSTEMS 0005

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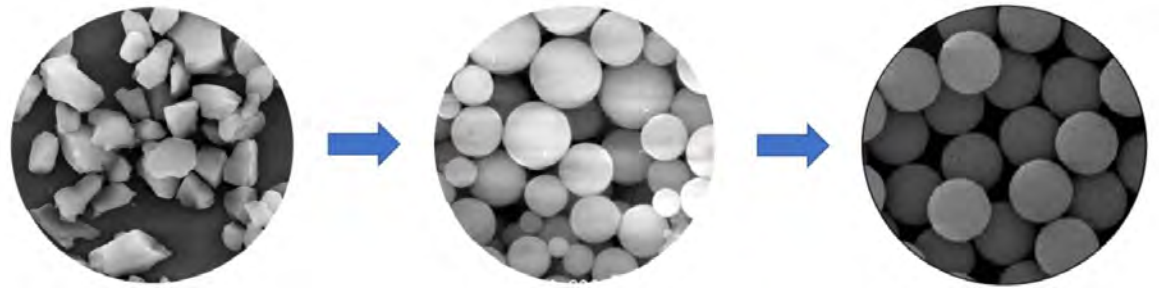
Our Customers Worldwide

NanoMicro products have been used by international companies since 2013. Our customers includes well known international and domestic bio/pharmaceutical companies, API producers and life science companies,

Why Monodisperse?

The significant advances in chromatography have always followed the appearance of enhanced support matrices!

- From 1st generation irregular silica to 3rd generation monodisperse spherical silica media



1st Generation Irregular Silica | 2nd Generation Spherical Silica | 3rd Generation Monodisperse Silica

Overcoming the limitations of polydisperse particle sizes in chromatography

Limitations

Uneven Flow /Diffusion

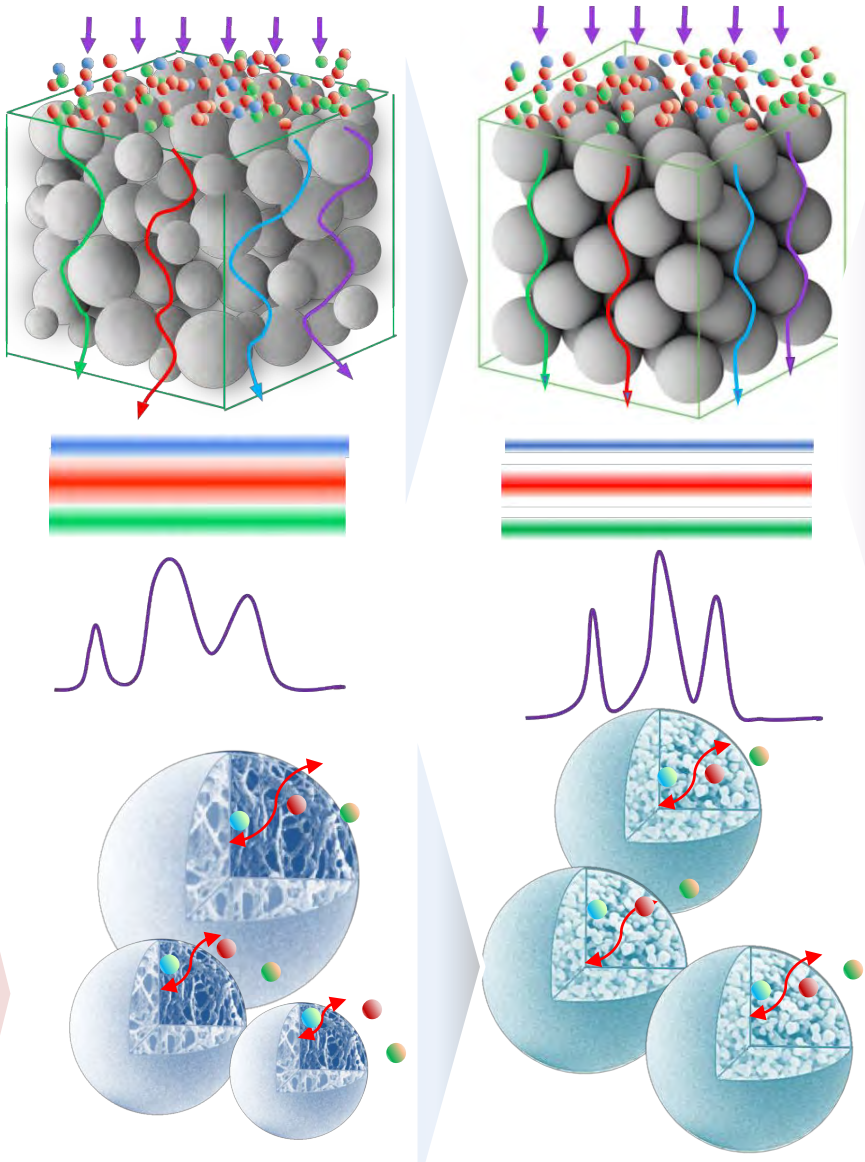
- Uneven flow velocities through the column
- Uneven diffusion pathlength in particles of different size
- Uneven flow path
- Increase Eddy diffusion
- Inefficient mass transfers
- Zone mixing

Band broadening

- Loss in resolution
- Lower chromatographic efficiency
- Loss in recovery
- Poor product quality

Poor Mass Transfer

Diffusion is the main mode of mass transfer in porous particle chromatography. Uneven diffusion pathlengths in different particle sizes and shapes in polydisperse media lead different times of elution of the molecules out of the particles leading to band broadening and consequently a loss in recovery and process economy. This limitation can be overcome by using spherical monodisperse media



Varying diffusion pathlengths in polydisperse particles

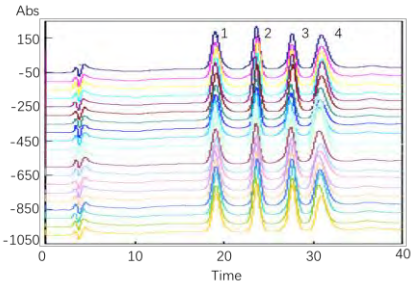
Similar diffusion pathlengths in monodisperse particles

Features/Benefits of NanoMicro Monodisperse Media

Features

- Rigorous manufacturing process resulted in precise and consistent media

Performance



Benefits

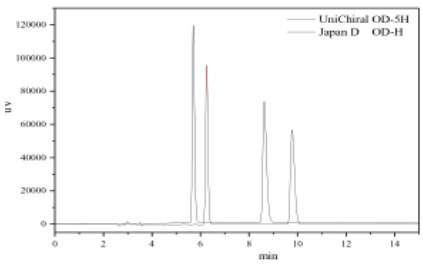
Precise Lot-to-Lot Reproducibility

Highly consistent and reproducible separations of 4 model proteins from 20 consecutive batches of NanoMicro UniPS® 40-300
Samples:
1.. Ribonuclease
2.. Insulin
3.. Lysozyme
4.. BSA

Features

- Uniformed particle size
  - Less band broadening
  - Less Eddy diffusion
  - Less mass transfer resistance

Performance



Benefits

Better HETP & asymmetry

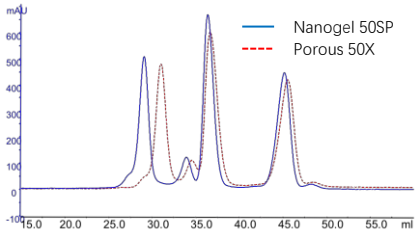
Theoretical Plates		Tailing Factor		α	
UniChiral®	Japan D	UniChiral®	Japan D	UniChiral®	Japan D
16222	15267	1.149	1.214	2.07	2.07
14779	13740	1.345	1.437		

Sample: Trans-Stilbene oxide
Column: UniChiral® OD-5H 4.6×250mm
Mobile phase: Hexane / IPA=9:1
Flow rate: 1mL/min
Detection: UV 254nm
Temperature: 25 ℃

Features

- Optimal pore structure
- Uniformed particle size
- Unique selectivity

Performance



Benefits

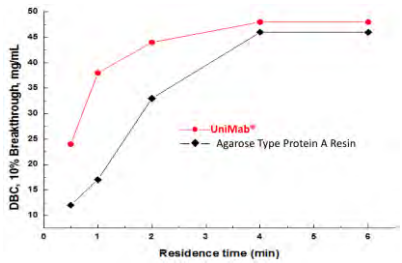
Higher resolution

Column: 4.6x200mm
Buffer A: 20mM MES, pH6.2
Buffer B: 20mM MES/1.0M NaCl, pH6.2
Gradient Elution: 0-100% B, 16CV
Sample: chymotrypsinogen A/ cytochrome C/lysozyme
Flow Rate: 300cm/h

Features

- Optimal pore structure
- Uniformed particle size

Performance



Benefits

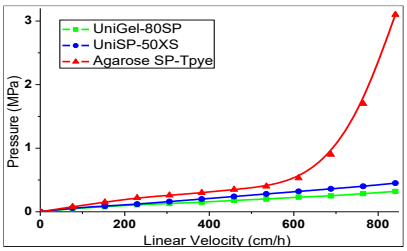
Faster mass transfer, more concentrated elution, and less buffer consumption

NanoMicro UniMab has much higher dynamic binding capacity than Agarose type Protein A at low residence time indicating UniMab has better mass transfer due to more open pore structure.

Features

- Lower back pressure
- Less risk for fouling or clogging
- Possible to use larger mesh size filters/nets

Performance



Benefits

Fast, robust, longer Lifetime

Comparison of Pressure/flow curves of UniGel-80SP vs a top-ranked Agarose analogous and UniPS-50XS, a highly rigid poly(styrene-divinylbenzene) resin (Test column: 4.6×200mm; mobile phase: water; temperature:25°C). System/tubing pressure is excluded.

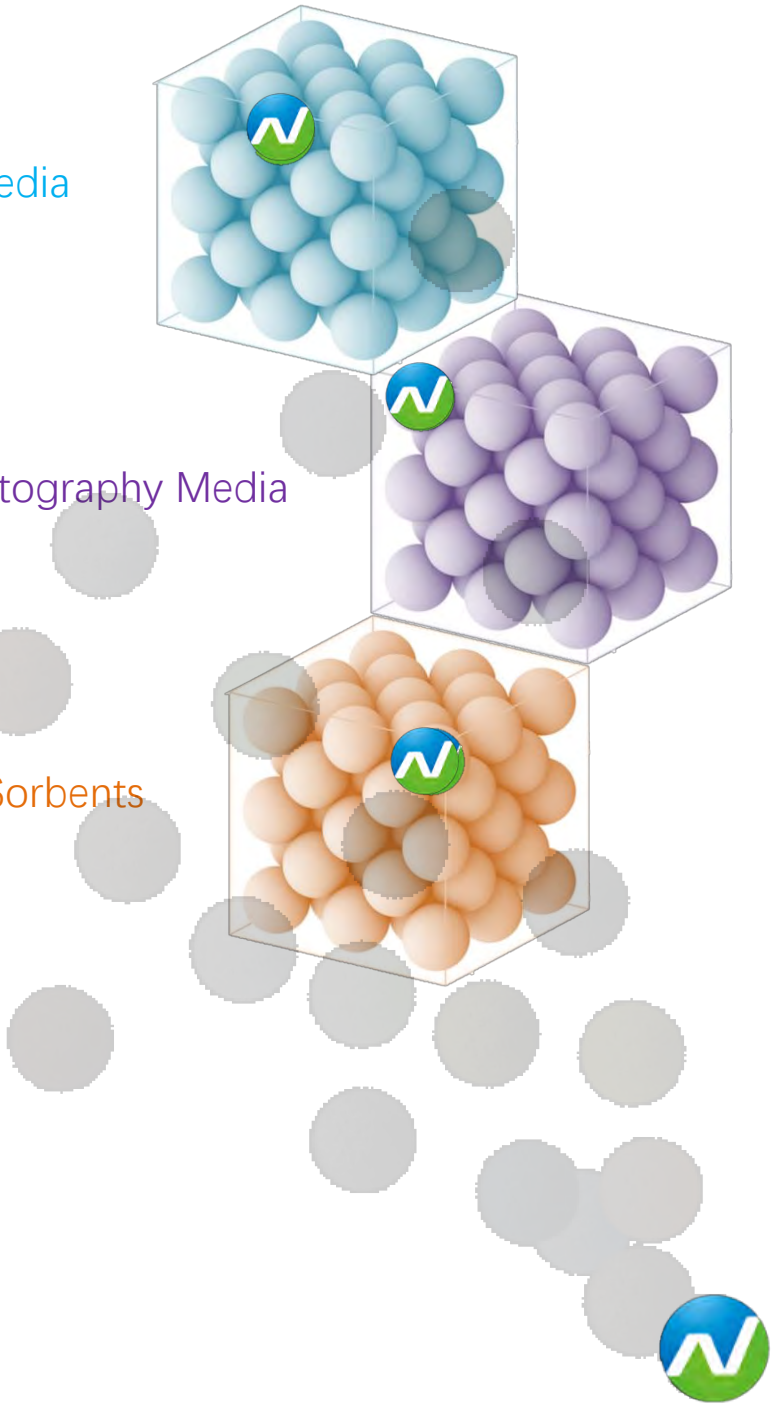
Product Guide

Monodisperse Chromatography Media

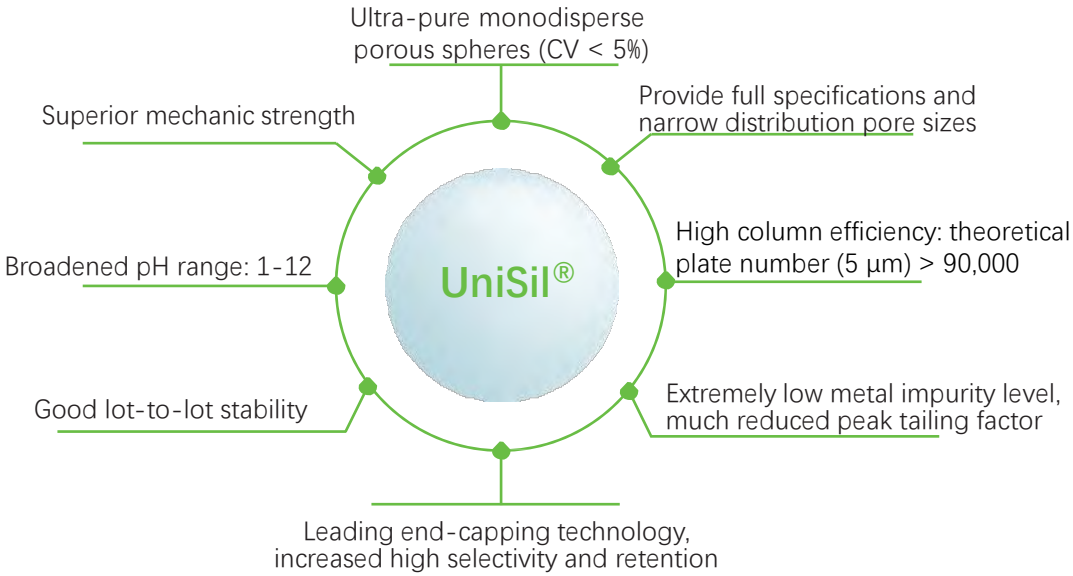
Silica Chromatography Media

Polymeric Chromatography Media

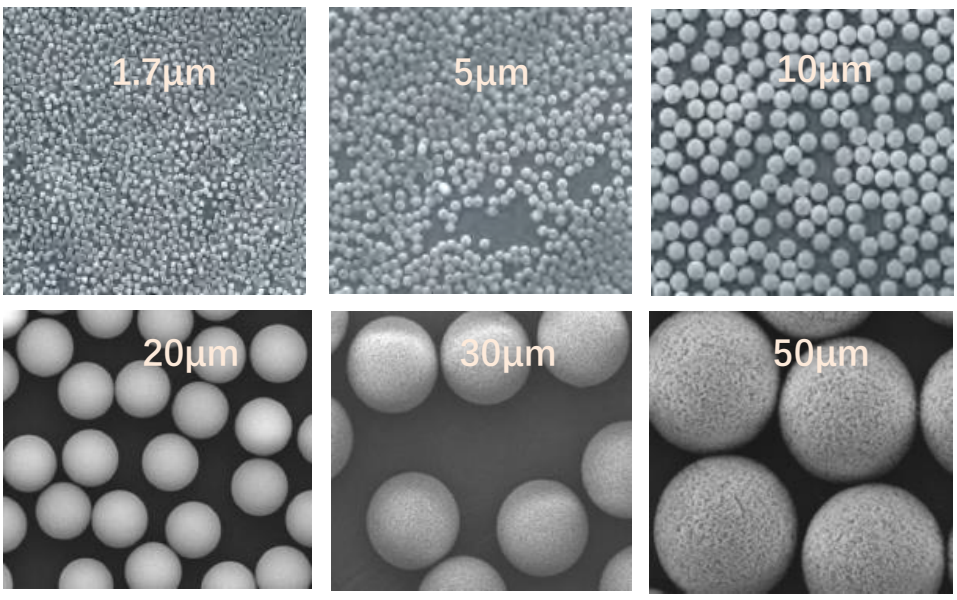
Solid Phase Extraction Sorbents



UniSil® - Silica Based Chromatography Media



UniSil® is a series of monodisperse spherical silica gel designed as matrices for high performance liquid chromatography (HPLC) analysis and purification. Developed by Suzhou NanoMicro with its unique patented technology, all UniSil® products have distinct features such as uniformed particle size, perfectly spherical shape, and outstanding mechanical strength. In addition, NanoMicro's "State-of-the-Art" microsphere precision manufacturing enables UniSil® products excellent lot-to-lot consistency as well as well-tailored pore size and particle size to serve varied application. All these features provide UniSil® products competitive advantages such as high column efficiency, robust column packing and repacking, quality consistency, etc. UniSil® products have already been widely used in both laboratory and industrial scale separation of synthetic compounds, natural products, and many biomolecules. Through strong offering of the UniSil® product line at commercial scale, NanoMicro is proud to be a leading provider of silica chromatography media.



Representative SEM micrographs of UniSil® silica of varied particle sizes. Note their uniformed sizes and perfectly spherical shapes.

Features and Benefits of UniSil® Products

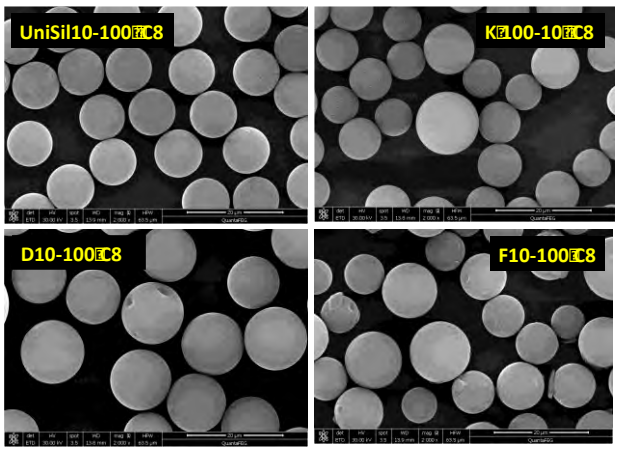
Features	Benefits
High uniformity of particle size and perfect spherical shape	High column efficiency and resolution, low back pressure
High mechanical strength	Robust column packing and repacking, long lifetime
Well-tailored pore and particle sizes	High loading capacity and high selectivity
Unique surface bonding technology	Good acid and alkaline resistance, broad application pH range
Large scale production and lot-to-lot consistency	Consistent product quality, short delivery cycle

Product Highlights

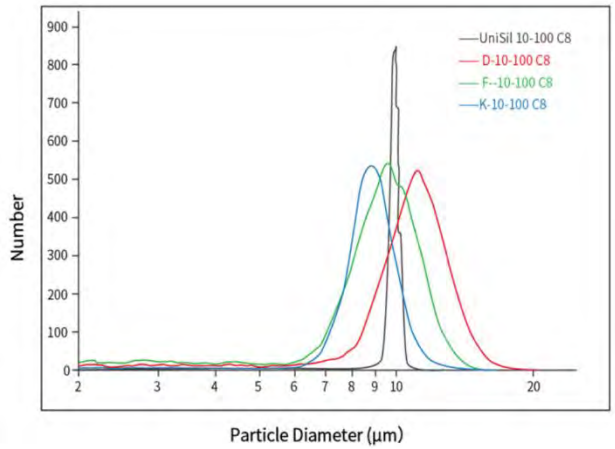
• Uniformed particle size and perfectly spherical shape

Made using the unique patented technologies, all UniSil® silica medias have precise particle sizes with unparalleled high uniformity and perfectly spherical shape. Therefore, UniSil® products have advantages over conventional silica chromatography media, such as high column efficiency and reduced frit plugging risk.

Comparison of UniSil®10-100 C8 and analoques from top ranked international brands

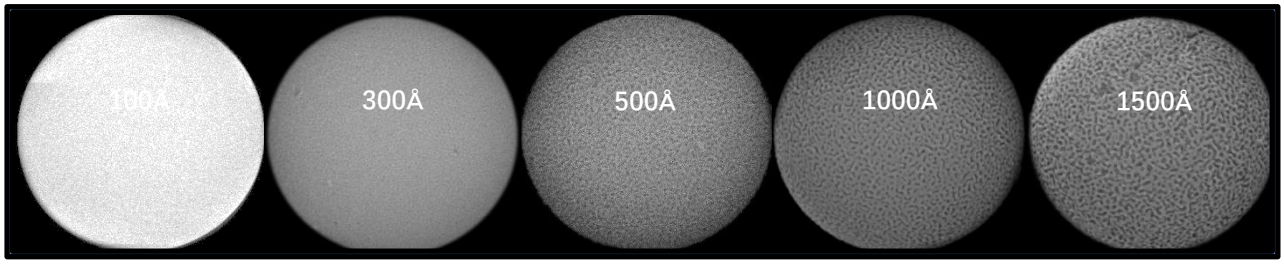


Particle size distribution of UniSil®10-100 C8 and analogues frpm top-ranked international brands



• Well-tailored pore structure

The pore structure of silica gel has a great influence on its mechanical strength, separation ability, and loading capacity. UniSil® products have not only precisely controlled particle size and size distribution, but also offer tailored pore size and pore volume to provide optimal performance for varied chromatography applications.

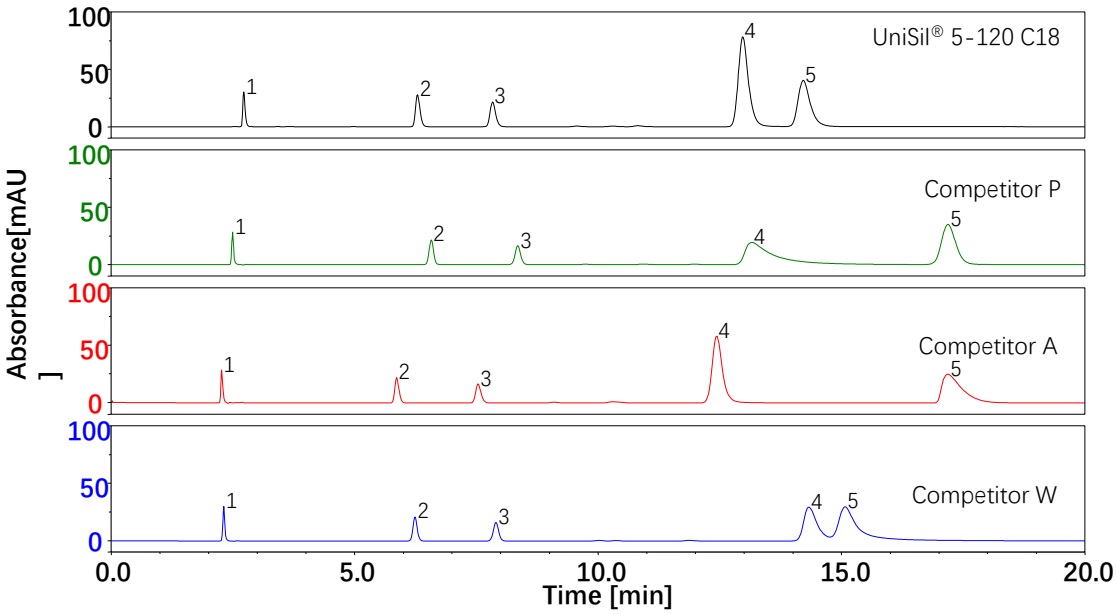


Representative SEM images of UniSil® silica with varied pore sizes.

• High quality surface bonding

In addition to the world leading technology of making silica gel, NanoMicro has developed advanced techniques of surface bonding and end-capping to make bonded phase UniSil® products (C18, C8, C4, Phenyl, NH_2, CN, Diol,etc.) of competitive performance such as high selectivity and high peak symmetry. The sharper and more symmetric peaks of the UniSil® column indicate high quality bonding and end-capping in the product.

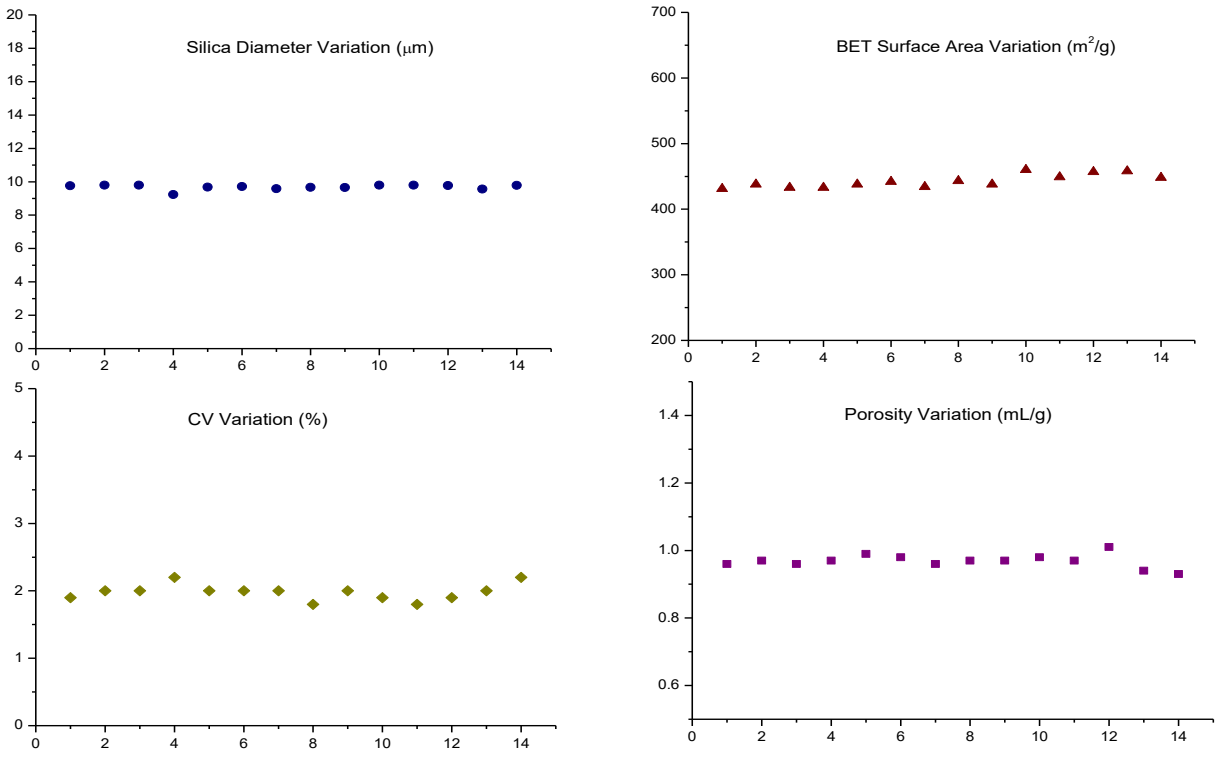
Chromatographic separation of model compounds by UniSil® 5-120 C18 column versus analogues from top-ranked international brands.



• Large scale production capability and lot-to-lot consistency

NanoMicro's state-of-the-art manufacturing facilities and rigorous quality control enable the production of UniSil® media with excellent batch-to-batch consistency and scalability, meeting the demand of today's industrial separation for reproducibility and reliability of supply.

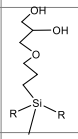
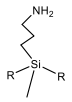
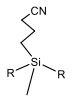
Particle size and BET Characterization run chart of 14 continuous batches of UniSil® 10-120.



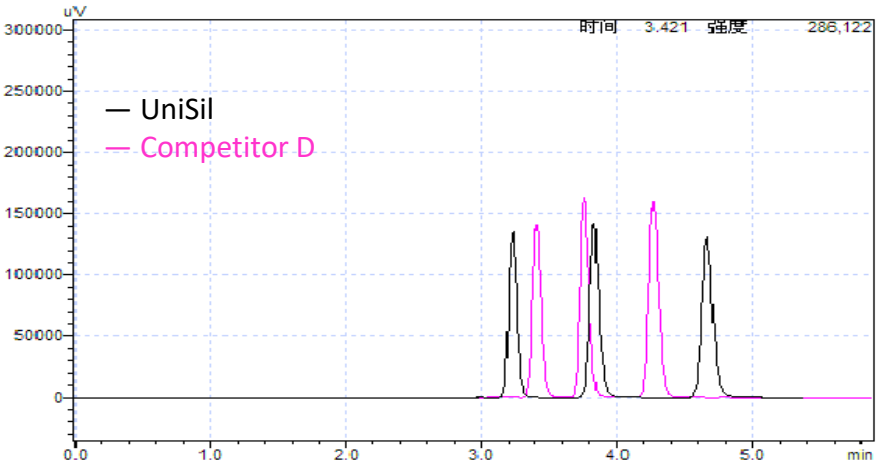
Normal Phase Silica Gels

UniSil® normal phase silica gel from NanoMicro Tech are ultra-high purity monodisperse silica microspheres (purity >99.999%; CV<3%) produced by a patented technology. Polar functional groups richly cover the surface of the microspheres in which the residual metal contents are extremely low thereby enabling optimal retention and symmetrical peaks for excellent resolution. Two types of functional surface are provided: silanol (unbonded) and diol groups that especially suitable for separation of polar compounds with peak tailing.

Product Offering Information

Product Name	Structure of Functional Groups	Particle Size (μm)	Pore Size (Å)	Specific surface area m^2/g	Bulk Density	Carbon Content (%)	pH Rage
UniSil®	/	1.7/2.0/2.7/3/5 /5L/8/10	100	~450	~0.50	/	2~8
			120	~350	~0.50	/	
			200	~200	~0.45	/	
			300	~100	~0.40	/	
			500	~50	~0.40	/	
			1000	~30	~0.40	/	
		15/20/ 30/50	100	~450	~0.50	/	
			120	~350	~0.50	/	
UniSil® Diol		3/5/10	120	~350	~0.50	7	2~8
UniSil® NH_2		3/5/10	120	~350	~0.50	5	2~8
UniSil® CN		3/5/10	120	~350	~0.50	8	2~8

Comparison of UniSil® with top-ranked competitors



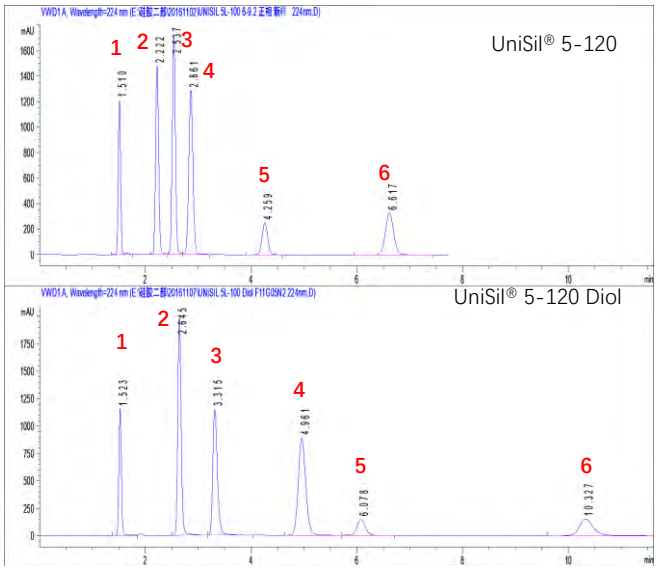
Column: 4.6×250 mm, 5 μm
Sample: Toluene, p-chloronitrobenzene, nitrobenzene
Mobile Phase: n-Hexane /Isopropanol=99.5:0.5
Flow Rate: 1.0 mL/min
Detection: UV 254 nm

Normal Phase Silica Gels

UniSil® Diol Silica Media

UniSil® Diol is supplementary to bare silica media in separation and analysis applications. While gradient elution should be adopted by using bare silica media, a simple isocratic elution will lead to good result by using Unisil® Diol media.

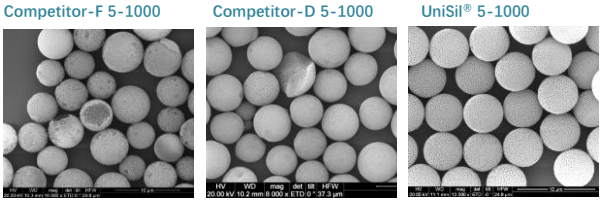
Difference in analysis between UniSil® and UniSil® Diol



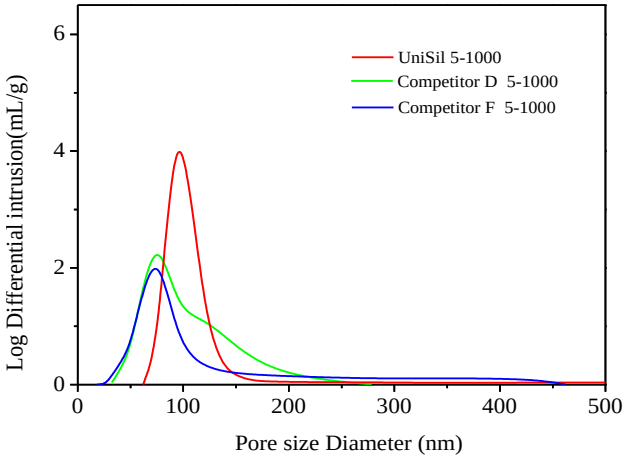
Column:	4.6×250 mm 5μm		
Mobile phase:	n-Heptane/ isopropanol=85:15		
Flow rate:	2ml/min		
Temperature:	20℃ ,		
Detection:	UV 224nm		
Sample:	1, 1,3,5-Tri-tert-butylbenzene	4 , 2,4-Dinitroaniline	
	2, 2-Ethoxyaniline	5, Hydroquinone	
	3, Catechol	6, 4-Nitroaniline	

UniSil® Macroporous Silica Media

UniSil® macroporous silica media is mono-sized silica gels of very large pore sizes. Produced by NanoMicro Tech with its unique proprietary technologies, UniSil® Macroporous has distinct features such as highly uniformed particle size, narrow pore size distribution, high purity and outstanding mechanical strength which enable them to be the ideal chromatography matrices for high mass transfer or large molecule analytes.



SEM of UniSil® 5-1000 and two competitors



Pore size distribution of UniSil® 5-1000 and two competitors

Ordering Information

Series	Cat. No.	Product Name	Diameter μm	Pore Size Å	Package Size
UniSil® Normal Phase	19000-017010	UniSil® 1.7-100	1.7	100	10g, 50g 100g, 500g 1kg
	19000-027012	UniSil® 2.7-120	2.7	120	
	19000-030012	UniSil® 3-120	3	120	
	19000-050012	UniSil® 5-120	5	120	
	19000-080012	UniSil® 8-120	8	120	100g, 500g 1kg, 5kg 10kg, 20kg
	19000-100010	UniSil® 10-100	10	100	
	19000-100012	UniSil® 10-120	10	120	
	19000-200012	UniSil® 20-120	20	120	
	19000-300012	UniSil® 30-120	30	120	
	19000-500012	UniSil® 50-120	50	120	
	19009-050012	UniSil® 5-120 Diol	5	120	10g, 50g 100g, 500g 1kg
	19008-050012	UniSil® 5-120 CN	5	120	
	19005-050012	UniSil® 5-120 NH_2	5	120	
	19009-100012	UniSil® 10-120 Diol	10	120	100g, 500g 1kg, 5kg 10kg, 20kg
	19008-100012	UniSil® 10-120 CN	10	120	
	19005-100012	UniSil® 10-120 NH_2	10	120	
UniSil® Macroporous	19000-030100	UniSil® 3-1000	3	1000	10g, 50g 100g, 500g 1kg
	19000-030150	UniSil® 3-1500	3	1500	
	19000-050100	UniSil® 5-1000	5	1000	
	19000-050150	UniSil® 5-1500	5	1500	
	19000-100100	UniSil® 10-1000	10	1000	
	19000-100150	UniSil® 10-1500	10	1500	

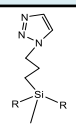
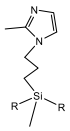
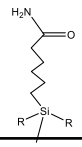
Note: Particle size and/or pore size can be customized upon request.

HILIC Silica Gels

UniSil® HILIC

UniSil® HILIC silica gel is a new generation of HILIC medias developed by NanoMicro's unique technologies of surface passivation and bonding, which enable it with multiple functions such as hydrophilic, separation and distribution. Moreover, up to 60% H_2O solution can be used as mobile phase. UniSil® HILIC is a better choice than reversed phase silica gel for highly polar and hydrophilic molecules, especially for strong alkaline chemicals. It enhanced the sensitivity of LC-MS, due to the high proportion of volatile mobile phases that can be used.

Characteristics of UniSil® HILIC Series of Media

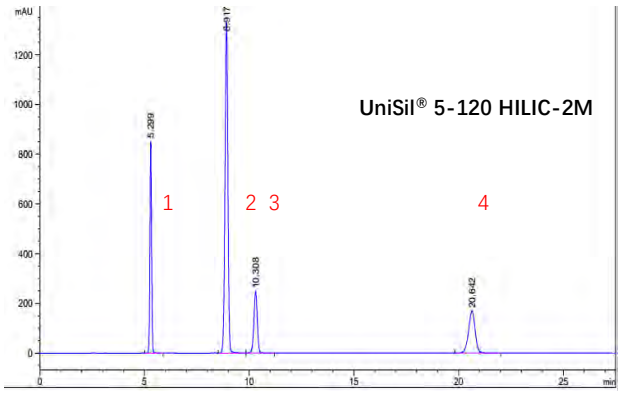
Product Name	Structure of Functional Group	Particle Size (μm)	Pore Size (Å)	Surface Area m^2/g	Bulk Density	Carbon Content (%)	pH Rage	Applications
UniSil® HILIC-T		3/5/10	120	~350	~0.50	5	2-8	Separation of oligosaccharides, glycine and chemicals with similar molecule.
UniSil® HILIC-2M		3/5/10	120	~350	~0.50	6	2-8	Separation of melamine, streptomycin and chemicals with similar molecule.
UniSil® Amide		3/5/10	120	~350	~0.50	5	2-8	Separation of stevioside and chemicals with similar molecule.

Separation of Highly Polar Molecules

UniSil® HILIC are especially suitable for separation of highly polar molecules that are typical challenges for conventional reversed phase chromatography. Many high polarity substances have too weak retentivity in reversed-phase chromatography to be separated (k≈0), but can be easily separated using hydrophilic interaction chromatography.

Comparison of UniSil® 5-120 C18 and UniSil® 5-120 HILIC-2M for separation of highly polar molecules

Column: 4.6×250 mm 5μm
Mobile Phase: Acetonitrile/10mM ammonium acetate=10:90
Flow Rate: 1 mL/min
Temperature: 20℃
Detection: UV 254nm
Sample: 1: Uracil
2: Uridine
3: Adenosine
4: Cytidine

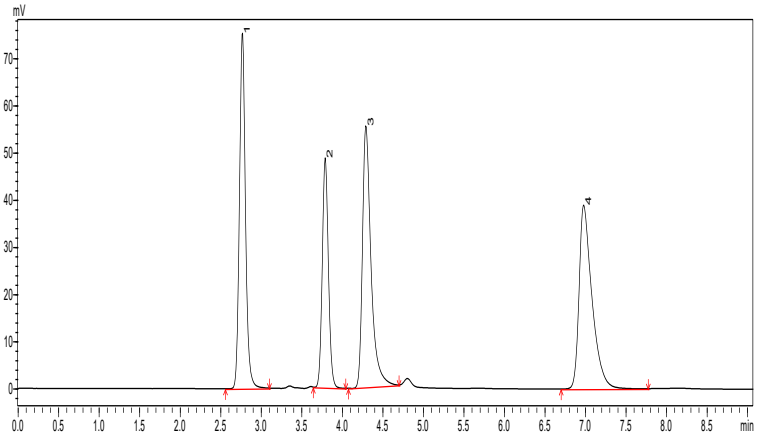


Column: 4.6×250 mm 5μm
Mobile Phase: Acetonitrile/10mM Ammonium Acetate=90:10
Flow Rate: 1 mL/min
Temperature: 20℃
Detection: UV 254nm
Sample: 1: Uracil
2: Uridine
3: Adenosine
4: Cytidine

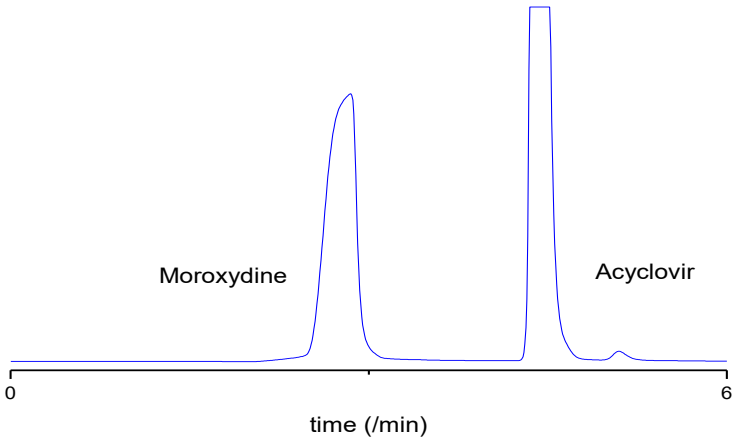
HILIC Silica Gels

The functional group of HILIC-2M is imidazole, which has multiple interaction with analyte such as ion exchange, weak hydrophobic and electrostatic interactions, so it can be used under pure water circumstance.

Application of UniSil® 5-120 HILIC-2M for using pure H_2O as mobile phase



Column: UniSil® 5-120 HILIC-2M 4.6×250mm
Mobile Phase: H_2O
Flow rate: 1mL/min
Temperature: 40℃
Detection: UV 254nm
Sample: 1. Cytosine
2. Thymine
3. 2-Aminopyrimidine
4. 6-Chloroguanine



Column: UniSil® 5-120 HILIC-2M 4.6×250mm
Mobile Phase: H_2O
Flow Rate: 1mL/min
Temperature: 40℃
Detection: UV 254nm
Sample: 1. Moroxydine
2. Acyclovir

Tips: UniSil® HILIC Hydrophilic chromatography is designed for wide pH range. All silica based medias will dissolve slowly in aqueous solution at pH>6. In order to increase column lifetime, it is recommended that the working temperature is below 40℃, the buffer concentration is below 20mM, and high pH buffers such as phosphate and carbonate are not used.

Ordering Information

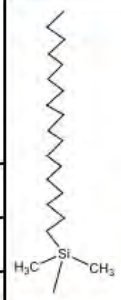
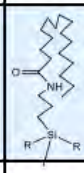
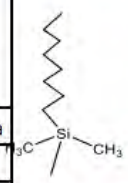
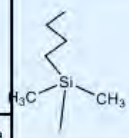
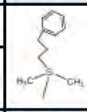
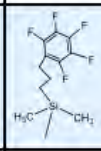
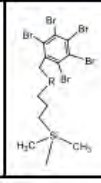
Series	Cat. No.	Product Name	Diameter	Pore Size	Package Size
			μm	Å	
UniSil® HILIC	19012-050012	UniSil® 5-120 HILIC-T	5	120	10g, 50g 100g, 500g 1kg
	19011-050012	UniSil® 5-120 HILIC-2M	5	120	
	19017-050012	UniSil® 5-120 Amide	5	120	
	19012-100012	UniSil® 10-120 HILIC-T	10	120	100g, 500g 1kg, 5kg 10kg, 20kg
	19011-100012	UniSil® 10-120 HILIC-2M	10	120	
	19017-100012	UniSil® 10-120 Amide	10	120	

Note: Particle size and/or pore size can be customized upon request.

Reversed Phase Silica Gels

NanoMicro offers wide selection of reversed phase silica chromatography media based on monodisperse UniSil® matrices. Besides varied bonding phases, different surface modification of UniSil® matrices were employed to provide varied category of RPC silica media products. For example, UniSil® Ultra and UniSil® Ultra Plus are two categories of products for higher pH tolerance. While UniSil® matrices' work pH range is up to 8, UniSil® Ultra and UniSil® Ultra Plus products can extend their work pH range up to 10 and 12 respectively, significantly increasing the lifetime of their performance. The following table summarizes the offering of all NanoMicro's reversed phase silica products.

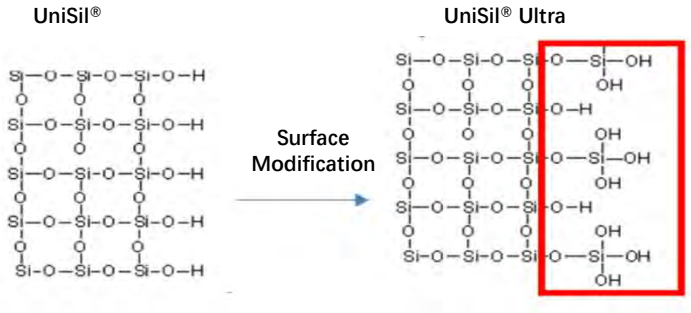
NanoMicro's Offering of Reversed Phase Silica Media

Product Name	Structure of Functional Group	Particle Size (μm)	Pore Size (Å)	Surface Area m^2/g	Bulk Density	Carbon content (%)	pH Range
UniSil® C18		8/10	100	~450	~0.60	17	2~8
			120	~350	~0.55	16	
			200	~200	~0.50	12	
			300	~100	~0.45	7	
		15/20/30/50	120	~350	~0.55	16	
UniSil® C18 Ultra		1.7/3/5/8/10	120	~310	~0.55	16	2~10
UniSil® C18 Ultra Plus		3/5/10	120	~370	~0.55	17	2~12
UniSil® C18 AQ		3/5/10	120	~350	~0.55	15	2~8
UniSil® C18 Polar		3/5/10	120	~350	~0.55	16	2~8
UniSil® C8		8/10	100	~450	~0.55	11	2~8
			120	~350	~0.50	10	
			200	~200	~0.45	7	
		15/20/30/50	120	~350	~0.50	10	
UniSil® C8 Ultra		1.7/3/5/8/10	120	~310	~0.50	10	2~10
UniSil® C8		5/8/10	120	~370	~ 0.50	10	2~12
Ultra Plus			200	~200	~0.45	7	
UniSil® C4		8/10	120	~350	~0.45	6	2~8
			300	~100	~0.40	3	
UniSil® C4 Ultra		1.7/3/5/8/10	120	~310	~0.45	6	2~10
UniSil® Ph		10	120	~350	~0.50	12	2~8
UniSil® Ph Ultra		1.7/3/5/10	120	~310	~0.50	12	2~10
UniSil® PFP		5/10	120	~310	~0.50	12	2~8
UniSil® PBB		5/10	120	~310	~0.50	8	2~8

Reversed Phase Silica Gels

UniSil® Ultra Reversed Phase

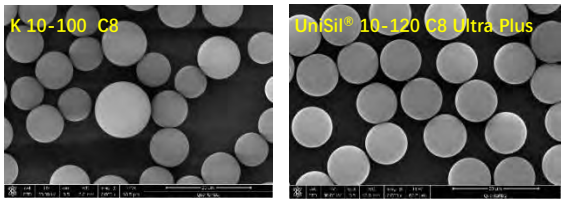
UniSil® Ultra is based on UniSil® silica matrix, but the surface is specially modified as shown in the figure below. Such modification renders improved reversed phase bonding that enhances the alkaline resistance (pH 2-10) and reduce peak tailing issue.



Surface Modification of UniSil® Ultra

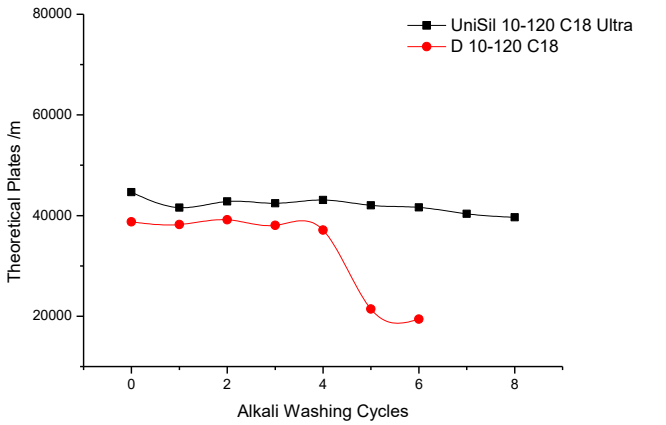
UniSil® Ultra Plus Reversed Phase

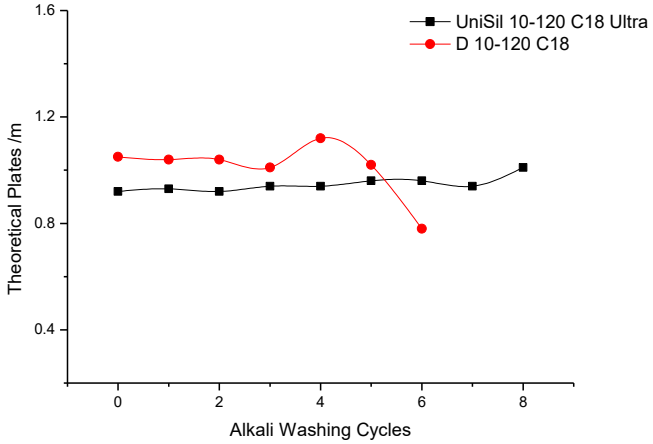
UniSil® Ultra Plus is based on monodispersed silica gel that is surface-treated using proprietary chemistry before the reverse phase surface bonding. This special pre-bonding surface treatment provides UniSil® Ultra Plus reversed phase products extreme chemical stability, extending the work pH range (pH 2-12) and column lifetime.



Comparation of UniSil® 10-120 C8 Ultra Plus with Competitor K 10-100 C8

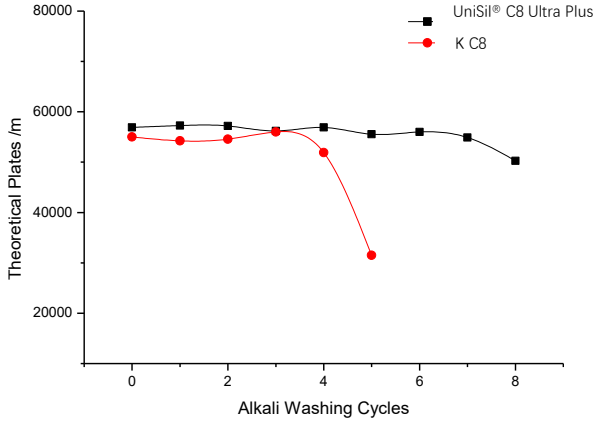
Comparison of UniSil® 10-120 C18 Ultra with D 10-120 C18 on alkaline resistance

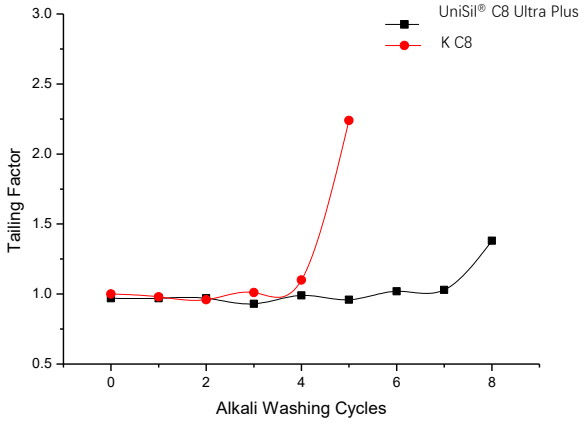




CIP condition:
Mobile phase: MeOH / TEA (pH=10.0) = 40:60
Volume: 60 CV
Analytical condition:
Mobile Phase: ACN / H_2O = 60:40
Temperature: 35 ℃
Sample: Toluene

Comparison of UniSil® C8 Ultra Plus with competitor K C8 on alkaline resistance





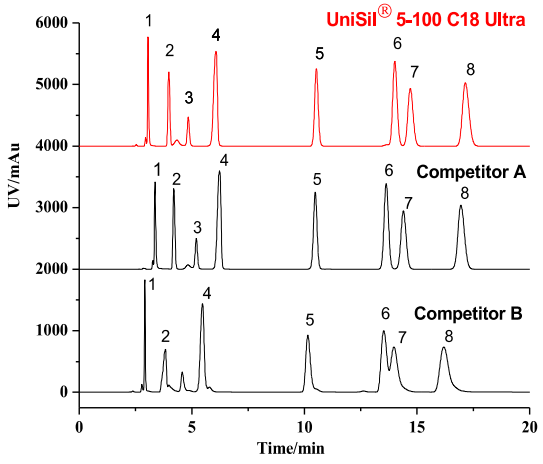
CIP condition:
Mobile phase: MeOH / NaOH (pH=13.0) = 40:60
Volume: 60 CV
Analytical condition:
Mobile phase: ACN / H_2O = 60:40
Temperature: 35 ℃
Sample: Toluene

Reversed Phase Silica Gels

Benefits of UniSil® Reversed Phase Silica Gel:

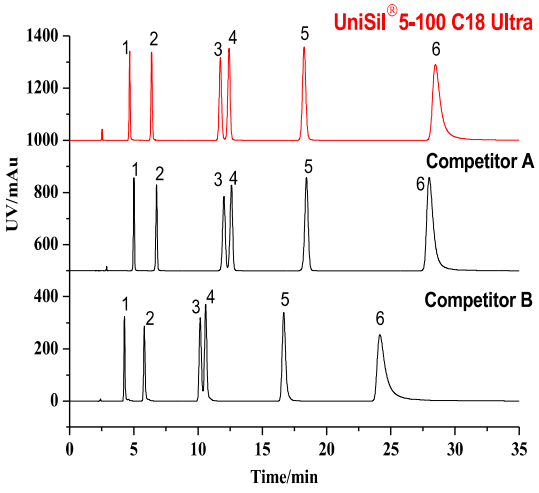
- Large-scale production capacity (200kg/batch) and rigorous quality control system.
- High mechanical strength, high efficiency and high resolution
- A wide variety of bonded phases for applications from analytical to process scale.
- Good acid and alkali resistance
- In-house "State-of-the-Art" manufacturing from bead synthesis, bonding, to end capping enables good control of traceability and lot-to-lot consistency

Comparison of UniSil® C18 and top competitors in the market



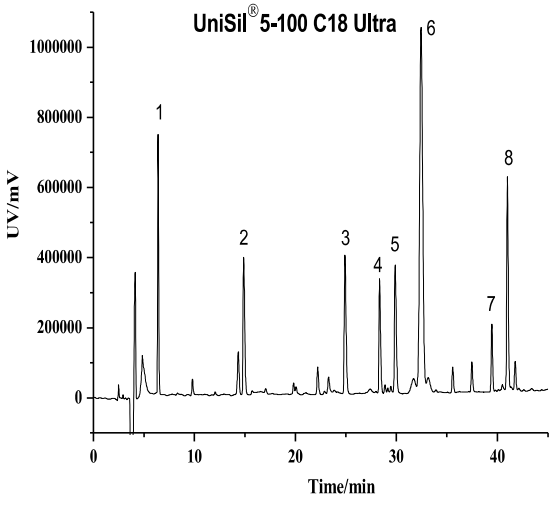
Conditions
Mobile Phase:
ACN/0.1% H_3PO_4 - H_2O=10/90
Flow Rate: 1.0 mL/min
Temperature: 40 C°
Detection: UV 210 nm

Sample:
1, Malonic acid
2, Trans-aconitic acid
3, Citraconic acid
4, p-Aminobenzoic acid
5, Crotonic acid
6, α-Methacrylic acid
7, Mandelic Acid
8, Phthalic acid



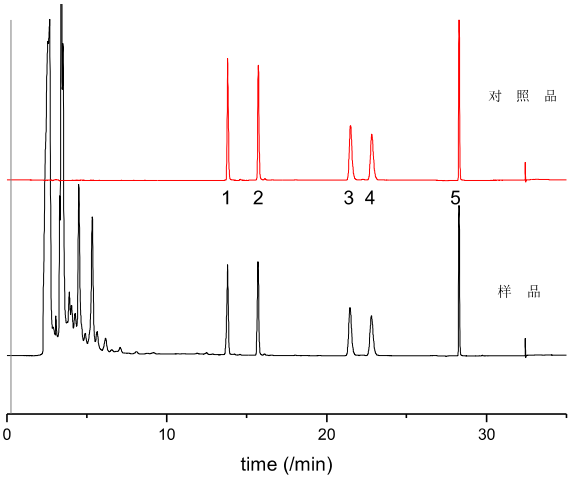
Conditions
Mobile Phase:
NaAc-HAc- H_2O(pH = 4.6)
Flow Rate: 1.0 mL/min
Temperature: 25 C°
Detection: UV 254 nm

Sample:
1, Cytosine
2, Uracil
3, Hypoxanthine
4, Adenine
5, Guanine
6, Thymine



Conditions
Mobile Phase:
0.1% TFA- ACN / 0.1 % TFA-H_2O
Gradient elution:
Flow Rate: 1.0 mL/min
Temperature: 30 C°
Detection: UV 214 nm

Sample :
1, Glycyl
2, Val-Tyr-Val
3, Met-enkephalin
4, Angiotensin II
5, Leuencephalin
6, Ribonuclease
7, Bovine insulin
8, Lysozyme



Conditions
Column: UniSil® 5-120 C18 Ultra
Mobile Phase:
0.1% HCOOH- ACN / 0.1% HCOOH-H_2O
Flow Rate: 1.0 mL/min
Temperature: 30 C°
Detection: UV 330nm

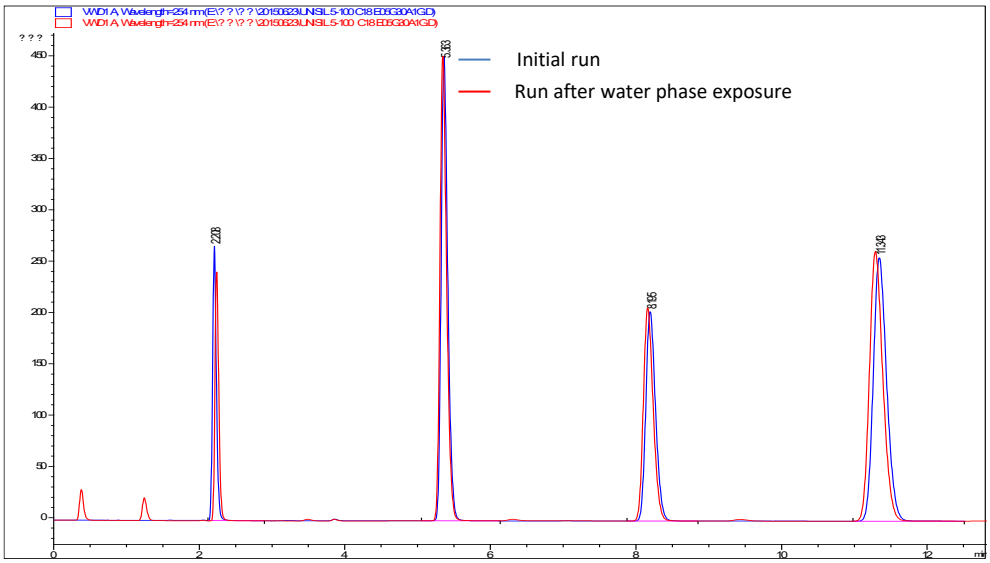
Sample:
1, Amentoflavone
2, Bilobetin
3, Ginkgetin
4, Isoginkgetin
5, Sciadopitysin

Reversed Phase Silica Gels

UniSil® C18 AQ

UniSil® C18 AQ are unique family members of Nanomicro's UniSil® product lines. These reversed phase chromatography media have both a high carbon loading of hydrophobic alkyl groups (C18) and a relatively hydrophilic surface. Such special surface chemistry is designed to allow the hydrophobic phase to remain "wetted" in highly aqueous mobile phases, thereby preventing "phase collapse". Thus they provide reproducible retention and excellent peak shape in highly aqueous eluents even 100% water. In addition, because the alkyl phase remains fully accessible in highly aqueous eluents, they provide stronger retention for polar compounds than conventional C18 stationary phase. Therefore, as compared with conventional C18, UniSil® C18 AQ products provide different selectivity and typically enhance separation of highly polar compounds such as peptides, proteins, and nucleotides.

Chromatographic runs of a UniSil® 5-120 C18 AQ column

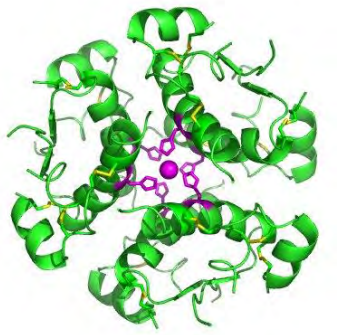


Column: UniSil® 5-120 C18 AQ 4.6*250mm
Mobile phase: MeOH/H_2O = 70 / 30
Flow rate: 1.0 ml/min
Column temperature: 30°C
Detector: UV @ 254 nm
Sample: 1. Uracil 2. Acetophenone 3. Phenol 4. Methyl benzoate

Results: After the water exposure for 2 hours, analyte retention did not change, suggesting the aqueous phase compatibility of UniSil C18 AQ.

In a typical C18 stationary phase the hydrophobic surface is so difficult to infiltrate by highly aqueous eluents that hydrophobic alkyl chains collapse in highly aqueous mobile phase. Such "phase collapse" would render performance lose or unreproducible performance even after reviving with less aqueous eluents. To this end, we have designed a simple water exposure experiment to validate the aqueous phase compatibility of our UniSil® C18 AQ. Specifically, after a routine reversed phase HPLC run of a sample of model compounds using a UniSil 5-120 C18 AQ column, the column was rinsed with 100% water at 1.0 ml/min flow rate for 2 hours. After that, the eluent was converted to the original less aqueous mobile phase to repeat the HPLC run of the same sample. Retention time of model compounds before and after the water exposure are compared. As a result, reproduced retention was observed in our experiment, suggesting that our UniSil® C18 AQ product has good aqueous phase compatibility.

Reversed Phase Silica Gels



Uni® Insulin C8

Uni® Insulin C8 is designed specially for separation and purification of insulins. It is made with monodispersed UniSil® Ultra Plus matrix as well as Nanomicro's proprietary end-capping and bonding technologies, enabling it with high mechanic strength, good resolution, high recovery and excellent alkalic resistance(pH 2-12).

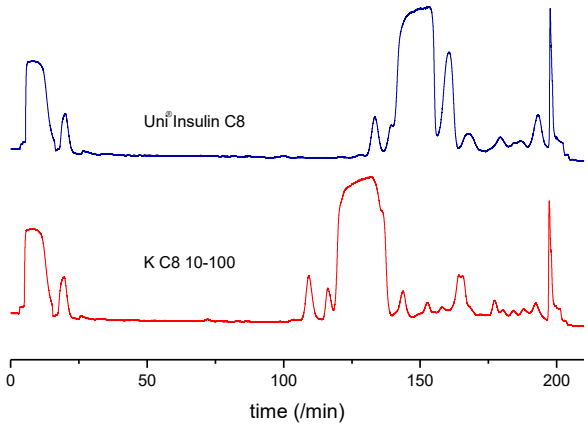
Purification of Recombinant Human Insulin

	K C8 10-100	Uni®Insulin C8
Crude sample	86.7 %	
Sample Load	8 mg/g	
Purity	99.46 %	99.41 %
Yield	62.1 %	73.6 %

Purification of Degludec Insulin

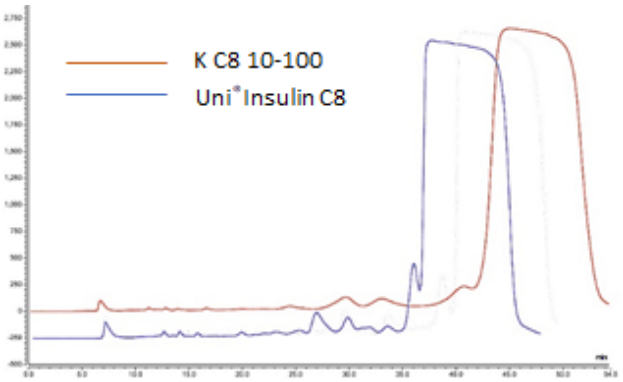
	K C8 10-100	Uni®Insulin C8
Crude sample	96.4 %	
Sample Load	12.5 mg/g	
Purity	99.01 %	99.07 %
Yield	67.0 %	70.8 %

Purification of Recombinant Human Insulin



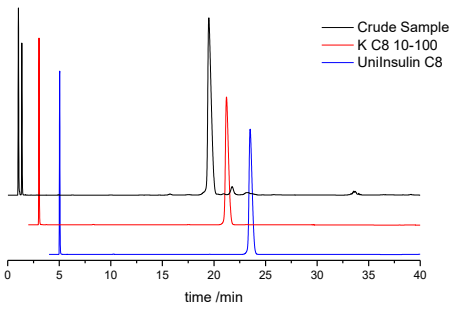
Column: UniSil® 3-120 C4 4.6×100mm
Mobile phase:
A: 50mM NaH_2PO_4 (H_3PO_4 pH=2.5)
B: Solution A/ACN=50:50
Gradient elution
Detection: UV 220nm
Flow rate: 1mL/min
Sample size: 5μL

Purification of Degludec Insulin

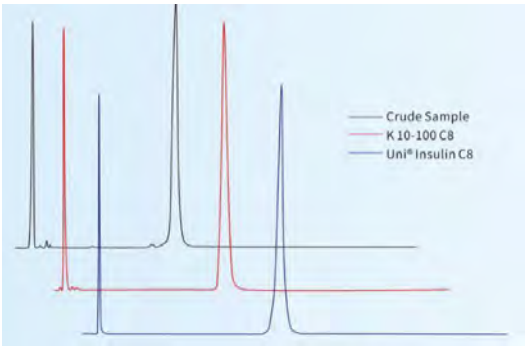


Column: UniSil® 3-120 C8 4.6×150mm
Mobile phase:
A: Na_2SO_4+ NaH_2PO_4 (pH=5.7)
B: H_2O/ACN=50:50
Gradient elution
Detection: UV 214nm
Flow rate: 1mL/min
Sample size: 10μL

Analysis of Recombinant Human Insulin



Analysis of Degludec Insulin



Reversed Phase Silica Gels

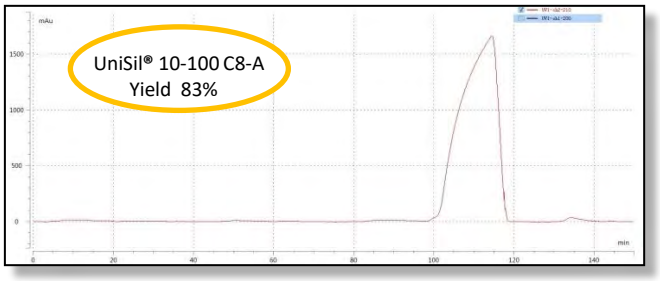
Customized Reversed Phase Silica Media

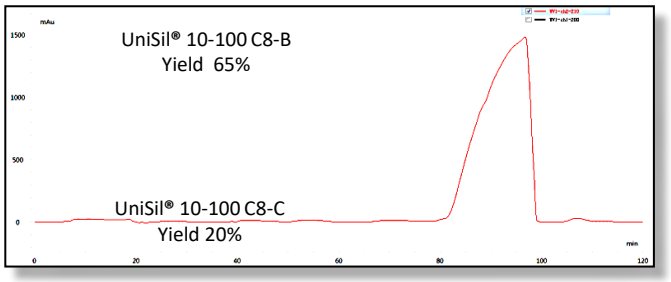
Besides routine product offering, NanoMicro also provides flexibility to develop customized reversed phase silica media to maximize purification performance accordingly for different customer requirements. For example, we have developed different customized C8 silica media for the purification of Oristat of two different customers, According to their specific purification requirements, two C8 products of different specification provided optimal results for the same drug of these two different customers respectively.

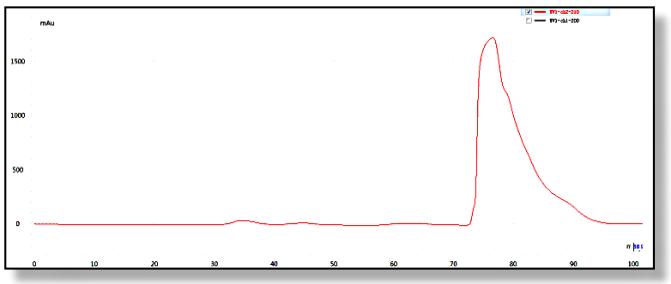
Purification of Orlistat for Customer A

Requirements by Customer A

- Mobile phase must be Method/Water
- Content of isomer(RRT=0.96) ⩽0.15%
- Increase yield against sample size remains at 13mg/g





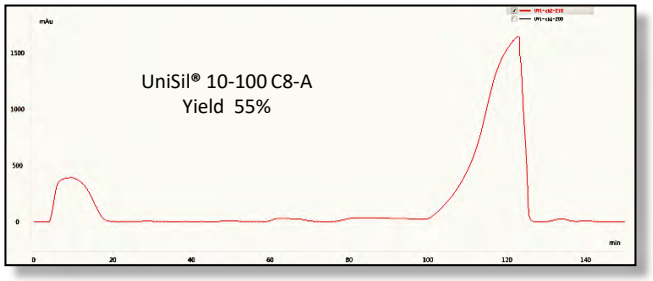


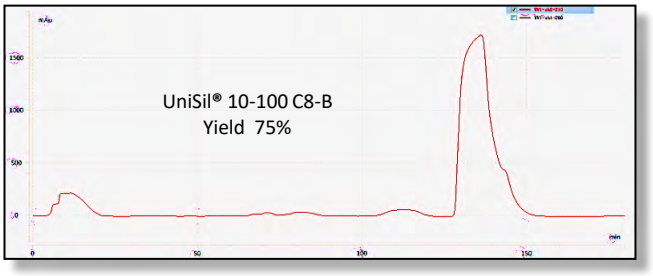
Result
UniSil® 10-100 C8-A has the best result.

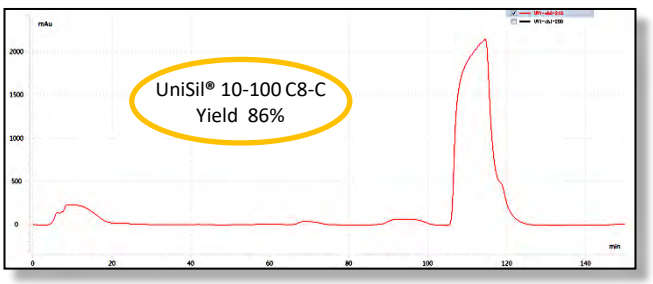
Preparation of Orlistat for Customer B

Requirements by Customer B

- Mobile phase must be Method/Water
- Single impurity ⩽0.1%
- Total impurities ⩽1.0%
- Increase yield against sample size remains at 13mg/g





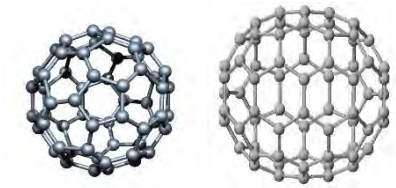


Result
UniSil® 10-100 C8-C has the best result.

Reversed Phase Silica Gels

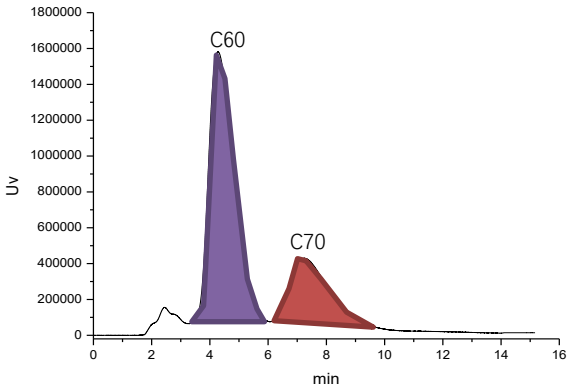
UniSil® PBM and PTZ for Fullerene

The separation of C60 and C70 from fullerenes mixture is very challenging because they have similar physical and chemical properties. Nanomicro has introduced two specialty reversed phase silica media, UniSil® PBM and UniSil® PTZ, for the separation of fullerenes.



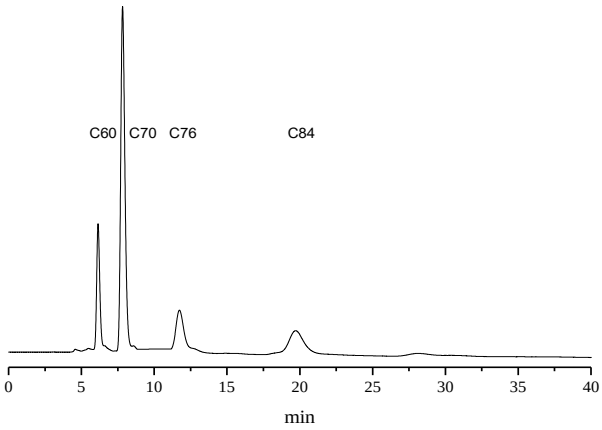
C60 C70

Prurification of C60 and C70 with UniSil® PBM



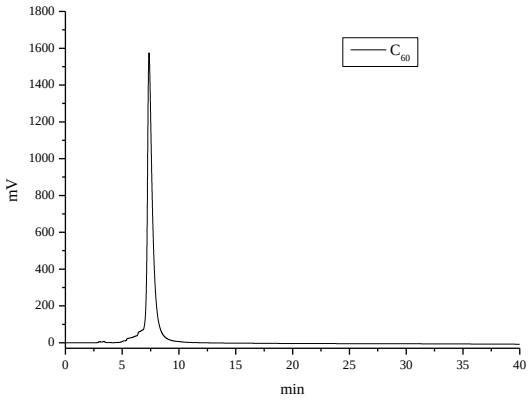
Sample: Fullerene(dissolved in Xylene)
Column: UniSil® PBM 15×310mm
Mobile phase: Toluene
Detection: UV 310nm
Sample size: 3ml

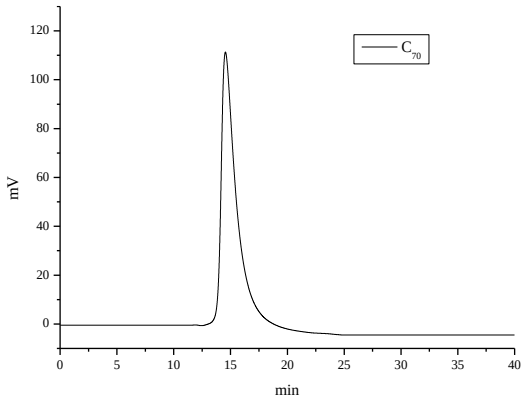
Purification of C60 and C70 with UniSil® PTZ



Sample: High-carbon Fullerene
Column: UniSil PTZ 4.6×250mm 10um
Mobile phase: Toluene
Detection: UV 310nm
Sample size: 5μL

Analysis of C60 and C70





Sample: C60 and C70
Column: UniSil® PBM 4.6×250mm 10um
Mobile phase: Toluene
Detection: UV 310nm
Sample size: 100μL

Features and Benefits of UniSil® PBM and UniSil® PTZ

- Monodispersed uniformed spherical silica matrix(5μm, 10μm) and unique bonding technology resulting in good specific surface area and binding capacity.
- Excellent selectivity
- Stable in organic solvents such as toluene, xylene and chloro-benzene.
- Low back pressure

Reversed Phase Silica Gels

Ordering Information

Series	Cat. No.	Product Name	Diameter	Pore Size	Package Size
			μm	Å	
UniSil® Reversed Phase	19001-017012	UniSil® 1.7-120 C18	1.7	120	10g 50g 100g 500g 1kg
	19001-030012	UniSil® 3-120 C18	3	120	
	19001-050012	UniSil® 5-120 C18	5	120	
	19001-060012	UniSil® 5L-120 C18	5	120	
	19001-080012	UniSil® 8-120 C18	8	120	100g 500g 1kg 5kg 10kg 20kg
	19002-080012	UniSil® 8-120 C8	8	120	
	19001-100010	UniSil® 10-100 C18	10	100	
	19001-100012	UniSil® 10-120 C18	10	120	
	19001-100020	UniSil® 10-200 C18	10	200	
	19001-100030	UniSil® 10-300 C18	10	300	
	19006-100012	UniSil® 10-120 C18 AQ	10	120	
	19004-100012	UniSil® 10-120 C18 Polar	10	120	
	19002-100012	UniSil® 10-120 C8	10	120	
	19003-100012	UniSil® 10-120 C4	10	120	
	19001-150012	UniSil® 15-120 C18	15	120	
	19001-200012	UniSil® 20-120 C18	20	120	
	19001-300012	UniSil® 30-120 C18	30	120	
	19001-500012	UniSil® 50-120 C18	50	120	

Note: Particle size and/or pore size can be customized upon request.

Reversed Phase Silica Gels

Ordering Information

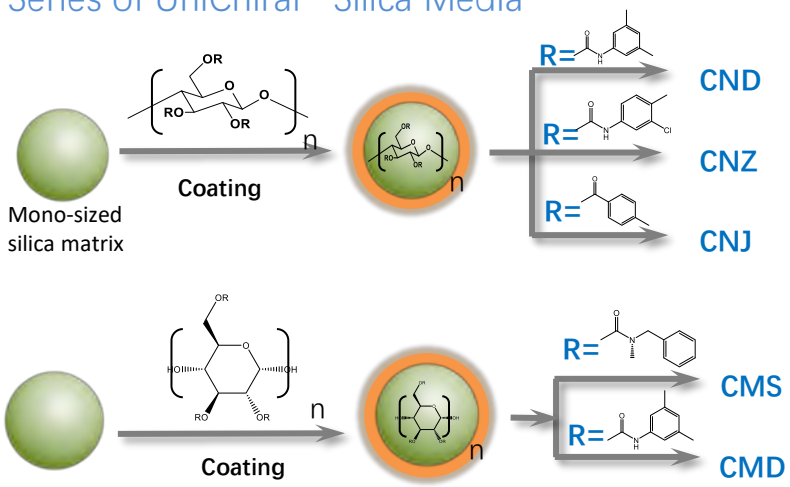
Series	Cat. No.	Product Name	Diameter	Pore Size	Package Size
			μm	Å	
UniSil® Ultra	19101-080012	UniSil® 8-120 C18 Ultra	8	120	100g 500g 1kg 5kg 10kg 20kg
	19102-080012	UniSil® 8-120 C8 Ultra	8	120	
	19100-100012	UniSil® 10-120 Ultra	10	120	
	19101-100012	UniSil® 10-120 C18 Ultra	10	120	
	19102-100012	UniSil® 10-120 C8 Ultra	10	120	
	19103-100012	UniSil® 10-120 C4 Ultra	10	120	
	19107-100012	UniSil® 10-120 Ph Ultra	10	120	
UniSil® Ultra Plus	19201-080012	UniSil® 8-120 C18 Ultra Plus	8	120	
	19202-080012	UniSil® 8-120 C8 Ultra Plus	8	120	
	19201-100012	UniSil® 10-120 C18 Ultra Plus	10	120	
	19202-100012	UniSil® 10-120 C8 Ultra Plus	10	120	
Uni®Insulin	14001-000010	Uni® InsulinC8 Type A	/	/	100g, 500g, 1kg 5kg, 10kg, 20kg
	14001-000011	Uni® InsulinC8 Type B	/	/	
UniSil® Fullerene	19020-050012	UniSil® 5-120 PBM	5	120	100g, 500g 1kg, 5kg 10kg, 20kg
	19020-100012	UniSil® 10-120 PBM	10	120	
	19021-050012	UniSil® 5-120 PTZ	5	120	
	19021-100012	UniSil® 10-120 PTZ	10	120	

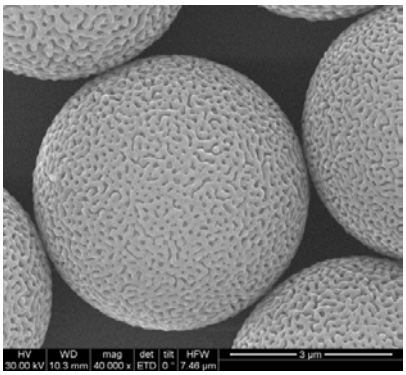
Note: Particle size and/or pore size can be customized upon request.

Chiral Chromatography Media

UniChiral® is a family of polysaccharide chiral chromatography media based on NanoMicro's unique silica matrix with monodispersed particle size and large pore morphology. This product line includes CND, CNJ, CNZ, CMS, and CMD five series that employ Cellulose and Amylose respectively as surface coating for the derivatization of varied chiral selector phases. They provide a variety of complementary selectivity that allow you to screen for the most effective chiral separation and purification. While the 5 µm and 10 µm are routine catalogue offering, other particle sizes can be customized upon request. Besides UniChiral® bulk media, NanoMicro also offers their HPLC columns for analytical and semi-preparative purification applications. UniChiral® products are very affordable and highly competitive in quality and performance. They will make your chiral separation experience easy and productive.

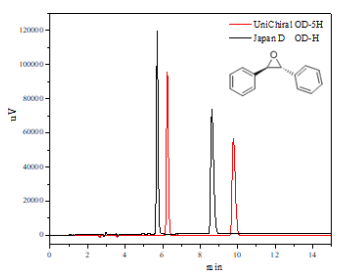
Series of UniChiral® Silica Media





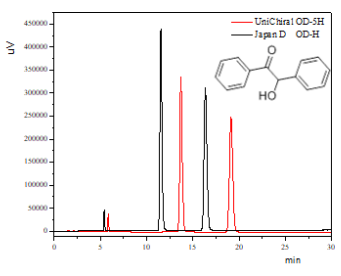
SEM of 5µm UniChiral® silica matrix. Note its mono-sized feature and large pore morphology

Chiral Separation Benchmarking of UniChiral® CND and Its Competitor



Sample: Trans-Stilbene oxide
Column: UniChiral® CND-5H 4.6×250mm
Mobile phase: Hexane / IPA=9:1
Flow rate: 1mL/min
Detection: UV 254nm
Temperature: 25 ℃

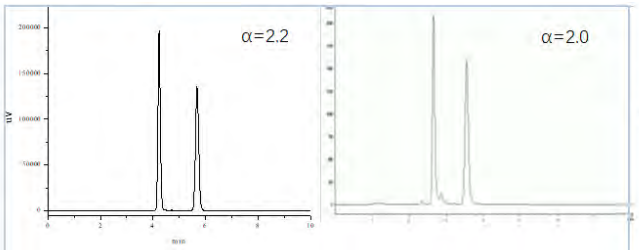
Theoretical Plates		Tailing Factor		α	
UniChiral®	Japan D	UniChiral®	Japan D	UniChiral®	Japan D
16222	15267	1.149	1.214	2.07	2.07
14779	13740	1.345	1.437		



Sample: Benzoin
Column: UniChiral® CND-5H 4.6×250mm
Mobile phase: Hexane / IPA=9:1
Flow rate: 1mL/min
Detection: UV 254nm
Temperature: 25 ℃

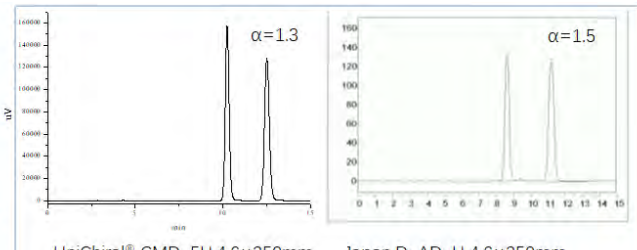
Theoretical Plates		Tailing Factor		α	
UniChiral®	Japan D	UniChiral®	Japan D	UniChiral®	Japan D
11899	12219	1.167	1.197	1.50	1.56
12707	12150	1.114	1.154		

Chiral Separation Benchmarking of UniChiral® CMD and Its Competitor



UniChiral® CMD-5H 4.6×250mm Japan D AD-H 4.6×250mm

Sample: Furoin
Mobile phase: EtOH
Flow rate: 1mL/min
Detection: UV 270nm
Temperature: 25 ℃



UniChiral® CMD-5H 4.6×250mm Japan D AD-H 4.6×250mm

Sample: 2,2,2-trifluoro-1-(9-anthryl) ethanol
Mobile phase: Methanol
Flow rate: 1 mL/min
Detection: UV 270nm
Temperature: 25 ℃

Chiral Chromatography Media

UniChiral® Highlights

- Highly competitive enantioselectivity and column efficiency
- Innovative silica technologies provides superior product lifetime and characteristic of low back pressure.
- In-house silica matrix production, polysaccharide coating, chiral phase functionalization, and column packing provide us complete control of our product quality and traceability
- Very affordable prices and highly competitive in quality and performance

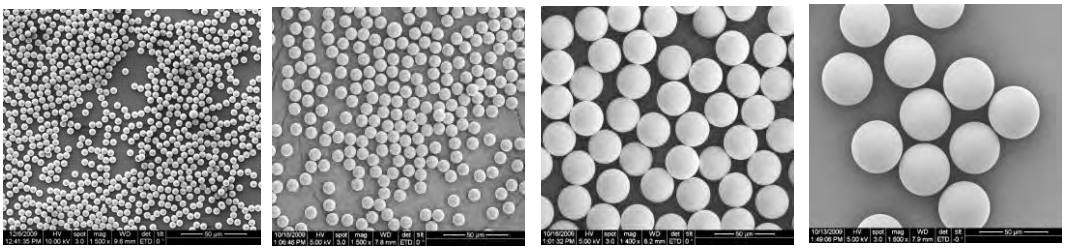
Ordering Information

Catalogue No.	Product Name	Particle Size	Bulk Media Package Size Options	UniChiral® Column Size Options	
				ID (mm)	Length (mm)
21210-005100	UniChiral CND-5H	5 μm	/	21.2 10.0 4.6	250 150
21230-005100	UniChiral CNJ-5H	5 μm			
21110-005100	UniChiral CND-5RH	5 μm			
21130-005100	UniChiral CMS-5H	5 μm			
21120-005100	UniChiral CNZ-5H	5 μm			
21210-010100	UniChiral CMD-10H	10 μm	100g、500g、1Kg、5Kg、10Kg、20Kg	21.2 10.0 4.6	250 150
21230-010100	UniChiral CMS-10H	10 μm			
21110-010100	UniChiral CND-10H	10 μm			
21130-010100	UniChiral CNJ-10H	10 μm			
21120-010100	UniChiral CMZ-10H	10 μm			

Please contact your sales representative for bulk media package sizes or column sizes that are not listed above

Reversed Phase Chromatography Resins

Reverse phase chromatography (RPC) resins are important alternatives to silica-based RPC media as they have different selectivity, high capacity and wide pH stability range. UniPS®, UniPMN, and UniPMM are the major components of NanoMicro Tech's polymeric RPC bulk media product lines. All of them are monodispersed, rigid divinylbenzene or methacrylic copolymer beads developed with proprietary precision microsphere technologies. They are designed for high resolution and high capacity RPC purification of a wide range of materials, from natural products, peptides, oligonucleotides to large proteins.



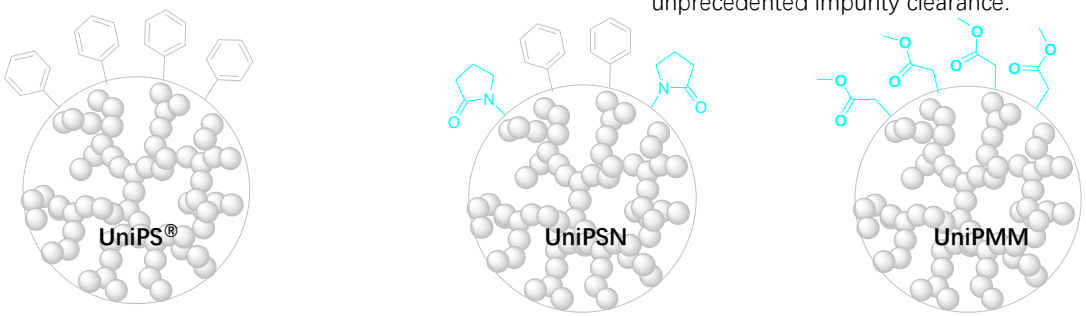
Representative SEM of UniPS RPC resins of varied particle sizes.

Characteristics of NanoMicro Polymeric RPC Bulk Media

	UniPS®	UniPSN	UniPMM
Support Matrix	Poly(styrene/ divinylbenzene)	Poly(N-Vinyl Pyrrolidone /divinylbenzene)	Polymethacrylate
Surface Polarity	Low	Medium	High
Surface Functionality	None, native polymer matrix		
Bead Form	Monodisperse, spherical, rigid		
Particle Size (µm)	3, 5, 10, 15, 20, 30, 40	30, 60	40
Chemical Stability	Can be used with all aqueous and organic solvents commonly used in reverse phase chromatography		
Working pH Range	1 to 14	2 to 13	2 to 12
CIP pH Range	1 to 14	1 to 14	1 to 14
Maximum Pressure Drop	< 10 MPa	< 4 MPa	< 1.6 MPa
Operating Temperature	4 to 40 °C	4 to 40 °C	4 to 40 °C
Delivery Conditions	20% ethanol suspension or dry powder		

Unique Selectivity

Conventional organic polymeric RPC matrices, such as poly(styrene-divinylbenzene), can provide different selection from that of silica-based RPC media, especially in the separation of biomolecules. NanoMicro has not only provided high performance poly(styrene-divinylbenzene) media (i.e. UniPS® products), but also developed UniPSN and UniPMM that are a range of polymer matrices with increased polarity (see the carton below). Such higher polarity can differentiate their separation selection from that of conventional poly(styrene-divinylbenzene), and hence provides more choices of unique selectivity to address unprecedented impurity clearance.

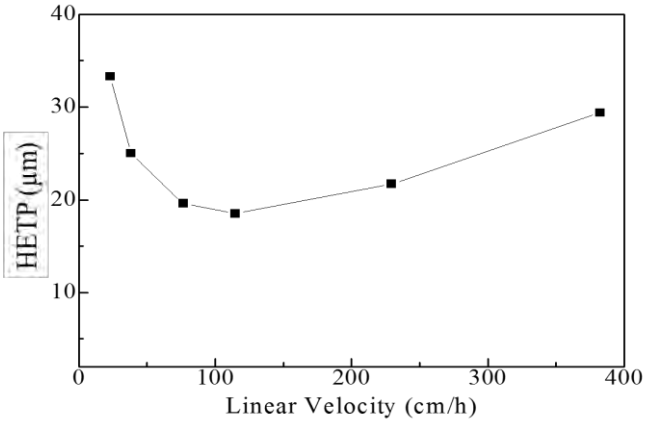


Reversed Phase Chromatography Resins

High Column Efficiency and High Capacity

Due to the nature of their uniformed sizes and perfectly spherical shapes, UniPS®, UniPSN, and UniPMM reverse phase matrices generally render better column efficiency than their conventional polymeric RPC media analogous, and hence provide better RPC resolution. And because their pore size distribution is optimized, they also provide competitive high loading capacity.

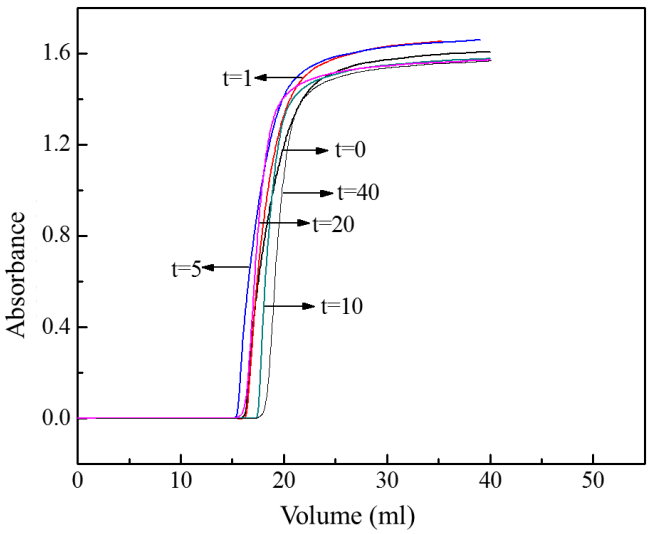
Column HETP of UniPS®10-300 vs Linear Flow Rate



Excellent Chemical and pH Stability

UniPS®, UniPSN, and UniPMM RPC matrices all exhibit excellent chemical and pH stability. pH stability of UniPS® media are especially superior because they are based on poly(styrene-co-divinylbenzene) which is inherently unreactive and stable over the entire pH range of 1 to 14. Such chemical and pH stability provides the polymeric RPC matrices unmatched flexibility in the operating conditions and cleaning procedures, as well as excellent lifetime.

Insulin loading capacity breakthrough curves of UniPS® 10-300 after varied days of exposure to 1M NaOH at 60 °C.

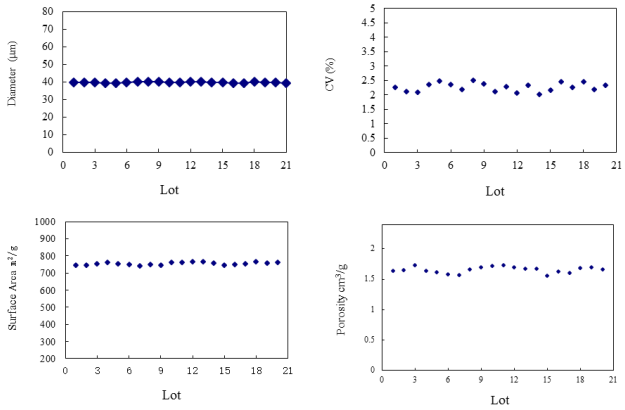


Lot-to-lot Consistency and Large-Scale Manufacturing

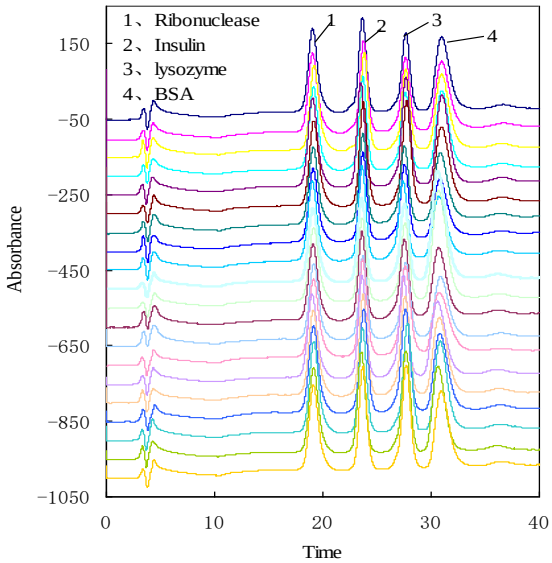
NanoMicro Tech's state-of-the-art manufacturing facilities and rigorous quality control enable the production of our RPC bulk media with excellent batch-to-batch consistency and scalability, meeting the demand of today's industrial bioprocessing for reproducibility and reliability of supply. Quality control examination of each batch of our RPC media products include characteristics measurement such as particle size, size distribution, pore size and surface area, as well as performance tests including model protein retention time, resolution, and loading capacity, etc.

Bulk packed UniSP® RPC media for biopharmaceutical companies

Particle size analysis (top) and porosimetry measurement (bottom) of 20 continuous batches of UniSP® 30-300



Model protein RPC separation test of 20 continuous batches of UniSP® 40-300

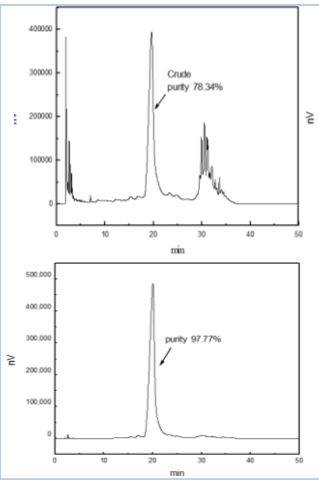


Reversed Phase Chromatography Resins

Applications

UniPS®, UniPSN, and UniPMM resins have been mainly applied in preparative RPC purification of peptides, oligonucleotides, proteins, and natural products, while UniPS® products of small particle sizes (especially the non-porous resins) have been used as analytical chromatography matrices. In addition, these high performance chromatography media have also seen applications as reverse phase solid phase extraction (SPE) sorbents. Due to their superior pH stability and unique selectivity, these polymeric RPC products are especially suitable for RPC purification requiring high pH operation or selectivity alternative to that of silica-based RPC media.

Purification of Liraglutide through a RPC process using UniPS® 10-300.



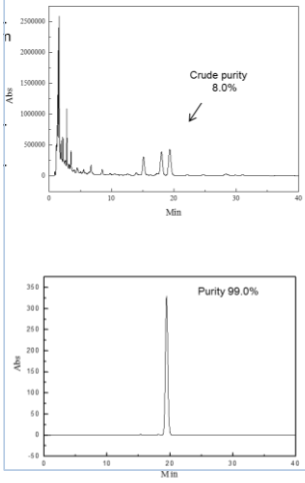
Purification Process

Column:	PS 10-300, 4.6*250mm
Mobile Phase:	A:0.15% NH_4OH in water B:0.15% NH_4OH in acetonitrile
Flow Rate:	0.6ml/min
Detection:	UV254nm

Analysis Method

Column:	Phenomenex Jupiter Proteo 4-90
Mobile Phase:	A:110mM ammonia dihydrogen phosphate(pH=3.7) / 100ml acetonitrile(9:1), B: acetonitrile
Flow Rate:	1.0ml/min
Detection:	UV254nm

Purification of Taxol through a two-step reverse phase chromatography process using UniPS® 30-300 and UniPMM 40-300 media



Purification Process

Step 1

Column:	Uni PMM 40-300
Loading	25.0 mg/ml
Mobile Phase:	A:water; B:methanol
Flow Rate:	20.0 ml/min
Purity/Recovery	55.0% / 65.0%

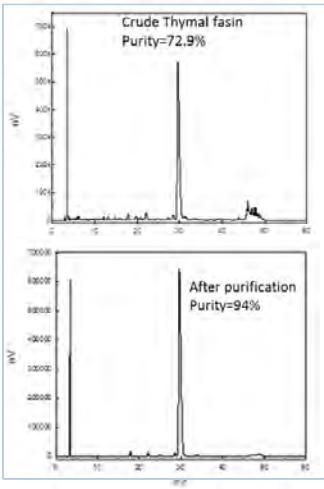
Step 2

Column:	Uni PS 30-300
Loading Mobile Phase:	25.0 mg/ml A:water; B:acetonitrile
Flow Rate:	6.0 ml/min
Purity/Recovery	99.0% / 40.0%

Analysis Method

Column:	Agilent 4.6*100mm C18, 3.5μm
Mobile Phase:	Acetonitrile 40%
Flow Rate:	1.0ml/min
Detection:	UV 227nm

Application of UniPS® 10-300 for the RPC purification of a crude Thymalfasin containing a D-Asn28-Thymalfasin isomer impurity that is difficult to separate by conventional silica RPC.



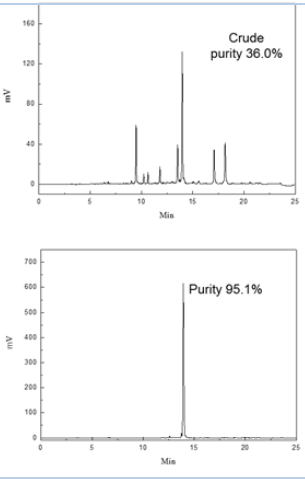
Purification Process

Column:	PS 10-300 4.6*250mm
Mobile Phase:	A: 0.6% acetic acid B: 0.6% acetic acid in acetonitrile
Flow Rate:	0.6 ml/min
Detection:	

Analysis Method

Column:	UniSil® 5-300 4.6*250mm
Mobile Phase:	A: 0.6% acetic acid B: 0.6% acetic acid in acetonitrile
Flow Rate:	0.6 ml/min
Detection:	

Reverse phase chromatography purification of Vancomycin using UniPS® 30-300 media.



Purification Process

Column:	UniPS® 30-300
Loading:	10.0 mg/ml
Mobile Phase:	A: 0.02% trifluoroacetic acid B: acetonitrile
Flow Rate:	0.6 ml/min
Purity/Recovery:	95.0% / 60.0%

Analysis Method

Column:	4.6*250mm C18, 5.0μm
Mobile Phase:	A: 0.1% trifluoroacetic acid B: acetonitrile
Gradient Process:	At 0 min 0% B At 20 min 90% B
Flow Rate:	1.0 ml/min
Detection:	UV 280nm

Reversed Phase Chromatography Resins

Ordering Information

Cat. No.	Product Name	Diameter	Pore Size	Package Size
		μm	Å	
02000-003030	UniPS® 3-300	3	300	30ml 100ml 500ml 1L 10L 100L
02000-005010	UniPS® 5-100	5	100	
02000-005030	UniPS® 5-300	5	300	
02000-005050	UniPS® 5-500	5	500	
02000-005100	UniPS® 5-1000	5	1000	
02000-010010	UniPS® 10-100	10	100	
02000-010030	UniPS® 10-300	10	300	
02000-010050	UniPS® 10-500	10	500	
02000-010100	UniPS® 10-1000	10	1000	
02000-015010	UniPS® 15-100	15	100	
02000-015030	UniPS® 15-300	15	300	
02000-015050	UniPS® 15-500	15	500	
02000-015075	UniPS® 15-750	15	750	
02000-015100	UniPS® 15-1000	15	1000	
02000-020010	UniPS® 20-100	20	100	
02000-020030	UniPS® 20-300	20	300	
02000-020050	UniPS® 20-500	20	500	
02000-020100	UniPS® 20-1000	20	1000	
02000-025030	UniPS® 30-100	30	100	
02000-030030	UniPS® 30-300	30	300	
02000-030030	UniPS® 30-500	30	500	
02000-030050	UniPS® 30-800	30	800	
02000-030100	UniPS® 30-1000	30	1000	
02000-040010	UniPS® 40-100	40	100	
02000-040030	UniPS® 40-300	40	300	
02000-040050	UniPS® 40-500	40	500	
02000-040080	UniPS® 40-800	40	800	
02000-040100	UniPS® 40-1000	40	1000	
02000-050030	UniPS® 50-300	50	300	
02000-230030	UniPSA 30-300	30	300	
02000-440050	UniPMM 40-500	40	500	
02006-450030	UniPMM 50-Carb	50	/	
02000-330030	UniPSN 30-300	30	300	
02000-340030	UniPSN 40-300	40	300	
02000-360030	UniPSN 60-300	60	300	

Note: Other particle size and/or pore size features can be customized upon request.

Affinity Chromatography Resins

UniMab® Protein A Affinity Resin

To raise the purification efficiency of monoclonal antibodies (mAb) and recombinant Fc fragment proteins, Nanomicro has developed world-leading Protein A affinity resins, UniMab®. Based on rigid, mono-sized polymethacrylate matrices of excellent surface hydrophilization, the resin has minimal non-specific binding and high mechanical strength for fast flow operation. Its optimal surface bonding and leading genetic-engineered rProtein A ligand provide excellent Fc-binding selectivity, base stability, and low leachate. UniMab has proven its robust performance in many successful applications, including bioprocessing purification of mAb drugs in Phase III.

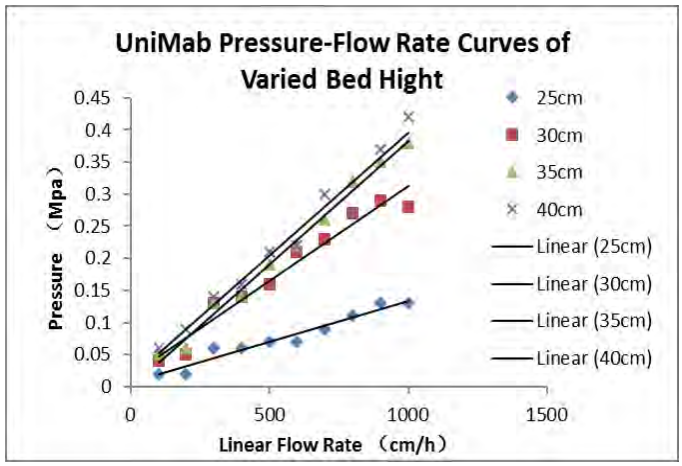
Characteristics of UniMab®

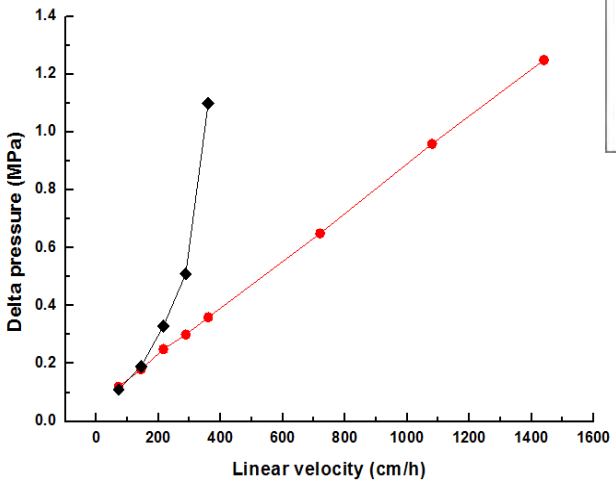
Features	UniMab®
Matrix	Mono-sized Polymethacrylate
Ligand	Engineered rProtein A
Particle size, μm	50
Loading, mg human IgG / ml packing (4 min residence time)	> 35
Maximum pressure, psi (bar, MPa)	116 (8, 0.8)
Maximum flow rate, cm/h	800
Protein A leachate	< 5 ng/ml
pH stable range	3-12
CIP cleaning	0.1-0.5 M NaOH
Temperature, C°	4~40
Storage	20% Ethanol, 2-8 C°

Highlights of UniMab®

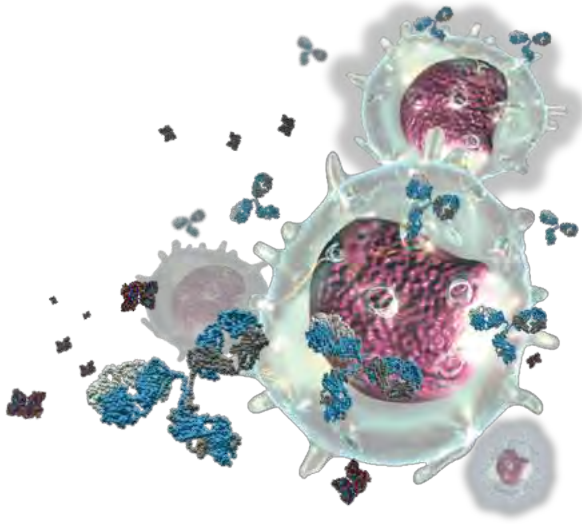
- High Mechanical Strength

Due to its rigid and mono-sized matrix, Uni®Mab has superior mechanic strength for high flow rate and low back pressure. This allows our customers to pack larger column bed height and/or operate at higher flow rate, improving process productivity.





Comparison of Uni®Mab and a conventional Agarose-type Protein A resin in pressure vs. flow rate characteristics



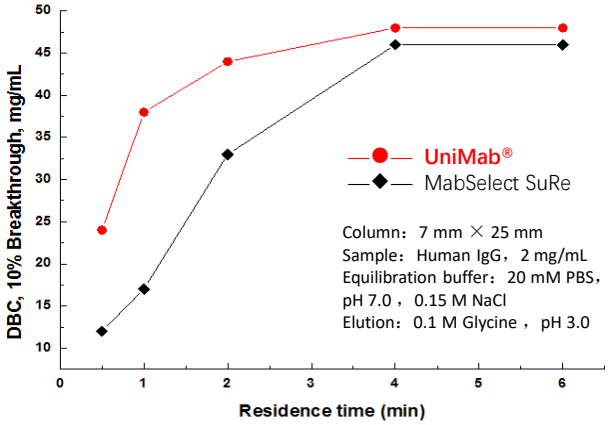
Affinity Chromatography Resins

UniMab® Protein A Affinity Resin

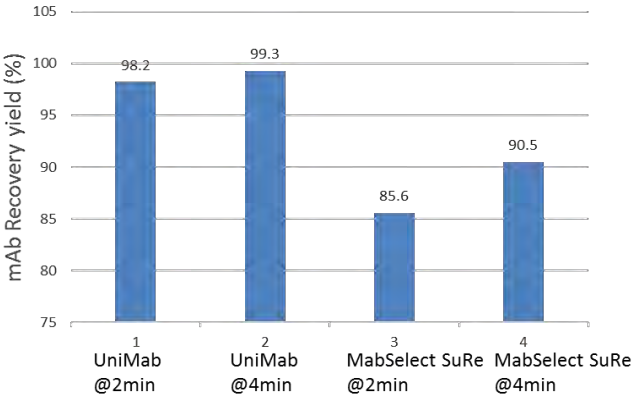
- ### High Dynamic Binding Capacity and High Recovery Yield at High Flow Rate

Because of its mono-sized nature and optimal pore size, UniMab® has high mass transfer and exhibits significantly better dynamic binding capacity (DBC) and recovery yield than that of the conventional Agarose-type protein A resin in short residence time.

Comparison of mAb DBC at varied residence time



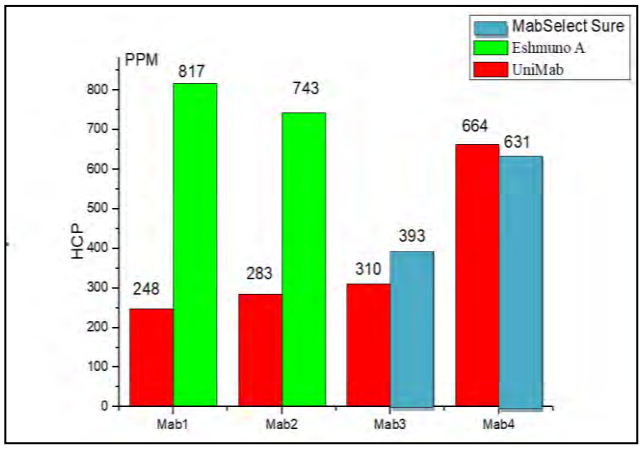
Comparison of mAb recovery yield at varied residence time



- ### Minimal Non-specific Binding and Low HCP

UniMab provides highly competitive mAb affinity specificity and renders very low HCP concentration during mAb purification.

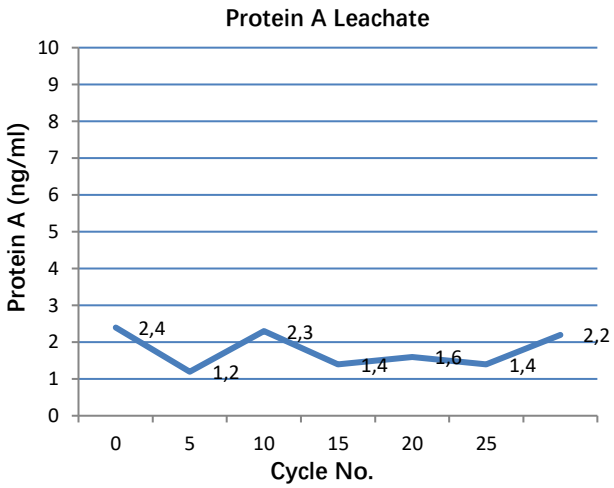
Comparison of HCP Impurity concentration in the purification of varied mAbs



- ### Very Low Protein A Leachate

Because of its optimal surface bonding as well as robust, engineered rProtein A ligand, UniMab exhibits very low level of protein A leachate in application.

UniMab demonstrates consistently low level (<5 ng/ml) of protein A leachate in varied cycle of use



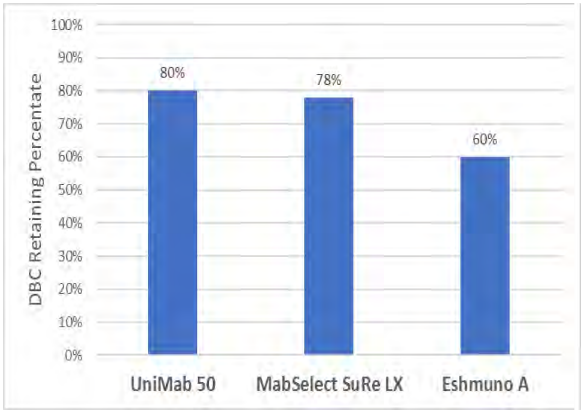
Affinity Chromatography Resins

UniMab® Protein A Affinity Resin

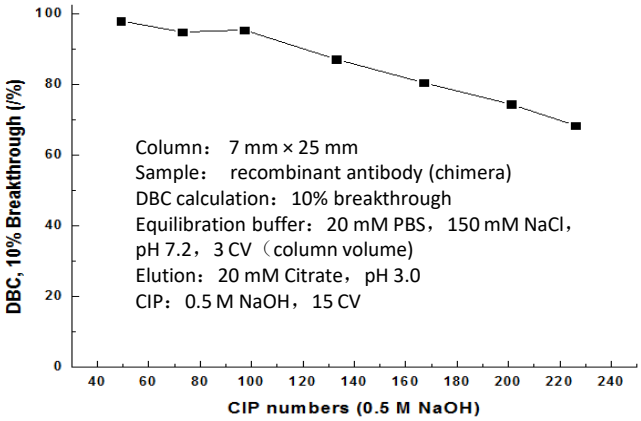
- ### Superior Alkaline Stability

UniMab's optimal surface bonding and leading engineered rProtein A ligand also provides excellent alkaline stability that enables the use of 0.1-0.5M NaOH as the CIP condition and extends its life cycles.

DBC Retaining Percentage of varied protein A resins after soaking in 0.5M NaOH for 24 Hours

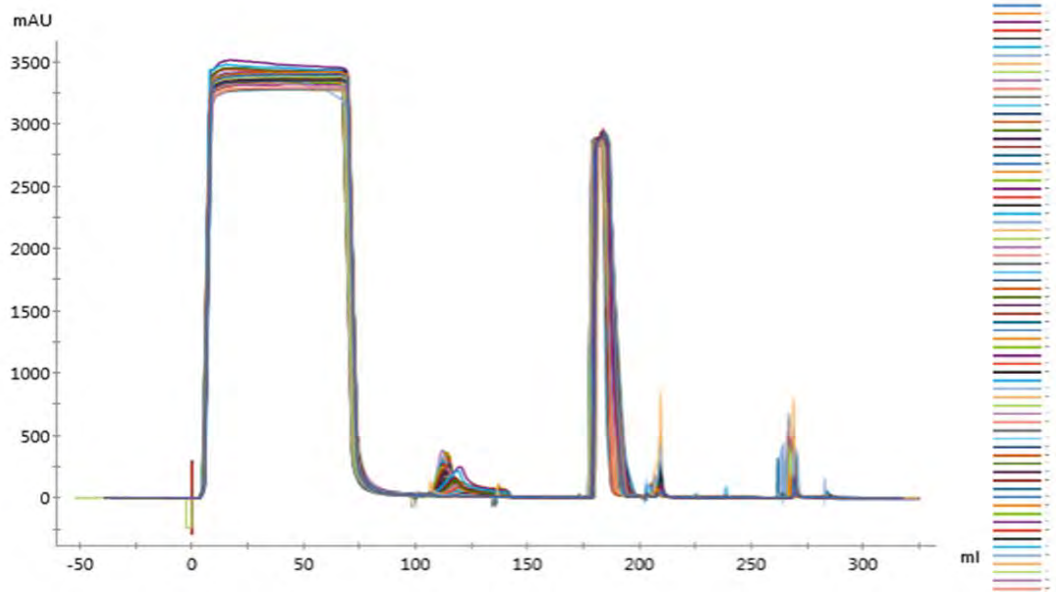


Uni®Mab life cycle tests of mAb DBC stability under 0.5 M NaOH CIP treatment



- ### High Reproducibility

UniMab's chromatogram overlay of 150 cycles of mAb purification

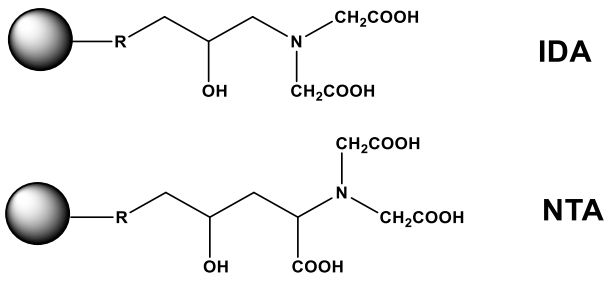


Affinity Chromatography Resins

Immobilized Metal Ion Affinity Chromatography Resins

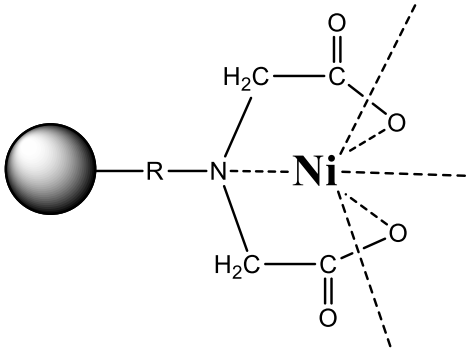
Immobilized metal ion affinity chromatography (IMAC) resins are commonly used to purify his-tagged proteins, but also untagged recombinant or native proteins. The affinity chemistry is based on the coordination bonding between protein surface amino groups (histidine, tryptophan, cysteine, etc.) and transition metal ions (Ni^{+2}, Co^{+2}, etc.) immobilized on the resins. NanoMicro's IMAC resins are made from rigid, 80μm mono-sized polymethacrylate matrices that carry two different types of chelating ligands , iminodiacetic acid (IDA) or nitrilotriacetic acid (NTA). NanoMicro offers Ni^{+2} charged IMAC resin products, UniIDA-80Ni and UniNTA-80Ni, as well as uncharged IMAC resins, UniIDA-80L and UniNTA-80, which can chelate with varied metal ions such as Cu^{2+}, Ni^{2+}, Zn^{2+} and Co^{2+}.

Uncharged IMAC Resins



Ni^{2+}, Cu^{2+}, Co^{2+},Fe^{2+}, Zn^{2+}, Mg^{2+}

Ni^{+2} charged IMAC Resins



Characteristics s of NanoMicro's IMAC Resins

	UniIDA-80L	UniNTA-80L	UniIDA-80Ni	UniNTA-80Ni
Matrix	Mono-Sized Crosslinked Polymethacrylate Resin			
Chelating Ligand	IDA	NTA	IDA	NTA
Metal Ion Charged	Uncharged	Uncharged	Ni^{+2}	Ni^{+2}
Particle Size	~80 μm			
Metal Ion Capacity	~30 μm/mL (Ni^{2+})	~50 μm/mL (Ni^{2+})	~30 μm/mL (Ni^{2+})	~50 μm/mL (Ni^{2+})
Dynamic Binding Capacity	NA	NA	> 20mg His-tagged protein	> 15mg His-tagged protein
pH Range	2-12	2-12	2-12	2-12
Maximum Pressure（MPa）	0.5	0.5	0.5	0.5

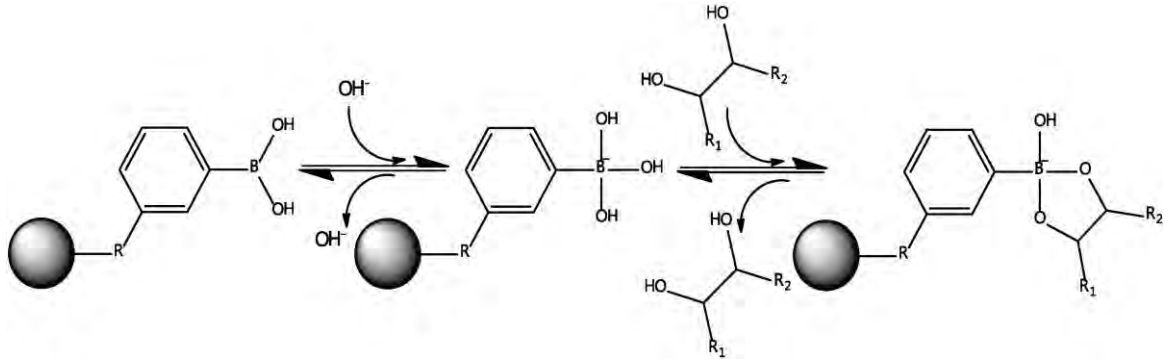
Highlights of Uni IMAC Resins

- Rigid, mono-sized matrix enables high flow rate operation
- Tolerant of NaOH and high concentration reducing agents, simplified sample pretreatment, much improved protein activity protection
- Competitive binding capacity
- Minimal ligand loss, stable in cleaning, long service life

Affinity Chromatography Resins

Boronic Acid Affinity Chromatography Resin

NanoMicro has launched a new generation of boronic acid affinity packings in which boronic acid forms a coordination compound with cis-diol for separation and purification. Under alkaline conditions, boronic acid functional group interacts with the cis isomer of a 1,2-diol forming a stable five-membered cyclic adduct of cis-diol molecules and boronic acid on the stationary phase. Under acidic conditions, the adduct ring opens releasing the target molecules. Boronic acid affinity media are employed in the separation and purification of compounds containing cis-diol groups such as glycoproteins, nucleosides, nucleotides, sugars, etc.



Low pH, elution

High pH binding

Characteristics of UniPB

Product	UniPB-80L
Separation principle	Boronic acid affinity capture
Substrate	Poly(methyl methacrylate), or PMMA
Ligand	Phenyl boronic acid
Particle size, μm	80
Pore size, Å	1000
Purification stage	Capture, moderate purification
Characteristics	High flow rate, low back pressure, stable in cleaning
Maximum pressure, MPa	0.5
Recommended linear flow rate, cm/ h	150-750
pH stable range	2-12
CIP cleaning	0.1-0.5 M NaOH
Storage	20% ethanol, 2-8 C°

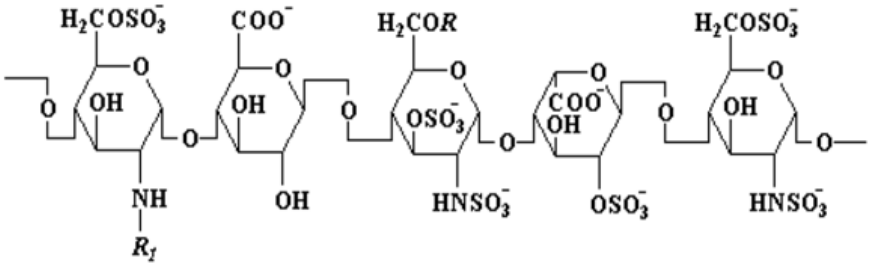
Highlights of UniPB-80L Boronic Acid Affinity Resin

- Monodisperse microspheres as packing substrate,
- Enabling high flow rate to raise productivity
- High ligand density providing very high loading capacity
- Very long service life reducing manufacturing cost

Affinity Chromatography Resins

Heparin Affinity Chromatography Resin

Heparin is a linear and highly sulfated glycosaminoglycan which has anti-coagulant properties. Due to its polyanionic nature, heparin interacts with a wide range of biomolecules including plasma coagulation proteins, lipoprotein lipase, collagenase, and DNA polymerase. Immobilized heparin is widely used as an adsorbent in affinity chromatography for the purification of biological substances. NanoMicro has developed high performance heparin affinity resin UniHeparin-65L using monodisperse crosslinked polymethacrylate matrix with excellent surface hydrophilization. UniHeparin-65L has optimal pore size and ligand coupling chemistry that yield competitive binding capacity. In addition, this rigid resin with mono-sized nature provides superior mechanic strength for fast flow operation. Its overall robust performance has enabled UniHeparin-65L to be a good choice for bioprocessing heparin affinity chromatography as well as sample preparation sorbent. Besides UniHeparin-65L, NanoMicro also offers an agarose-based Heparin affinity resin product, NM90 Agarose Heparin,



Characteristics of NanoMicro's Heparin Affinity Resins

	UniGel-65Heparin	NM90 Agarose Heparin
Matrix	Monodisperse crosslinked polymethacrylate resin	Highly crosslinked agarose resin
Affinity Ligand	Heparin	Heparin
Particle Size	~65 µm	~90 µm
Ligand Density	~3 mg/ml	~5 mg/ml
pH Range	4-12	4-12
Maximum Pressure	0.8 MPa	0.3 MPa

Highlights of Heparin Affinity Resin UniHeparin-65L

- Rigid matrix enable to operate at fast flow for high productivity.
- Optimal ligand coupling provides highly competitive dynamic binding capacity
- Mono-sized matrix yields the robust performance in varied applications including not only bioprocessing purification but also SPE sample preparation.

Affinity Chromatography Resins

Ordering Information

Series	Cat. No.	Product Name	Diameter μm	Package Size
Protein A Affinity	17010-050100	UniMab 50	50	30ml, 100ml, 500ml 1L, 10L
IMAC Affinity	04085-080100	UniIDA-80L	80	10ml, 30ml 100ml, 1L
	04086-080100	UniNTA-80L	80	
	04087-080100	UniIDA-80Ni	80	
	04088-080100	UniNTA-80Ni	80	
Boronic Acid Affinity	04000-080001	UniPB-80L	80	30ml, 100ml, 1L
Heparin Affinity		UniGel-65Heparin	65	30mL, 100mL, 1L
		NM90 Agarose Heparin	90	

Note: customized affinity resin products can be developed upon request.

Ion Exchange Chromatography Resins

Ion exchange (IEX) chromatography is a process that separates different biomolecules based on their surface charges (type, amount, and distribution). NanoMicro provides world leading monodisperse IEX resins of rigid polymer matrices. These mono-sized products have high separation resolution, excellent compatibility with active biomolecules, and superior pressure-flow characteristics, offering customers more productive IEX solution for laboratory purification and commercial production of bioactive compounds.

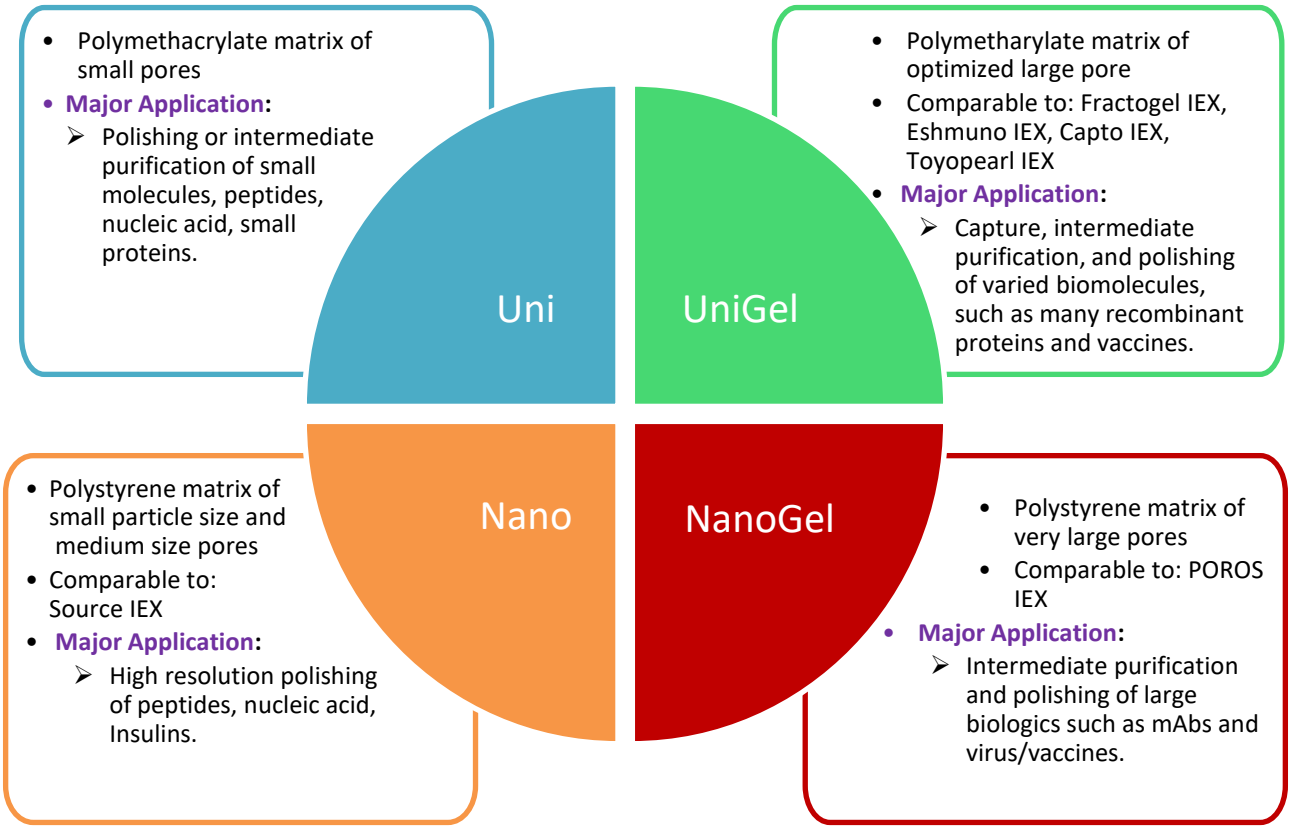
Ion Exchange Functional Groups

Type	Functional group	Abbreviation	Features	pKa
Weak cation exchange	$-CH_2COO^-$ carboxylate	CM	Weakly acidic, mobile phase pH > 4	4-6
Strong cation exchange	$-(CH_2)_3SO_3^-$ sulfonate	SP	Strongly acidic, pH 1-14	< 2
Weak anion exchange	$-(CH_2)_2N(CH_3)_2$ tertiary amino	DEAE	Weakly alkaline, mobile phase pH < 9	> 9
Strong anion exchange	$-CH_2N^+(CH_3)_3$ quaternary ammonium	Q	Strongly alkaline, pH 1-14	> 12

1.Mobile phase pH should be between isoelectric point (pI) and pKa.
2.Mobile phase pH should be at least 1.0 pH unit from pI of analyte.
3.Select strongly cationic media when pH<3.0, strongly anionic media when pH>10.0

NanoMicro's IEX Product Series

NanoMicro offers four series of IEX resins of different matrix type and pore size to satisfy varied application. These products are complementary with each other to provide full spectrum IEX solution for all steps of bioprocessing chromatography (capture, intermediate purification, and polishing) of large variety of biologics, from small peptides to large proteins and viral particles,



Ion Exchange Chromatography Media

Uni Series IEX Resins

UniCM, UniSP, UniQ, UniDEAE, and UniMSP are the components of NanoMicro's Uni series of ion exchange (IEX) products. They are designed for the IEX purification of small proteins, peptides, oligo nucleotides, and small molecule drugs such as antibiotics. Their supports are highly crosslinked polymethacrylate beads of uniformed particle size. Through polyhydroxyl surface modification chemistry, these resins are enabled with excellent hydrophilicity and low non-specific adsorption property. Uni IEX resins have smaller pore size and hence better fit the IEX purification of small biomolecules. All these resins meet the demands of today's industrial bioprocessing for reproducibility, scalability, and reliability of supply.

Characteristics of Uni IEX Resins

Product Name	UniCM-30S	UniCM-50XS	UniSP-30S	UniSP-50XS	UniQ-30S	UniQ-50XS	UniDEAE -30S	UniDEAE -50XS	UniMSP-30XS	UniMSP-50XS
Support Matrix	Monodisperse Highly Crosslinked Polymethacrylate Bead									
Particle Size (μm)	36	55	36	55	36	55	36	55	33	52
Pore Size (Å)	500	300	500	300	500	300	500	300	300	300
IEX Type	Weak Cation		Strong Cation		Strong Anion		Weak Anion		Strong Cation /HIC Mixed Mode	
Charged Group	$-CH_2COO^-$		$-(CH_2)_3SO_3^-$		$-CH_2N^+(CH_3)_3$		$-CH_2CH_2N(CH_2CH_3)_2$		$-(CH_2)_3SO_3^-$	
Total Ionic Capacity (mmol/ml)	~0.23	~0.23	~0.23	~0.25	~0.23	~0.25	~0.20	~0.20	~0.25	~0.20
Dynamic Binding Capacity	~60 mg/ml (Lys)	~55 mg/ml (Lys)	~60 mg/ml (Lys)	~55 mg/ml (Lys)	/	/	/	/	~70 mg/ml (Lys)	~65 mg/ml (Lys)
Operating Pressure	< 0.8 MPa	< 0.5 MPa	< 0.8 MPa	< 0.5 MPa	< 0.8 MPa	< 0.5 MPa	< 0.8 MPa	< 0.5 MPa	< 0.8 MPa	< 0.5 MPa
pH Range	2 - 12		2 - 12		2 - 12		2 - 12		2-12	

** DBC (10% breakthrough) of CEX resins is measured using 2mg/ml lysozyme in 20mM phosphate pH6.8 equilibration buffer. DBC of AEX resins is quantified using 2mg/ml of BSA in 20mM Tris pH8.0 equilibration buffer.*

Highlights of Uni IEX Resins

- Uniformed Particle Size
- High Resolution
- Superior Mechanic Strength
- Minimal Non-Specific Binding

Application of Uni IEX Resins

UniCM, UniSP, UniQ, UniDEAE, and UniMSP resins are mainly applied in the IEX chromatography purification of small biomolecules including peptides, oligonucleotides, and small proteins. They are suitable for polishing, intermediate purification or capture from lab to commercial-scale.

Ion Exchange Chromatography Media

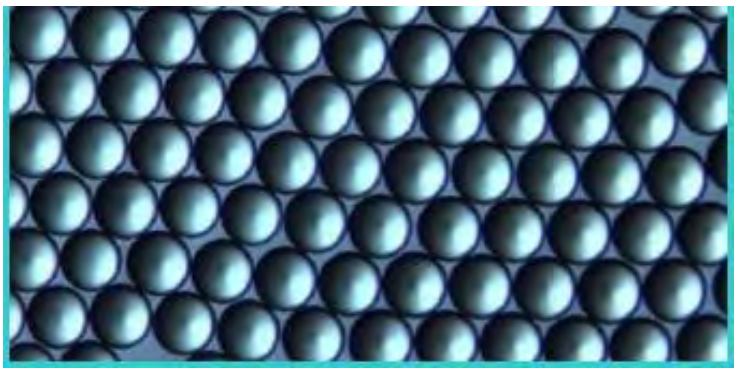
UniGel Series of IEX Resins

NanoMicro's UniGel series of IEX resins include weak cation (CM), strong cation (SP), weak anion (DEAE), and strong anion (Q) four types of products . Their supports are highly crosslinked polymethacrylate beads of uniformed particle size and open pore structure. Through polyhydroxyl surface modification and special surface extender chemistry, these UniGel ion exchange (IEX) resins are enabled with excellent hydrophilicity and minimal non-specific adsorption Property. They are designed to meet the demands of downstream bioprocessing, from capture, intermediate purification to polishing, of biomolecules from small proteins to large biologics such as viral particles and vaccines. All these four types of UniGel IEX products have been widely applied by many biopharmaceutical cmpanies. Their reproducibility, scalability, and reliability have been well proved.

Characteristics of UniGel IEX Resins

Media Type	UniGel-CM	UniGel-SP	UniGel-DEAE	UniGel-Q
Support Matrix	Monodisperse Highly Crosslinked Polymethacrylate Bead			
Particle Size(μm)	30,80	30,80	30,80	30,80
Ion Exchange Type	Weak Cation	Strong Cation	Weak Anion	Strong Anion
Charged Group	$-CH_2COO^-$	$-(CH_2)_3SO_3^-$	$-(CH_2)_2N(CH_2CH_3)_2$	$-CH_2N^+(CH_3)_3$
Total Ionic Capacity	~0.28 mmol/ml	~0.11 mmol/ml	~0.09 mmol/ml	~0.09 mmol/ml
Dynamic Binding Capacity	~100 mg/ml(hIgG)	~115 mg/ml(Lys)	~90 mg/ml (BSA)	~90 mg/ml(BSA)
Operating Pressure	<1.0MPa for 30μm particle size; <0.5 Mpa for 80μm particle size			
pH Range:				
CIP	1 to 14			
working	2 to 13			
Operating Temperature	4 to 30℃			
Chemical Stability	pH stability range 2-13; can be regenerated with acid or base; compatible with organic solvents; do not expose to stronger oxidizers.			

** DBC (10% breakthrough) of CEX resins is measured using 2mg/ml lysozyme in 20mM phosphate pH6.8 equilibration buffer. DBC of AEX resins is quantified using 2mg/ml of BSA in 20mM Tris pH8.0 equilibration buffer.*



Optical micrograph of 80 μm UniGel-80SP resin. Note its uniformed particle size

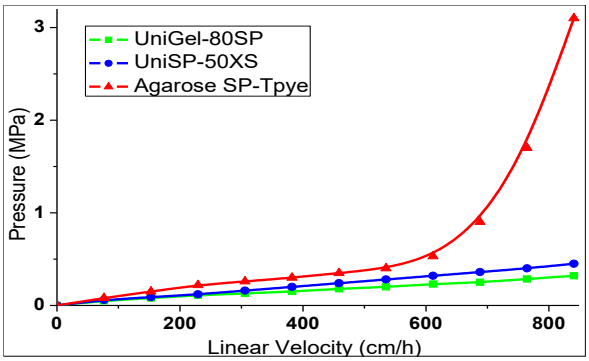
Ion Exchange Chromatography Resins

Highlights of UniGel IEX Resins

- **Superior Pressure-Flow Characterestics**

High flow velocities allow increased productivity of large-scale bioprocessing operations and processing of larger volumes in shorter working shift. Lower cycle times also reduce exposure of the target protein to proteases. UniGel resins are based on mono-sized, highly crosslinked polymethacrylate resin, and hence enable very high flow rate operation at low backpressure.

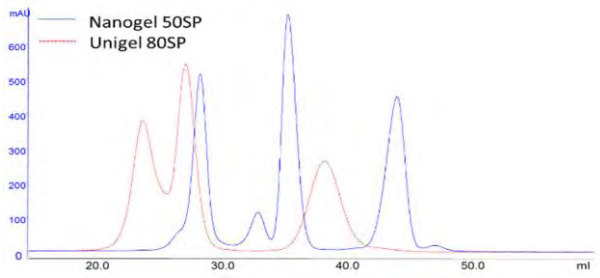
Comparison of Pressure/flow curves of UniGel-80SP vs a top-ranked Agarose analogous and UniPS-50XS, a highly rigid PS-DVB resin (Test column: 4.6×200mm; mobile phase: water; temperature:25°C). System/tubing pressure is excluded.



- **Minimal Non-specific Binding and High Elution Recovery**

Due to its proprietary surface modification chemistry ensuring excellent hydrophilicity and biocompatibility, UniGel resins exhibit minimal non-specific binding and excellent protein elution recovery at mild elution conditions. UniGel-80SP are especially suitable for purification of biologics that may have poor recovery or poor stability in high salt concentration, while NanoMicro's NanoGel-50SP is a salt-tolerant CEX resin that is excellent for many mAb polishing purification (please refer Page xx for the information of NanoGel-50SP). Those two strong CEX resins are complementary with each other to provide solutions for varied CEX application needs.

Comparison of salt-gradient elution of model proteins: UniGel-80SP vs NanoGel-50SP .

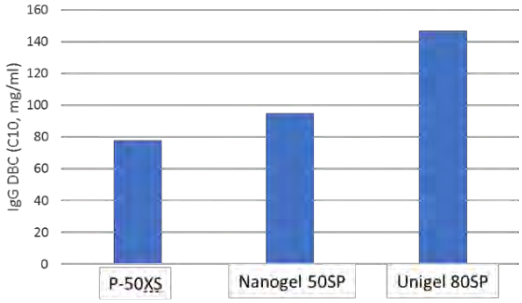


Column:	0.46cmD×20cmL
Sample:	Chymotrypsinogen A 5mg/ml Cytochrome C 8mg/ml Lysozyme 4mg/ml
Buffer A:	20mM MES/25mM NaCl, pH6.2
Buffer B:	20mM MES/1.0M NaCl, pH6.2
Gradient:	0-100%B, 16CV
Flow rate:	300 cm/h

- **Excellent Dynamic Binding Capacity**

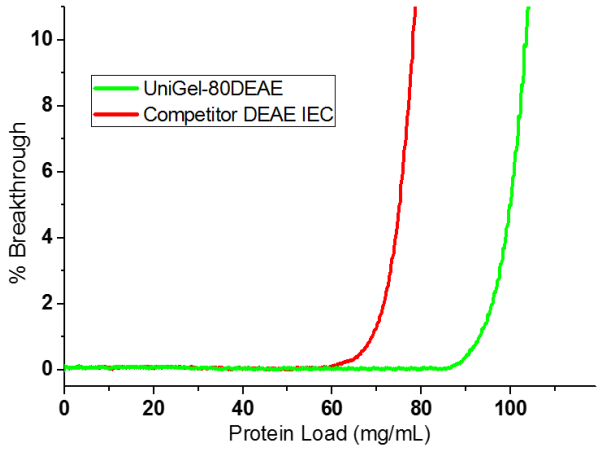
Due to their special surface extender chemistry and optimized pore structure, UniGel IEX resins exhibit superior dynamic binding capacity performance. As examples, UniGel-80SP exhibits much higher IgG dynamic binding capacity than top ranked CEX analogous in the market. UniGel-80DEAE also shows significantly higher BSA dynamic binding capacity than a top ranked, agarose-based DEAE resin.

Comparison of IgG dynamic binding capacity of UniGel-80SP with a top-ranked CEX competitor P-50XS, and NanoGel 50SP that is another high performance CEX resin of NanoMicro Tech.



Column:	Tricon 5*25mm, 0.5ml
Loading Buffer:	20mM NaCl; 20mM MES; pH4.8
Sample:	2mg/ml hIgG in loading buffer
Flow rate:	0.3 ml/min

Comparison of BSA dynamic binding capacity breakthrough curves of UniGel-80DEAE vs a top-ranked DEAE resin competitor.



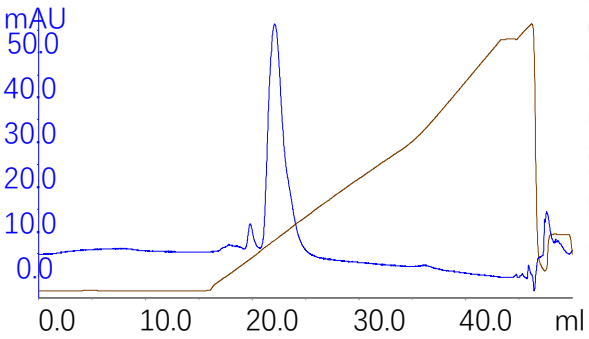
Column:	4.6 mm I.D*50mm
Sample:	BSA (2mg/ml) in 25nM Tris HCl (pH 7.4)
Mobile Phase:	25mM Tris HCl (pH 7.4)
Flow rate:	0.5 ml/min (180 cm/h)
Detector:	AKTA Purifier (UV 280nm)

Ion Exchange Chromatography Resins

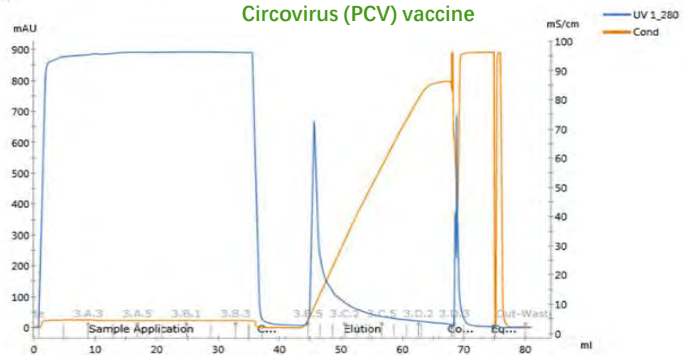
Applications of UniGel IEX Resins

UniGel-CM, UniGel-DEAE, UniGel-Q, and UniGel-SP resins are designed to meet the demands of downstream bioprocessing, from capture, intermediate purification to polishing, of biomolecules from small proteins to large biologics such as viral particles and vaccines. All these four types of ion exchange resins have seen applications in large scale bioprocessing purification of varied biologics. For examples, UniGel-80CM has been used in the production scale purification of bovine lactoferrin from milk as well as purification of recombinant HSA; All these application examples have demonstrated the high performance and well-proven reliability of our UniGel ion exchange resins.

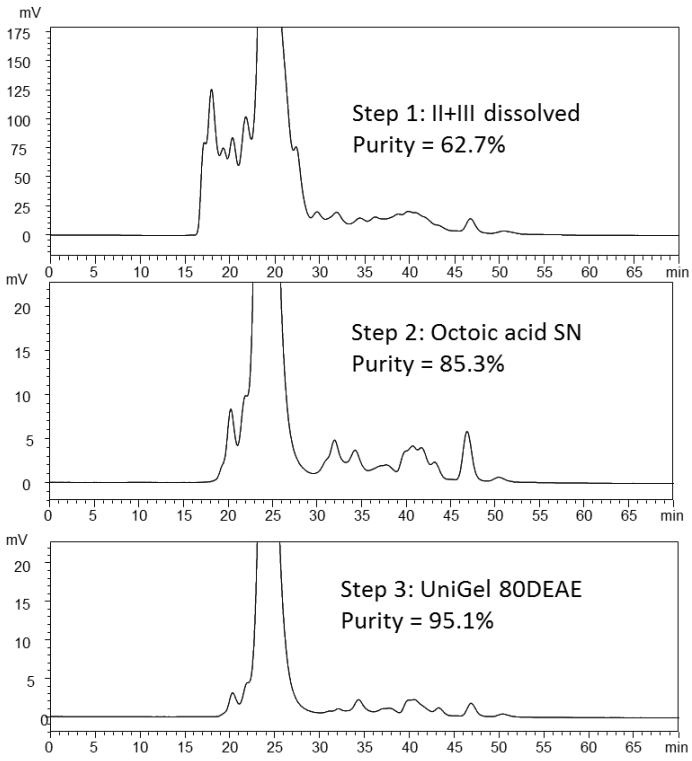
Application of UniGel-80DEAE in the polishing step of HAS protein through a bind-elute mode.



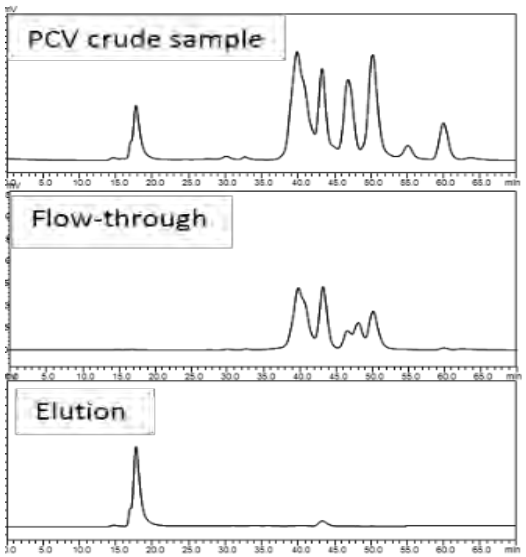
Application of UniGel 80SP to capture Porcine Circovirus (PCV) vaccine



Application of UniGel 80DEAE in a (Octoic acid precipitation + DEAE weak AEX) process to purify IVIG blood product.



Chromatogram of capture and then salt gradient elution to provide PCV of purity>90%.



SEC analysis chromatogram of PCV crude sample, the flow-through components during the capture step, and the purified PCV in the elution.

Ion Exchange Chromatography Resins

Nano Series IEX Resins

NanoSP and NanoQ are, respectively, strong cation (CEX) and strong anion exchange (AEX) chromatography resins made with NanoMicro's precision monodisperse microsphere technology. Their supports are rigid poly(styrene-divinylbenzene) (PS-DVB) beads of uniformed particle size and open pore structure. Through polyhydroxyl surface modification, these ion exchange resins are enabled with low non-specific binding property. They are intended for high resolution polishing or intermediate purification of small or medium size biomolecules.

Characteristics of NanoSP and NanoQ Resins

Media Type	NanoSP-15L	NanoSP-30L	NanoQ-15L	NanoQ-30L
Support Matrix	Monodisperse PS-DVB Bead			
Particle Size(μm)	15	30	15	30
Ion Exchange Type	Strong Cation	Strong Cation	Strong Anion	Strong Anion
Charged Group	$-(CH_2)_3SO_3^-$	$-(CH_2)_3SO_3^-$	$-CH_2N^+(CH_3)_2$	$-CH_2N^+(CH_3)_3$
Total Ionic Capacity (μmol/ml)	0.26	0.19	0.27	0.21
Dynamic Binding Capacity (mg/ml)	80	60	55	45
Operating Pressure (MPa)	≤ 6MPa	≤ 2 MPa	≤ 6MPa	≤ 2MPa
pH Range:				
CIP	1 to 14			
working	2 to 13			
Operating Temperature	4 to 30℃			
Chemical Stability	pH stability range 2-13; can be regenerated with acid or base; compatible with organic solvents; do not expose to stronger oxidizers.			

** DBC (10% breakthrough) of CEX resins is measured using 2mg/ml lysozyme in 20mM phosphate pH6.8 equilibration buffer. DBC of AEX resins is quantified using 2mg/ml of BSA in 20mM Tris pH8.0 equilibration buffer.*

Highlights of NanoSP and NanoQ Resins

- Uniformed Particle Size
- Excellent Resolution
- Superior Mechanic Strength

Application of NanoSP and NanoQ IEX Resins

NanoSP and NanoQ resins are mainly applied in the IEX chromatography purification of peptides, nucleotides, and proteins such insulins. They are highly comparable to GE's Source IEX resins that are well established ion-exchange resins for high resolution polishing or intermediate purification.

Ion Exchange Chromatography Resins

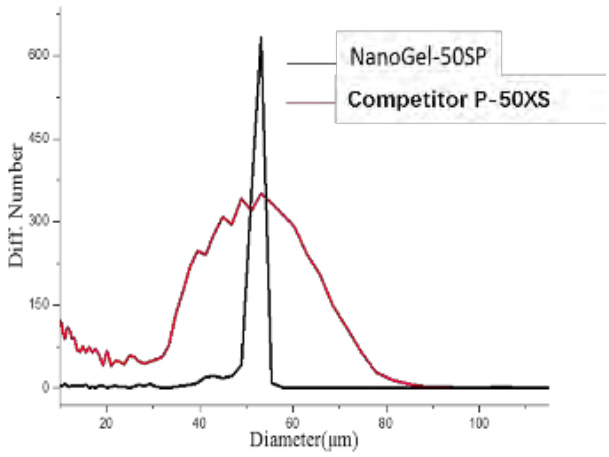
NanoGel - New Generation of Ion Exchange Chromatography Resins

NanoGel-50SP and NanoGel-50Q are, respectively, strong cation (CEX) and strong anion exchange (AEX) chromatography resins made with NanoMicro's precision monodisperse microsphere technology. Their supports are rigid poly(styrene-divinylbenzene) (PS-DVB) beads of uniformed particle size and large open pore structure. Through polyhydroxyl surface modification and special surface extender chemistry, these NanoGel ion exchange resins are enabled with low non-specific binding property. They are intended for large-scale bioprocess purification of large biomolecules (especially for mAbs).

Characteristics of NanoGel IEX Resins

	NanoGel-50SP	NanoGel-50Q
Support Matrix	Monodisperse Poly(styrene-divinylbenzene) Bead	
Particle Size	50 μm	50 μm
Ion Exchange Type	Strong Cation	Strong Anion
Charged Group	$-CH_2CH_2CH_2SO_3^-$	$-N^+(CH_3)_3$
Total Ionic Capacity	~0.18 mmol/ml	~0.20 mmol/ml
Dynamic Binding Capacity	>100mg/ml (hIgG)	>100mg/ml (BSA)
Operating Pressure	< 20 bar (2 MPa)	< 20 bar (2 MPa)
pH Range	1 to 14	1 to 14
Operating Temperature	4 to 30 °C	4 to 30 °C

SEM images and Coulter particle size analysis (bottom right) of NanoGel-50SP and competitor P-50XS, a top-ranked CEX analogous in the market.

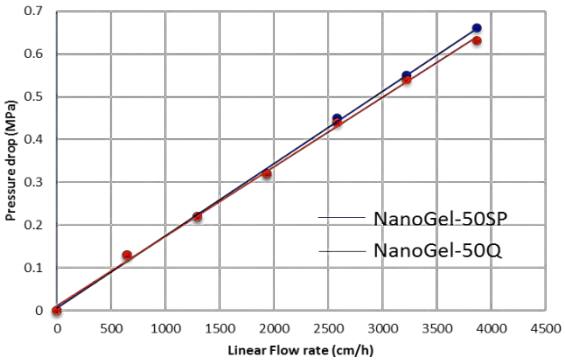


Ion Exchange Chromatography Resins

Highlights of NanoGel IEX Resins

• Excellent Pressure-Flow Characteristics

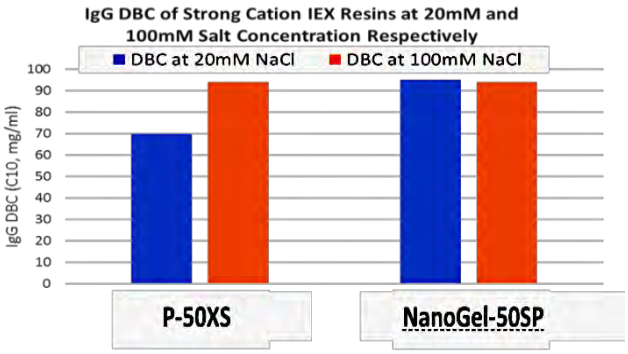
High flow velocities allow increased productivity of large-scale bioprocessing operations and processing of larger volumes in shorter working shift. Lower cycle times also reduce exposure of the target protein to proteases. NanoGel resins are based on highly rigid and monodisperse PS-DVB microspheres, and hence enable very high flow rate operation at low backpressure.



Pressure/flow curves of NannoGel-50SP and NanoGel-50Q (Test column: 7.7×100mm; mobile phase: water; temperature:25°C). System/tubing pressure is excluded.

• High Dynamic Binding Capacity Over a Wide Range of Process Conditions

NanoGel ion-exchange resins provide high dynamic binding capacity (DBC) due to their optimized pores and surface functionalization chemistry. More importantly, they exhibit high DBC over a range of process conditions such as varied residence time and effluent conductivities. This allows target-molecule binding and impurity removal over a wide range of process conditions, thereby increasing process development flexibility and manufacturing throughput.

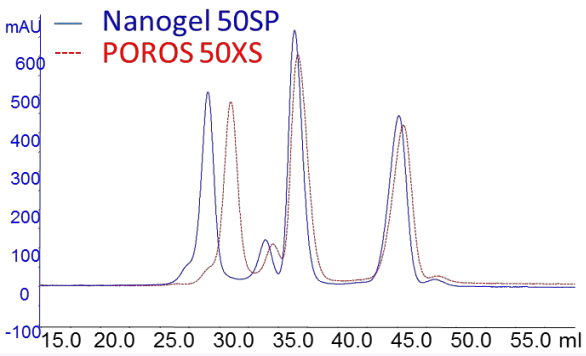


Comparison of DBC at varied salt concentration of NanoGel-50SP vs competitor P-50XS, a top-ranked CEX analogous. NanoGel-50SP exhibits high DBC at both low and high salt concentration.

• Superior Resolution

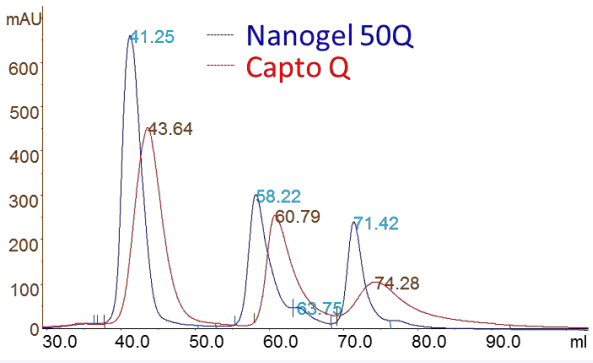
Due to their monodisperse 50µm particle size as well as the high mass transfer associated with their large and open pore structure, both NanoGel-50SP and NanoGel-50Q provide superior resolution performance.

Model protein separation benchmarking of NanoGel-50SP



Column: 0.46cmDx 20cmL
Buffer A: 20mM MES/25mM NaCl, pH 6.2
Buffer B: 20mM MES/1.0M NaCl, pH 6.2
Gradient: 0 –100%B, 16 CV
Sample: Chymotrypsinogen A 5mg/mL; Cytochrome C 8mg/mL; Lysozyme 4mg/ml.
Flow rate: 300cm/h.

Model protein separation benchmarking of NanoGel-50Q.

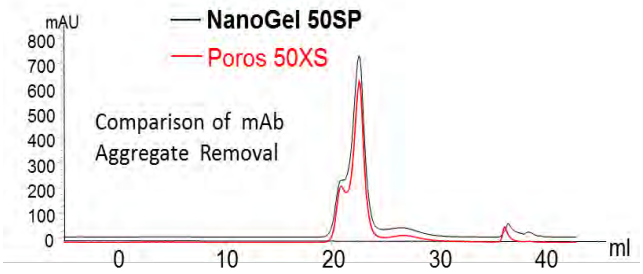


Column: 0.46cmDx 20cmL
Buffer A: 20mM Trisl, pH 8.0
Buffer B: 20mM Tris/1.0M NaCl, pH 8.0
Gradient: 0 –50%B, 20 CV
Sample: BSA 1mg/mL; Transferrin 1mg/mL; Amyloglycosidase 1mg/ml.
Flow rate: 300cm/h.

Ion Exchange Chromatography Resins

Applications

Due to their large and open pores, NanoGel 50Sp and NanoGel 50Q are especially suitable for the purification of many large biomolecules such as antibodies. The combination of high volume throughput and high capacity makes NanoGel resins the optimal choice for processing large amounts of protein in a fast and efficient way. In addition, their high resolution and high mass transfer properties provide superior performance for many unprecedented impurity clearance independent of scale and flow rate. NanoGel 50SP and NanoGel 50Q provide high performance in both bind-elute and flow-through modes.



	Samples	Purity(%)	Aggregate(%)	Yield(%)
Feed (mAb eluted from Protein A resin)	loading	98.36	1.64	/
NanoGel 50SP	E-1	99.80	0.19	87.86
	E-2	99.02	0.93	
	E-3	97.89	2.11	
Competitor P-50XS	E-1	99.88	0.12	81.41
	E-2	99.18	0.82	
	E-3	97.52	2.40	

Comparison of NanoGel 50SP with POROS XS, a top ranked CEX analogous, in the performance of mAb aggregate removal using bind-elute mode. Left is the conductivity gradient elute chromatograms; Right table displays the analysis results of the elution collections.

Ordering Information

Series	Product Name	Cat. No.	Diameter μm	Pore Size Å	Package Size
Uni	UniDEAE-30S	04023-030050	30	500	30ml 100ml 1L 10L 100L
	UniDEAE-50XS	04023-050030	50	300	
	UniQ-30S	04024-030050	30	500	
	UniQ-50XS	04024-050030	50	300	
	UniQ-50S	04024-05030	50	500	
	UniSP-30S	04022-050030	30	500	
	UniSP-50XS	04022-050030	50	300	
	UniCM-30S	04021-030050	30	500	
	UniCM-50XS	04021-050030	50	300	
	UniMSP-30XS	04012-030030	30	300	
	UniMSP-50XS	04012-050030	50	300	
UniGel	UniGel®-30Q	04084-030100	30	1000	
	UniGel®-80Q	04084-080100	80	1000	
	UniGel®-30SP	04082-030100	30	1000	
	UniGel®-80SP	04082-080100	80	1000	
	UniGel®-30CM	04081-030100	30	1000	
	UniGel®-80CM	04081-080100	80	1000	
	UniGel®-30DEAE	04083-030100	30	1000	
	UniGel®-80DEAE	04083-080100	80	1000	
Nano	NanoSP-15L	04042-015100	15	1000	
	NanoSP-30L	04042-030100	30	1000	
	NanoQ-15L	04044-015100	15	1000	
	NanoQ-30L	04044-030100	30	1000	
NanoGel	NanoGel-50SP	04062-050200	50	1500	
	NanoGel-50Q	04064-050200	50	1500	

Hydrophobic Interaction Chromatography Resins

UniHR Butyl and UniHR Phenyl are the two major classes of NanoMicro's HIC resin products. Their supports are highly crosslinked polymethacrylate beads of uniformed particle size and open pore structure. Through proprietary surface hydrophilization and HIC ligand coupling chemistries, these resins are enabled with low non-specific adsorption property. UniHR Butyl and UniHR Phenyl HIC resins have been used by many biopharmaceutical customers for varied application.

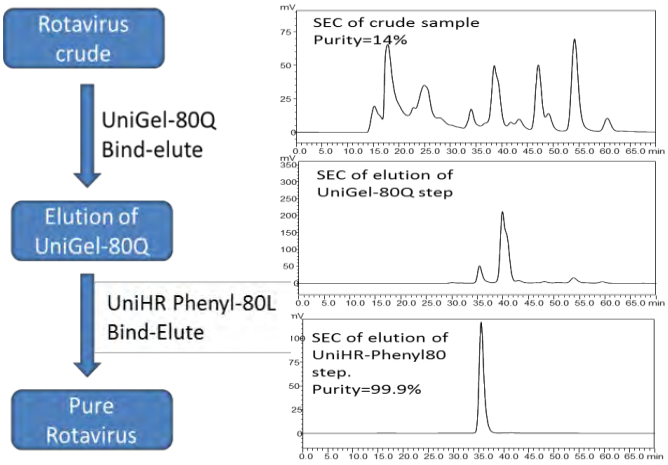
Characteristics of UniHR Butyl and UniHR Phenyl HIC Resins

Product Name	UniHR Butyl-30S	UniHR Butyl-30L	UniHR Butyl-60S	UniHR Butyl-80L	UniHR Phenyl-30S	UniHR Phenyl-30L	UniHR Phenyl-60S	UniHR Phenyl-80L
Support Matrix	Monodisperse Highly Crosslinked Polymethacrylate Beads							
HIC Ligand	Butyl				Phenyl			
Particle Size (μm)	35	32	60	80	35	32	60	80
Pore Size (Å)	500	1000	500	1000	500	1000	500	1000
Dynamic Binding Capacity*	~20 mg/ml (Lys)	~15 mg/ml (Lys)	~20 mg/ml (Lys)	~10 mg/ml (Lys)	~30 mg/ml (Lys)	~15 mg/ml (Lys)	~20 mg/ml (Lys)	~10 mg/ml (Lys)
Operating Pressure	< 0.8 MPa	< 0.8 MPa	< 0.5 MPa	< 0.5 MPa	< 0.8 MPa	< 0.8 MPa	< 0.5 MPa	< 0.5 MPa
Operating pH Range	2 – 12				2 – 12			
Chemical Stability	Can be regenerated with acid or base; compatible with organic solvents; do not expose to stronger oxidizers							

Product Highlights

- Uniformed Particle Size
- High Mass Transfer and High Resolution
- Outstanding Mechanic Strength and Superior Pressure-Flow characteristics
- Minimal Non-Specific Binding and High Recovery

Application Example: HIC Polish Purification of Rotavirus Using UniHR Phenyl-80L Resin



Ordering Information

Cat. No.	Product Name	Diameter μm	Pore Size Å	Package Size
06131-030050	UniHR Phenyl-30S	30	500	30ml 100ml 1L 10L 100L
06131-030100	UniHR Phenyl-30L	30	1000	
06131-060050	UniHR Phenyl-60S	60	500	
06131-080100	UniHR Phenyl-80L	80	1000	
06132-030050	UniHR Butyl-30S	30	500	
06132-030100	UniHR Butyl-30L	30	1000	
06132-060050	UniHR Butyl-60S	60	500	
06132-080100	UniHR Butyl-80L	80	1000	

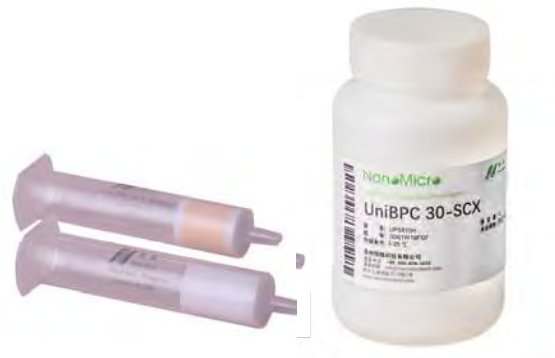
Solid Phase Extraction Sorbents

Monodisperse SPE Sorbents

Nanomicro's Solid Phase Extraction (SPE) sorbents are specialty monodisperse microspheres with very good chemical stability, broad pH use range, and optimized surface functional groups. Due to their precision mono-sized nature, NanoMicro's SPE sorbents exhibit better performance than traditional sorbents of non-uniform particle sizes in terms of consistency. In addition, they can provide compressed adsorption/elution and thus enable less solvent consumption.. They are popularly employed in the sample pretreatment for advanced liquid and gas chromatography or mass spectroscopy. They are widely used in the sample pretreatment and analysis of food, agriculture and livestock products, cosmetics, environmental samples, etc.

Features and Advantages

- Mono-sized nature, very good lot-to-lot reproducibility.
- Optimized pore size distribution and surface functional group density, very high sample recovery efficiency suitable for enrichment of trace target analyte
- Decreased solvent usage and compressed elution that reduce pollution stress on environment
- Multiple matrices and surface chemistries provide tailored hydrophobicity and surface function for optimal performance for varied application



Characteristics of Nanomicro's SPE Resins

Product	UniBPC	UniRPC	UniMC	NM BPC	UniSil C18
Functional groups	SCX, SAX, WAX, WCX	SCX	SCX, SAX, WAX, WCX	SCX	C18
Substrate	Monodisperse PolyTATO/St microspheres	Monodisperse PS/DVB microspheres	Monodisperse PMMA microspheres	PolyTATO/St microspheres	Silica microspheres
Hydrophilicity	Hydrophilic, lipophilic	Hydrophobic	Hydrophilic	Hydrophilic, lipophilic	Hydrophobic reversed phase
Particle size, μm	60, 40, 30	40, 30, 20, 10	30,20,10	60	30, 50
Swelling coefficient	⩽25% (60 μm) methanol	⩽15% (30 μm) methanol	⩽15% (40 μm) methanol	⩽25% (60 μm) methanol	No swelling
Pore size, Å	300 Å				120 Å

SCX = $-(CH2)_3SO^{3-}$ (strong cation exchange)
WCX = $-CH_2COO-$ (weak cation exchange)
SAX = $-CH_2N(CH_3)_3$ (strong anion exchange)
WAX = $-CH_2CH_2N(C_2H_3)_2$ (weak anion exchange)

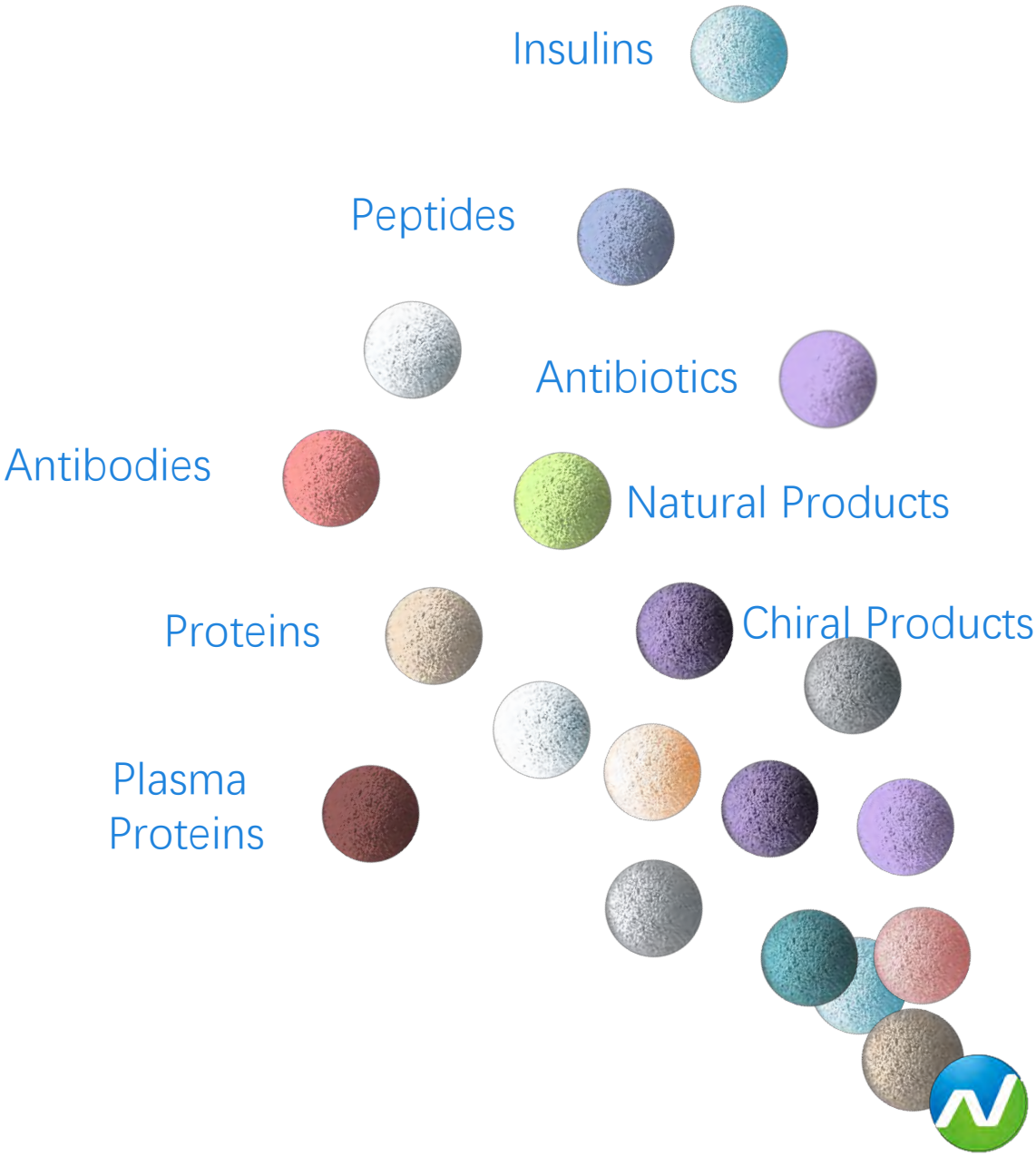
Ordering Information

Series	Cat. No.	Product Name	Diameter μm	Package Size
Uni® SPE Sorbents	02000-540030	UniBPC 40	40	30ml 100ml 500ml 1L 10L
	02000-560030	UniBPC 60	60	
	02000-560031	NM BPC 60	50-150	
	02001-095030	NM 100-SCX	50-150	
	02001-130030	UniRPC 30-SCX	30	
	02001-530030	UniBPC 30-SCX	30	
	02001-560031	NM BPC 60-SCX	60	
	02003-130030	UniRPC 30-SAX	30	
	02003-530030	UniBPC 30-SAX	30	
	02003-560030	UniBPC 60-SAX	60	
	02003-610030	UniMC 10-SAX	10	
	02003-620030	UniMC 20-SAX	20	
	02003-630030	UniMC 30-SAX	30	
	02004-620030	UniMC 20-WCX	20	
	02004-630030	UniMC 30-WCX	30	
	02005-130030	UniRPC 30-WAX	30	
	02005-560020	UniBPC 55-WAX	55	

Note: For more particle size and pore size, please contact with our sales.

Application Guide

Monodisperse Chromatography Media



Insulin Purification

The different expression systems in insulin production generates “insulin-like”impurities that are very similar to insulin itself. Such impurities can be difficult to eliminate and require multiple orthogonal chromatography purification steps.

Typically in the capture step an ion exchange chromatography media which has large binding capacity, good alkalic resistance, long life, and fast flow rate is used to capture and concentrate the large volumes of fermentation product. **NanoMicros UniGel-80SP is** a highly crosslinked polymethacrylate beads of uniformed 80μm particle size and open pore structure are offering very high flow rate at low back pressure and efficient capture of insulin

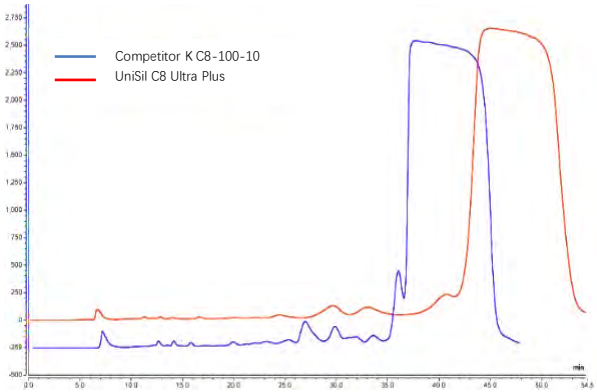
A chromatographic media with high-resolution is required in intermediate purification step to remove large amounts of impurities. Both ion exchange chromatography media and reversed-phase media can be used in this step. Polystyrene matrices such as **NanoMicro’s Nano SP 15μm or 30μm** media with advantages of high resolution and long column lifetime are widely used in this step

For the polishing step reversed-phase media based on silica such as **NanoMicro’s Uni® Insulin C8** is the media of choice, because it has very high resolution and high column efficiency, which is very effective in removing” insulin-like” impurities

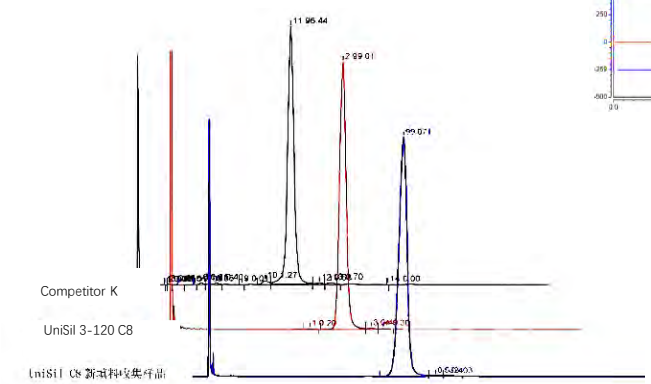
Purification of Degludec Insulin

	K C8 10-100	Uni®Insulin C8
Crude sample	96.4 %	
Sample Load	12.5 mg/g	
Purity	99.01 %	99.07 %
Yield	67.0 %	70.8 %

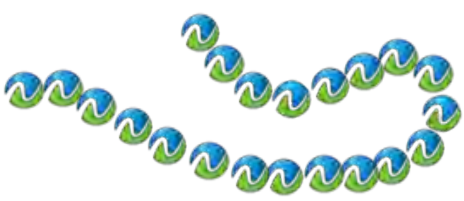
Purification of Degludec Insulin



Analysis of Degludec Insulin



Column: UniSil® 3-120 C8 4.6×150mm
Mobile phase:
A: Na_2SO_4+ NaH_2PO_4 (pH=5.7)
B: H_2O/ACN=50:50
Gradient elution
Detection: UV 214nm
Flow rate: 1mL/min
Sample size: 10μL

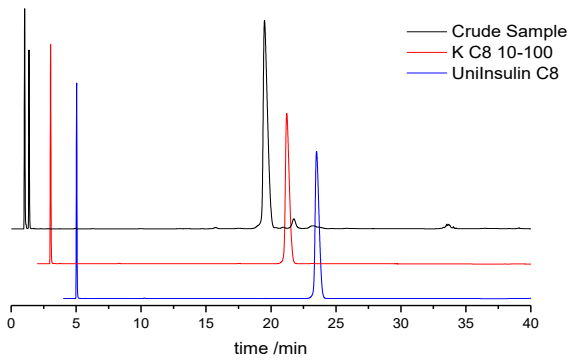


Insulin Purification

Purification of Recombinant Human Insulin

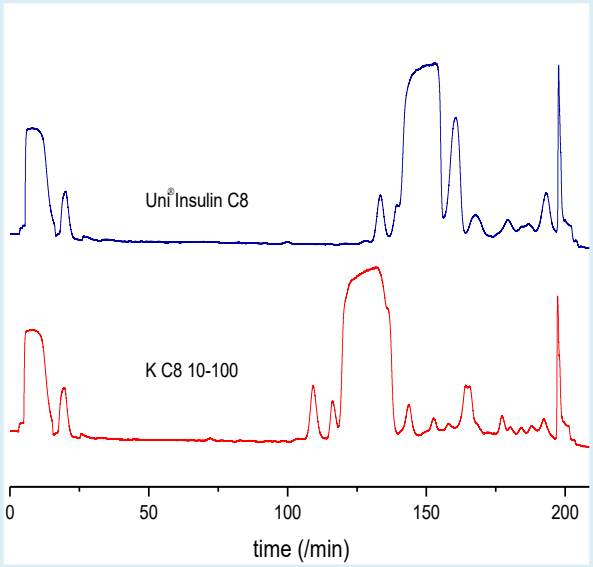
	K C8 10-100	Uni®Insulin C8
Crude sample	86.7 %	
Sample Load	8 mg/g	
Purity	99.46 %	99.41 %
Yield	62.1 %	73.6 %

Analysis of Recombinant Human Insulin



Column: UniSil® 3-120 C4 4.6×100mm
Mobile phase: Gradient elution
A: 50mM NaH_2PO_4 (H_3PO_4 pH=2.5)
B: Solution A/ACN=50:50
Detection: UV 220nm
Flow rate: 1mL/min
Sample size: 5μL

Preparation of Recombinant Human Insulin



Summary of Application References on Insulin Purification *

Molecules	Purification Step	Competitive Advantages of Nanomicro's Products	Application Results Summary			
			Binding Capacity	Crude	Purity	Recovery
Insulin Glargine	Capture	High flow rate, low non-specific binding, high binding capacity	20mg/ml	45.0%	78.0%	75.0%
	Intermediate Purification	High rigidity, long life, high alkalic & acidic tolerance, high resolution	24mg/ml	68.0%	98.0%	80.0%
			10mg/ml	65.0%	95.0%	75.0%
	Polishing	High resolution, high rigidity, high column efficiency	6mg/ml	95.0%	99.5%	78.0%
Insulin Detemir Insulin Degludec	Capture	High flow rate, Low non-specific binding, high binding capacity	100mg/ml	60.0%	95.0%	94.0%
	Intermediate Purification	High rigidity, long life, high alkalic & acidic tolerance, high resolution	24mg/ml	68.0%	98.0%	80.0%
			15mg/ml	80.0%	96.0%	85.0%
			15mg/ml	60.0%	95.0%	80.0%
	Polishing	High resolution, high rigidity, high column efficiency	15mg/ml	95.0%	99.0%	80.0%
Recombinant Human Insulin	Polishing	High Recovery	8mg/ml	86.7%	99.4%	73.6%

* For reference only. Results obtained based on specific sample and separation strategies. Please consult our Application Specialist for more information or assistance

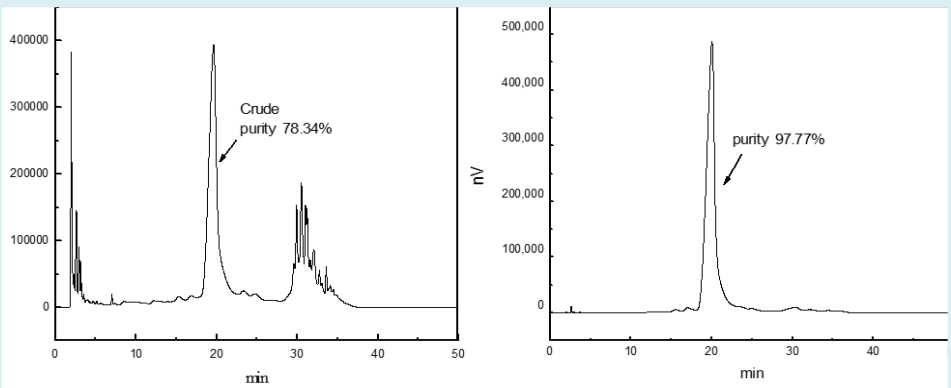
Peptide Purification

Generally, peptides and many small biomolecules are separated and analyzed by reversed-phase silica chromatography media, which is rigid and does not swell in organic solvents. NanoMicro offers a full line of monodisperse silica chromatography media, including reversed-phase, normal phase, HILIC, and chiral media. **NanoMicro** monodisperse silica medias are perfectly spherical with a very narrow particle size distribution, and hence provide advantages such as high resolution, more stable column bed and high column efficiency as compared to polydisperse silica media.

However, in some cases, reversed-phase silica media may not perform well because of selectivity limitations or some process conditions may exceed the pH-tolerant range of silica. To overcome these, **NanoMicro** develops and manufactures polystyrene/divinyl benzene based reversed-phase **UniPS** media that has superb chemical stability feature enabling it to be used over the full pH range. At the same time, it complements the selectivity of silica media and can be used in cases where silica media is not suitable.

Besides RPC media, NanoMicro's high resolution IEX resins, NanoSP and NanoQ as well as Uni series IEX resins are good choices for the polishing or intermediate purification of many peptides.

Purification of Liraglutide

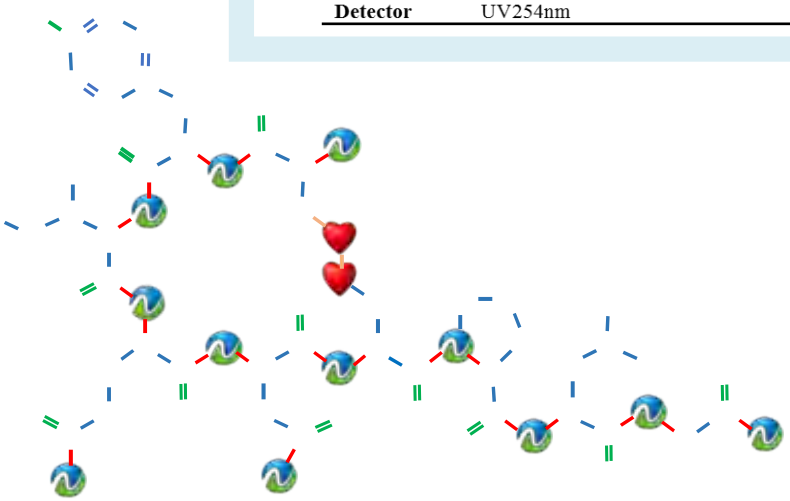


Purification Process

Column	PS10-300 4.6×250 mm
Mobil Phase	A=0.15% NH_4OH in water; B=0.15% NH_4OH in acetonitrile
Flow rate	0.6mL/min
Detector	UV254nm

Purity Analysis Method

Column	phenomenex Jupiter Proteo 4-90
Mobil phase	A: 110mM Ammonia dihydrogen phosphate(pH=3.7) / 100mL acetonitrile (9:1) B: acetonitrile
Flow rate	1.0mL/min
Detector	UV254nm

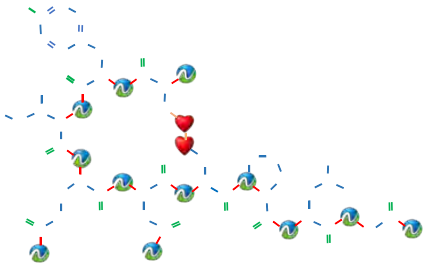


Peptide Purification

Summary of Application References on Peptide Purification *

Molecules	Purification Step	Competitive Advantages of Nanomicro's Products	Application Results Summary			
			Binding Capacity	Crude	Purity	Recovery
Terlipressin	Polishing	High Resolution, High Rigidity, Long Lifetime	6mg/ml	98.0%	99.0%	50.0%
Leuprorelin	Polishing	High Resolution, High Rigidity, Long Lifetime	6mg/ml	86.0%	98.0%	80.0%
Thymalfasin	Intermediate Purification	High Resolution, High Rigidity, Long Lifetime	12.5mg/ml	39.0%	85.0%	85.0%
	Intermediate Purification		12.5mg/ml	39.0%	85.0%	80.0%
	Polishing		8mg/ml	85.0%	98.0%	89.0%
	Polishing		12.5mg/ml	39.0%	85.0%	82.0%
Palmitoyl Tetrapeptide-7	Polishing	High Resolution, High Rigidity, Long Lifetime	10mg/ml	71.0%	98.0%	87.0%
Acetyl Tetrapeptide	Polishing	High Resolution, High Rigidity, Long Lifetime	6mg/ml	86.0%	98.0%	92.0%
Exenatide	Intermediate Purification	High Resolution, High Rigidity, Long Lifetime	8mg/ml	55.0%	81.0%	90.0%
	Polishing		4mg/ml	81.0%	98.0%	89.0%
Thymopentin	Polishing	High Resolution, High Rigidity, Long Lifetime	15mg/ml	85.0%	99.0%	72.0%
Oxytocin	Polishing	High Resolution, High Rigidity, Long Lifetime	100Unit/ml	62.3%	97.8%	81.8%
Tacrolimus	Polishing	High Resolution, High Rigidity, Long Lifetime	2mg/ml	82.0%	99.0%	80.0%
Bivalirudin	Polishing	High Resolution, High Rigidity, Long Lifetime	5mg/ml	94.0%	99.5%	70.0%
Octreotide	Polishing	High Resolution, High Rigidity, Long Lifetime	10mg/ml	68.0%	99.0%	70.0%
Liraglutide	Intermediate Purification	High resolution, high rigidity, high column efficiency, good alkalic and acidic tolerance	5g/l	88.0%	95.0%	70.0%
	Polishing		2.5g/l	95.0%	99.0%	60.0%

* For reference only. Results obtained based on specific sample type and separation strategies. Please consult our Application Specialist for more information or assistance



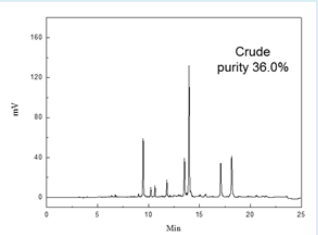
Antibiotic & Antifungal Purification

The commercial production of penicillin and other antibiotics is the most dramatic example of industrial microbiology. Production of antibiotics is very critical to meet the market demands of human patients worldwide. Profitable production and commercialization of antibiotics is a challenge today, affected mainly by the low market price and commercial profitability coupled with the high cost of development and unsustainable production cost. Lowering manufacturing cost while maintaining or improving production efficiency is very important. Conventional microporous resins of is commonly used in the separation and purification processes but the separation efficiency is not cost effective enough.

NanoMicro has developed a series of polystyrene and polyacrylate based chromatography media, which are proven to be very cost effective in purification of commercially produced antibiotics such as Vancomycin and Daptomycin. In one commercial production, 4000L of traditional microporous resin was replaced by 1000 liters of NanoMicro monodisperse media successfully improving product quality with significant manufacturing cost reduction from a more efficient purification process with higher product recovery and buffer consumption saving .

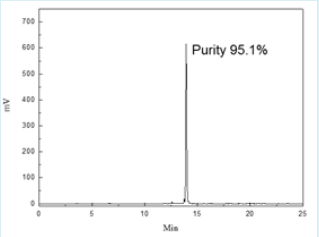
Vancomycin

Purification of Vancomycin using UniPS® 30-300 Reverse phase chromatography media.



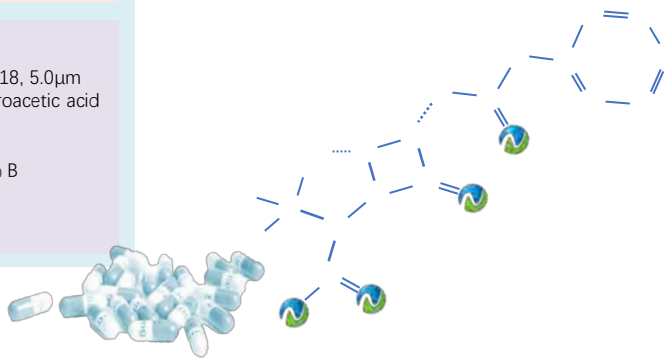
Purification Process

Column:	UniPS® 30-300
Loading:	10.0 mg/ml
Mobile Phase:	A: 0.02% trifluoroacetic acid B: acetonitrile
Flow Rate:	0.6 ml/min
Purity/Recovery:	95.0% / 60.0%



Analysis Method

Column:	4.6*250mm C18, 5.0μm
Mobile Phase:	A: 0.1% trifluoroacetic acid B: acetonitrile
Gradient Process:	At 0 min 0% B At 20 min 90% B
Flow Rate:	1.0 ml/min
Detection:	UV 280nm



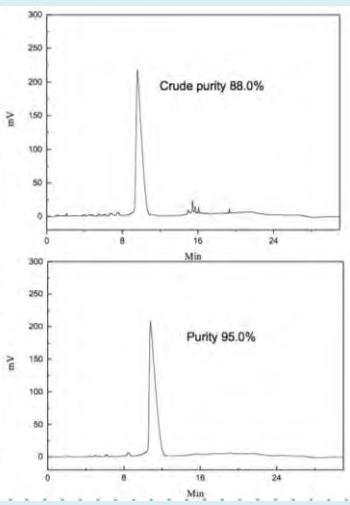
Purification of Vancomycin using UniVanco RPC Media

Analysis of crude

Column	4.6×250 mm C18, 5.0 μm
Mobile phase	Buffer: 0.2% (v/v) TEA - H_3PO_4 pH = 3.2 A = buffer : ACN : THF(93.5:5.5:1) B = buffer : ACN : THF(70:29:1)
Gradient	at 12 min 0% B at 20-22 min 100% B at 23 min 0% B
Flow rate	1.0 ml/min
Detector	UV 280 nm

Purification

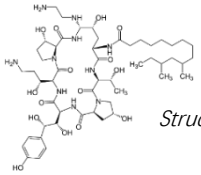
Packing	UniVanco
Loading	35.0 mg/ml
Mobile phase	A = H_2O B = EtOH
Flow rate	2.0 ml/min
Purity / Recovery	95.0% / 78.0%



Antibiotic & Antifungal Purification

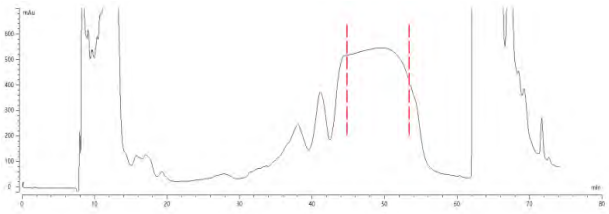
Caspofungin

Caspofungin is the first echinocandin drug that was approved by the US FDA in 2001. It was developed by Merck, for the patients with invasive aspergillosis cannot be cured or tolerated by standard therapies.



Structure of Caspofungin

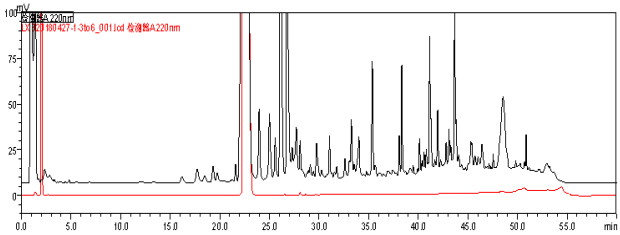
Separation of Caspofungin



Preparational Condition:

Media: UniSil® 8-120 C18
Sample Size: 20 mg/g
Purity of Curde Sample: 60.0 %
Purity of finished product: 99.6 %
Single Impurity: < 0.1 %
Recovery: 85 %

Analysis

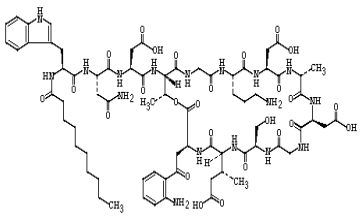


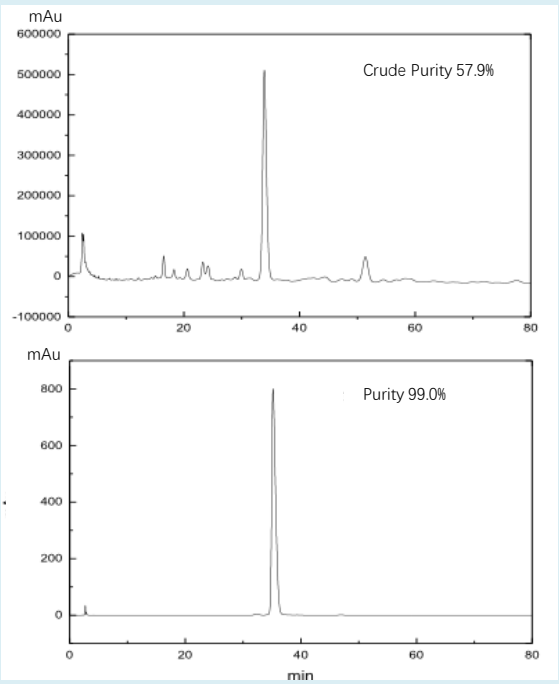
Analytical Condition:

Column: UniSil® 3-120 C18 Ultra, 4.6×150 mm
Detection: UV 220 nm
Flow Rate: 1.0 mL/min
Sample size: 10 µL

Daptomycin

Daptomycin is a cyclic lipopeptide antibiotic first marketed by Cubist Pharmaceuticals. It has a unique structure and distinct mechanism of action against Gram-positive aerobic and anaerobic bacteria. As the only antibiotic without resistance, Daptomycin is highly effective and fast-acting toward Gram-positive organism including resistant pathogens, such as Methicillin-resistant Staphylococcus aureus, Vancomycin-resistant Enterococcus faecalis, and Staphylococcus aureus. Its potent bactericidal activity is clinically very important in the treatment of infection that causes serious and life-threatening diseases. cannot be cured or tolerated by standard therapies.





Purification

Step 1

Column packing: UniQ-50XS
Loading: 10.0 mg/ml
Mobile phase: A = Buffer , B = Buffer + 0.5 M NaCl
Purity/Recovery: 85%/ 90.0%

Step 2

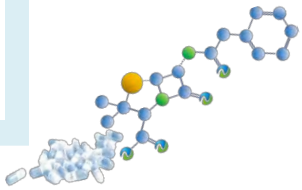
Column packing: UniQ-50XS
Loading: 10.0 mg/ml
Mobile phase: A = Buffer, B = Buffer + 0.5 M NaCl
Purity/Recovery: 90% / 87%

Step 3

Column packing: UniSil 10-100 C18
Loading: 10.0 mg/ml
Mobile phase: A = Buffer, B = Ethanol
Purity/Recovery: 99% / 46%

Analysis

Column: 4.6 ×250 mm C8, 5.0 µm
Mobile phase: A. CH_3CN/Buffer = 2/8, B. CH_3CN/Buffer = 5/5
Isocratic elution: A / B= 55 / 45
Flow rate: 1.0 ml/min
Detector: UV @ 225 nm

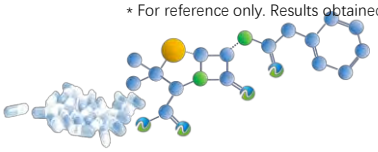


Antibiotic & Antifungal Purification

Summary of Application References on Antibiotics Purification*

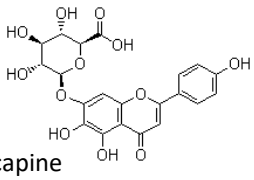
Project	Purification Step	Competitive Advantages of Nanomicro's Products	Application Results Summary			
			Binding Capacity	Crude	Purity	Recovery
7-ACA	Polishing	High Resolution, high rigidity, high column efficiency, long life	20mg/ml	96.3%	99.3%	93.0%
Ascomycin	Polishing	High Resolution, High Rigidity, High column efficiency	11g/kg	93.1%	99.5%	90.0%
Caspofungin	Polishing	High Resolution, high rigidity, high lolumn efficiency	20mg/ml	83.0%	99.0%	83.0%
Caspofungin Intermediate-II	Intermediate Purification	High Resolution, high rigidity, high column efficiency, long life	16.3mg/ml	65.0%	95.0%	97.0%
Cyclosporin Analogu	Intermediate Purification	High Resolution, high rigidity, high column efficiency, long life, high binding capacity	15mg/ml	56.0%	96.0%	85.0%
Cyclosporine	Polishing	High flow rate, High Resolution, Long life	50mg/ml	92.0%	99.0%	80.0%
Dalbavancin	Polishing	High Resolution, high rigidity, high column efficiency, long life, high binding capacity	15mg/ml	58.0%	99.0%	78.0%
Daptomycin	Intermediate Purification	High Resolution, high rigidity, high column efficiency, long life, high binding capacity	10mg/ml	50.0%	60.0%	90.0%
	Intermediate Purification		10mg/ml	60.0%	85.0%	75.0%
	Polishing	High Resolution, high rigidity, high lolumn efficiency	10mg/ml	85.0%	99.0%	60.0%
Fidaxomicin	Polishing	High Resolution, High Rigidity, High column efficiency	12mg/ml	97.0%	99.0%	97.0%
	Polishing		1 mg/ml	65.0%	99.1%	80.0%
Micafungin	Polishing	High flow rate, low non-specific binding, high binding capacity	5g/l	90.0%	98.0%	75.0%
Micafungin Intermediate	Polishing	High rigidity, long life, good alkalic and acidic tolerance, high resolution	5g/l	94.0%	99.6%	79.0%
Moxidectin	Intermediate Purification	High Resolution, high rigidity, high lolumn efficiency	20mg/ml	85.0%	89.0%	90.0%
	Polishing		30mg/ml	89.0%	99.3%	95.0%
Oritavancin Intermediate	Polishing	High Resolution, high rigidity, high column efficiency, long life	8mg/ml	80.4%	98.2%	40.0%
PneumocandinB$_0$	Polishing	High Resolution, high rigidity, high lolumn efficiency	1 mg/ml	65.6%	99.1%	80.0%
Rapamycin	Polishing	High Resolution, high rigidity, high column efficiency, long life, high binding capacity	4mg/ml	95.7%	98.5%	70.0%
Tacrolimus	Intermediate Purification	High rigidity, long life, wide pH range, high Resolution	30mg/ml	60.0%	82.0%	80.0%
Teicoplanin	Intermediate Purification	High rigidity, long life, wide pH range, high Resolution	30mg/ml	76.0%	94.0%	75.0%
Tiacumicins	Polishing	High Resolution, high rigidity, high lolumn efficiency	3mg/ml	80.0%	99.4%	65.0%
Vancomycin	Intermediate Purification	High Resolution, high rigidity, high column efficiency, long life	30mg/ml	76.0%	94.0%	72.0%
	Polishing	High Resolution, high rigidity, high column efficiency, long life, high binding capacity	30mg/ml	78.0%	95.0%	80.0%

* For reference only. Results obtained based on specific sample and separation strategies. Please consult our Application Specialist for more information or assistance



Natural Product Purification

Nanomicro offers a series of chromatographic media products, both silica and polymeric reverse phase resins, for efficient separation and purification of natural products. In addition, our dedicated application team have also developed many successful separation and purification process for customers. One of these examples is the process developed for the purification of Breviscapine.



Breviscapine

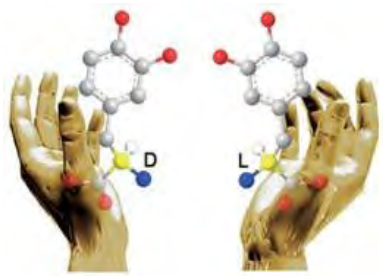
Summary of Application References about Natural Product Purification*

Project	Purification Step	Competitive Advantages of Nanomicro's Products	Application Results Summary			
			Binding Capacity	Crude	Purity	Recovery
Taxol	Intermediate Purification	High Resolution, high rigidity, high column efficiency, long lifetime	25mg/ml	8.0%	55.0%	65.0%
	Polishing		25mg/ml	55.0%	99.0%	40.0%
Docetaxel	Polishing	High Resolution, high rigidity, high column efficiency, long lifetime	10mg/ml	80.4%	99.0%	38.3%
Huperzine A	Capture	High Resolution, high rigidity, high column efficiency, long lifetime	40mg/ml	30.8%	76.0%	95.0%
	Polishing	High Resolution, High Rigidity, Long Lifetime	40mg/ml	76.0%	99.0%	70.0%
Scutellarin	Polishing	High Resolution, high rigidity, high column efficiency, long lifetime	10mg/ml	90.0%	99.0%	70.0%
Stevioside	Polishing	High Resolution, high rigidity, high column efficiency, long lifetime	50mg/ml	43.0%	98.0%	70.0%
Ginkgolides	Intermediate Purification	High Resolution, High Rigidity, Long Lifetime	10mg/ml	90.0%	95.0%	70.0%
	Polishing		20mg/ml	95.0%	99.7%	78.3%
Neomangiferin	Polishing	High Resolution, high rigidity, high column efficiency, long life	2.5mg/ml	51.8%	98.6%	62.5%
Myricetin	Polishing	High Resolution, high rigidity, high column efficiency, long life	3mg/ml	94.0%	99.8%	80.6%
Diosgenin	Polishing	High Resolution, high rigidity, high column efficiency, long life	10mg/ml	28.0%	80.0%	60.0%
Vinorelbine	Polishing	High Resolution, high rigidity, high column efficiency, long life	10mg/ml	73.0%	99.0%	55.0%
Cod Liver Oil	Polishing	High Resolution, High Rigidity, Long Life	1 mg/ml	EPA: 57.4% DHA:24.4%	EPA: 98.0% DHA:86.9%	EPA: 25.0% DHA:30.0%
Breviscapine Scutellarin	Polishing	Use Water as the solvent	7mg/ml	97.2%	99.3%	75.0%
Salvianolic acid A	Intermediate Purification	High Resolution, High Rigidity, Long Life	8mg/ml	91.7%	98.3%	80.0%
	Polishing	High binding capacity	10mg/ml	98.3%	99.7%	88.0%
Ginsenoside	Capture	High Resolution, High Rigidity, High column efficiency	4.2g/kg	Rg1: 2.12% Re: 4.3% Rg2: 2.7% Rb: 13.1% Rc: 14.6% Rb2: 9.2% Rd:32.5%	Rg1: 71.6% Re: 56.3% Rg2: 11.0% Rb: 71.3% Rc: 29.7% Rb2: 75.4% Rd: 97.4%	/
	Intermediate Purification		Rg1: 4.2g/kg Re: 4.2g/kg Rg2:1.1g/kg Rb1: 4.2g/kg Rb2: 4.2g/kg	Rg1: 71.6% Re: 56.3% Rg2: 11.0% Rb1: 71.3% Rb2: 75.4%	Rg1: 87.6% Re: 83.7% Rg2: 55.0% Rb1: 83.1% Rb2: 88.6%	/
	Polishing		Rg1: 4.2g/kg Re: 4.2g/kg Rg2: 3.5g/kg Rb1: 3.5g/kg Rc: 4.2g/kg Rb2: 4.2g/kg Rd: 4.2g/kg	Rg1:crude 87.6% Re: crude 83.7% Rg2:55.0% Rb1:crude	Rg1: 99.1% Re: 93.7% Rg2: 91.6% Rb1: 95.3% Rc: 93.7% Rb2: 90.7% Rd: 97.4%	/

* For reference only. Results obtained based on specific sample and separation strategies. Please consult our Application Specialist for more information or assistance

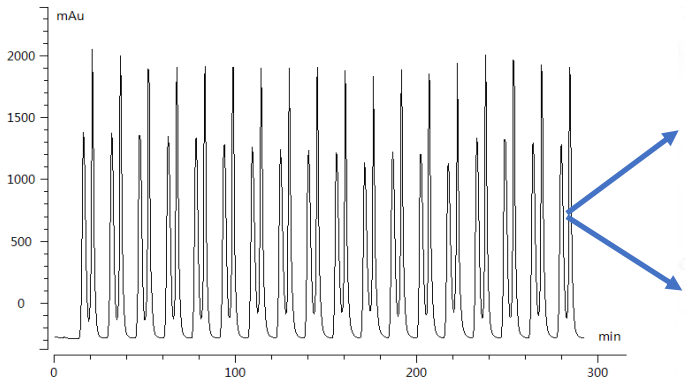
Chiral Separation

Chiral isomers have almost the same chemical and physical properties, it is extremely difficult in separation and purification. Usually, chiral isomers can be separated by chiral chromatography medias which are very expensive and monopolized by Daicel Chiral Technologies. Using innovative silica matrix and optimal surface chemistries, NanoMicro has developed a series of chiral chromatography medias of highly competitive performance for chiral analysis and separation. In addition, NanoMicro also offers service of customized process development for chiral purification. With a dedicated application team, a well-equipped GMP lab, and an established work-flow, NanoMicro has successfully provided numerous customers high quality service of chiral separation.

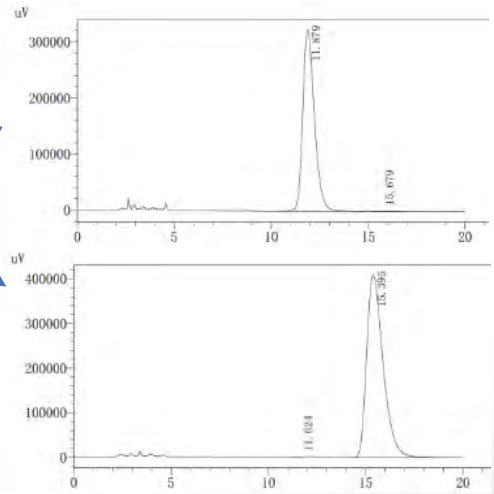


Chiral compound's racemate of AB

Chiral preparation spectra of 20 injections

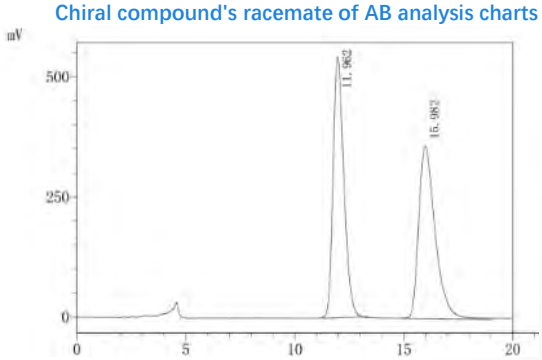


Purification fraction analysis charts



Column：UniChiral® CND-5H 50mm ø×250mm L
Loading quantities： 100mg/injection
Flowrate：80.0mL/min
Column pressure： 2Mpa
UV wavelength： 280nm
Temperature:30℃
Ee： peak1，ee.＞=99.0%; peak2,ee.>=99.0%
Yield： >90%

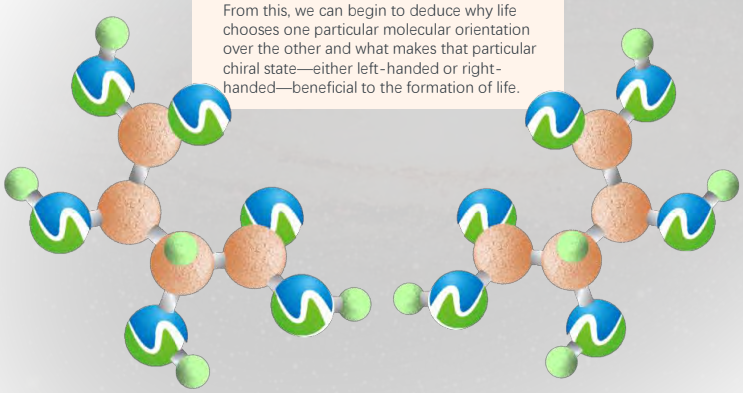
Chiral compound's racemate of AB analysis charts



Column：UniChiral® CND-5H
4.6mm×250mm L
Eluent：n-Hexane/Ethanol=90/10(v/v)
Temperature: 30℃
Flowrate：1.0mL/min
UV wavelength： 254nm

Discovering Life's Origins and the Mystery of Homochirality

The molecules necessary to form life here on earth are chiral molecules that exist predominantly in either the left-handed state or the right-handed state. No one knows why the building blocks of life tend to prefer one state over the other. Life's preference for the left-handed chiral molecules has puzzled biologist for a long time. The discovery of the complex chiral molecule propylene oxide (CH_3CHOCH_2) within a gaseous cloud outside our solar system has the potential to shed some light on Earth's homochiral mystery. From this, we can begin to deduce why life chooses one particular molecular orientation over the other and what makes that particular chiral state—either left-handed or right-handed—beneficial to the formation of life.

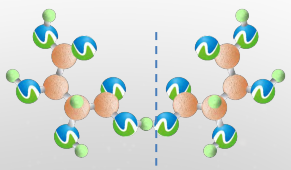


Chiral Separation

Summary of Application References about Chiral Separation

Project	Purification Step	Nanomicro's Resin and Media	Separation Mode	Corresponding Products in the Market	Competitive Advantages of Nanomicro's Products
2,2,2-trifluoro-1-(9-anthryl) ethanol	Analysis	**UniChiral® CND-5H**	Chiral resolution	OD-5H (Daicel)	High resolution, selectivity comparable to Daicel.
Benzoin	Analysis	**UniChiral® CND-5H**	Chiral resolution	OD-5H (Daicel)	High resolution, selectivity comparable to Daicel.
Bovasitan	Polishing	**UniSil® 10-120**	Normal Phase	Daisogel 120-10-P	High Resolution, high rigidity, high column efficiency, long life
Disopyramide	Analysis	**UniChiral® CMD-5H**	Chiral resolution	AD-5H (Daicel)	High resolution, selectivity comparable to Daicel.
Flurbiprofen	Analysis	**UniChiral® CMD-5H**	Chiral resolution	AD-5H (Daicel)	High resolution, selectivity comparable to Daicel.
Furoin	Analysis	**UniChiral® CMD-5H**	Chiral resolution	AD-5H (Daicel)	High resolution, selectivity comparable to Daicel.
Ketoprofen	Analysis	**UniChiral® CMD-5H**	Chiral resolution	AD-5H (Daicel)	High resolution, selectivity comparable to Daicel.
Pantolactone	Analysis	**UniChiral® CMD-5H**	Chiral resolution	AD-5H (Daicel)	High resolution, selectivity comparable to Daicel.
Thalidomide	Analysis	**UniChiral® CMD-5H**	Chiral resolution	AD-5H (Daicel)	High resolution, selectivity comparable to Daicel.
Warfarin	Analysis	**UniChiral® CMD-5H**	Chiral resolution	AD-5H (Daicel)	High resolution, selectivity comparable to Daicel.

* For reference only. Results obtained based on specific sample and separation strategies. Please consult our Application Specialist for more information or assistance

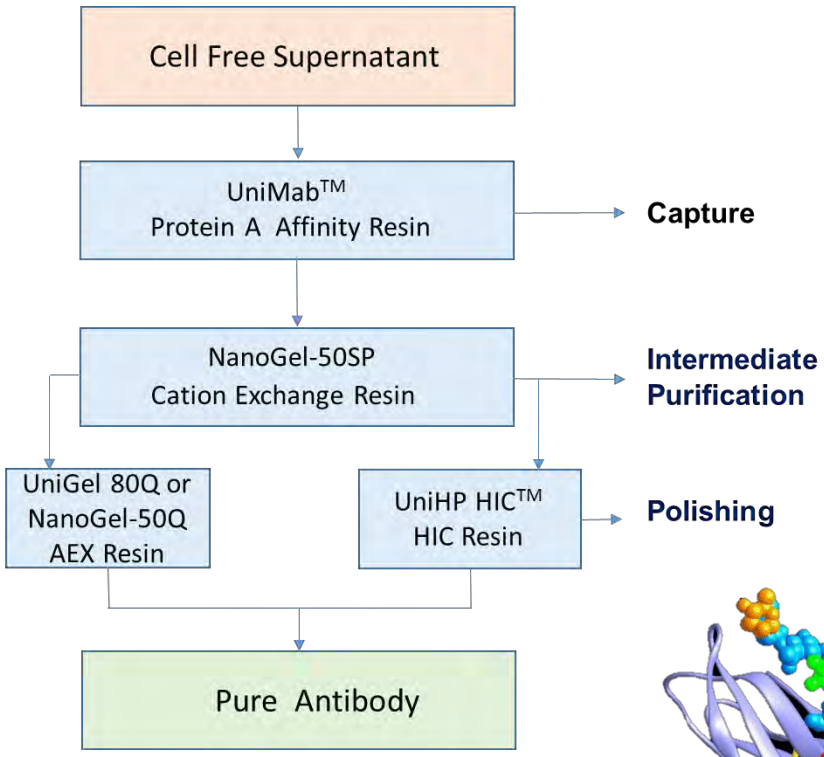


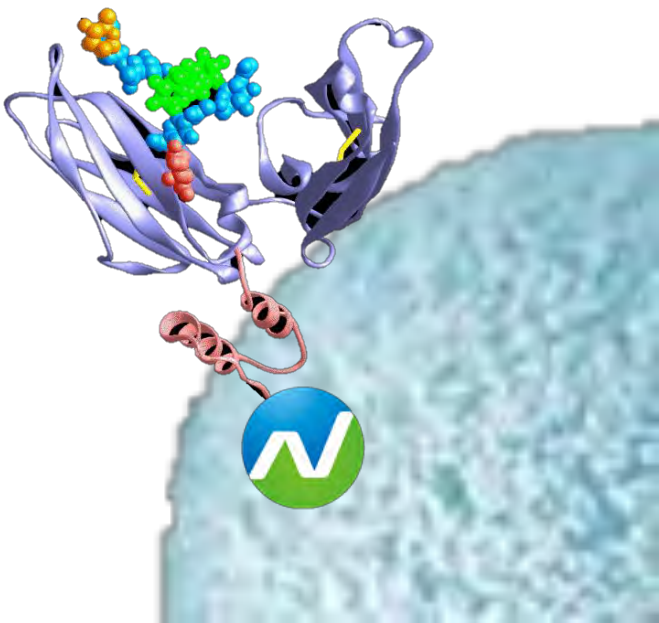
Antibody Purification

Monoclonal antibodies are so expensive because of the cost and complexity of manufacture and the need for relatively high doses. Although raw material costs are low the process itself is extremely expensive. Downstream processing covers more than 50% of the total cost, therefore reducing the cost of downstream processing is the key to achieve the target of making this biodrugs affordable for the masses.

Downstream processing of monoclonal antibodies or Fc-fusion proteins involves a platform process that hinges on the successful use of Protein A chromatography as a highly selective capture step. Cation exchange or hydrophobic interaction chromatography media is used in intermediate purification steps and typically anionic exchange chromatography is used in the final polishing step. NanoMicro provides competitive chromatography resin products for all these steps.

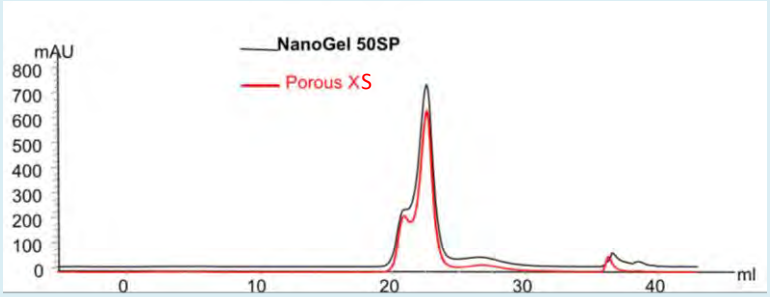
NanoMicro's protein A resin **UniMab** is based on **monodisperse** polymer matrix. It is rigid, with good alkaline tolerance and high dynamic binding capacity at a short residence times of 1-2 minutes ranging from 35-45mg/ml, improving production efficiency and making it particularly suitable for continuous processing. In addition, mono-sized UniMab resin has high mass transfer and can significantly reduce equilibration and elution buffer, thus lowering manufacturing cost further. NanoMicro has also developed **NanoGel-50SP,** a monodisperse cationic exchanger comparable to the well established POROS XS media from Thermofisher for effective removal of aggregates. For the AEX polishing step of mAbs, both **UniGel-80Q** and **NanoGel-50Q** are highly competitive choices.





Antibody Purification

Highly Efficient Removal of mAb Aggregate by NanoGel-50SP

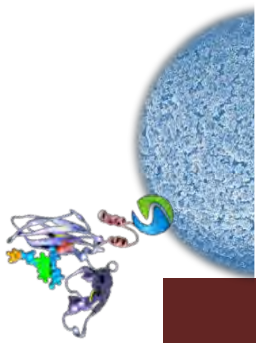


	Samples	Purity (%)	Aggregration(%)	Yield (%)
Feed (mAb eluted from Protein A resin)	S	98.36	1.64	
NanoGel 50SP	E-1	99.8	0.19	87.86
	E-2	99.02	0.93	
	E-3	97.89	2.11	
POROUS X	E-1	99.88	0.12	81.41
	E-2	99.18	0.82	
	E-3	97.52	2.4	

Summary of Application References about antibodies, Fc-fusion Proteins, and ADC

Project	Purification Step	Separation Mode	Competitive Advantages of Nanomicro's Products	Application Results Summary		
				Binding Capacity	Purity	Recovery
MAb	Capture	Affinity (Protein A)	High binding capacity at short retetion time(30mg/ml at 2min RT); Enable higher column height(>25cm); High alkaline tolerance(0.5M NaOH CIP); Less buffer consumption	45mg/ml (UniMab) 55mg/ml (UniMab Pro)	98.0%	90.0%
	Intermediate Purification	Strong Cation Exchange	Excellent salt tolerance(100mM NaCl); High efficiency in removing aggregates; High resolution; High mass transfer;	100mg/ml	99.0%	90.0%
	Intermediate Purification	Strong Cation Exchange	High column efficiency; High binding capacity; High recovery yield	120mg/ml	99.0%	90.0%
	Intermediate Purification	Mixed mode (hydrophobic and weak cation exchange)	High salt tolerance(300mM NaCl); Specical selectivity ; High resolution	30-50mg/ml	99.0%	85.0%
	Polishing	Strong Anion Exchange	High recovery; High flow rate; High binding capacity	100-200mg/ml	99.0%	90.0%
	Polishing	Mixed mode (hydrophobic and weak cation exchange)	High resolution; High flow rate	30-50mg/ml	90.0%	91.0%
Fc-Fusion Proteins	Capture	Affinity	High binding capacity at short retetion time(30mg/ml at 2min RT); Enable higher column height(>25cm); High alkaline tolerance(0.5M NaOH CIP); Less buffer consumption	45mg/ml (UniMab) 55mg/ml (UniMab Pro)	98.0%	90.0%
	Intermediate Purification	Hydrophobic	High Resolution; High efficiency in removing aggregates; High efficiency in removing degraded fragments	20mg/ml	99.0%	90.0%
	Polishing	Strong Anion Exchange	High flow rate	150mg/ml	99.0%	90.0%
Antibody-drug Conjugate (ADC)	Polishing	Hydrophobic	High resolution; High selectivity of ADC from different DAR.	30-50mg/ml	99.0%	85.0%
Antibody Fragment Fab	Polishing	Strong Cation Exchange	High resolution; Removing degraded fragments	30mg/ml	99.0%	85.0%
Bispecific antibodies (bsAbs)	Intermediate Purification	Mixed model (hydrophobic and weak cation exchange)	High Resolution; Efficient removal of aggregates and mismatch antibodies	30-50mg/ml	95.0%	80.0%

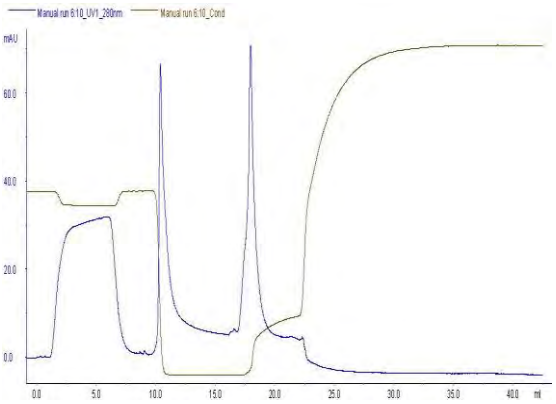
* For reference only. Results obtained based on specific sample and separation strategies. Please consult our Application Specialist for more information or assistance



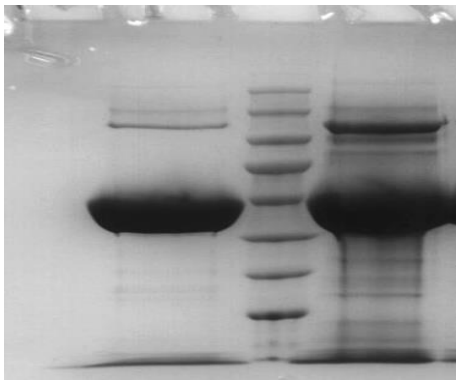
Recombinant Protein Purification

Nanomicro offers competitive IEX resins, HIC resins, and IMAC resins for efficient separation and purification of many recombinant proteins. One of these successful examples is the application in the purification of recombinant human serum albumin (rHSA) proteins. NanoMicro's UniGel-SP CEX has been successfully applied in the capture step of commercialized rHSA production due to its high binding capacity and excellent pressure-flow characteristics. NanoMicro's UniHR Phenyl HIC resin has seen its application in the intermediate purification step of rHSA, while UniGel-80DEAE and UniPB boronic acid affinity resin are successfully used in the polishing of rHSA.

Application of UniHR Phenyl HIC Resin in the Intermediate Purification of rHSA

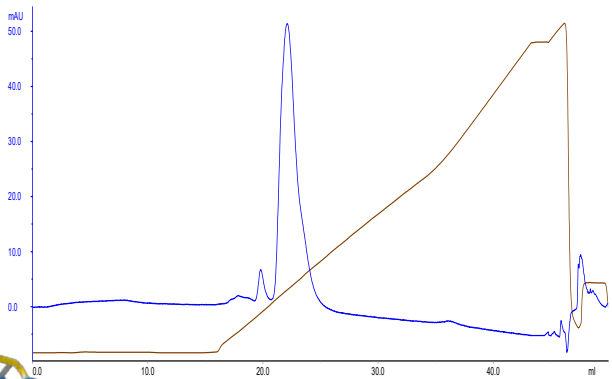


Purity ~95%, recovery yield ~80%

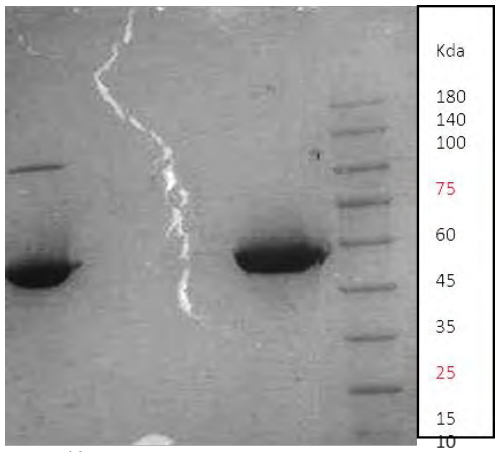


After HIC Before HIC

Application of UniGel-80DEAE in the Polishing of rHSA

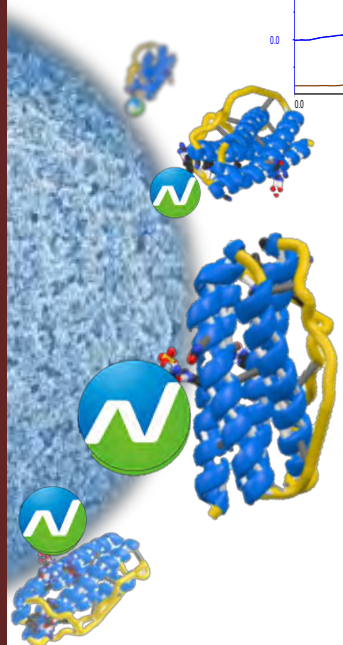


Purity >99%, recovery yield ~80%



Before AEX polishing

After AEX polishing

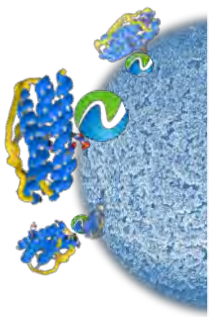


Recombinant Protein Purification

Summary of Application References about Recombinant Proteins

Project	Purification Step	Competitive Advantages of Nanomicro's Products	Application Results Summary		
			Binding Capacity	Purity	Recovery
Interleukin-11	Capture	High flow rate; Low back pressure; High binding capacity; High resolution	30-50mg/ml	50.0%	90.0%
Protease from Soybean	Capture	Low non-specific binding; Efficient impurity removal	30-50mg/ml	85.0%	82.0%
Recombinant Human Growth Hormone (rhGH)	Capture	High binding capacity; superior selectivity	30mg/ml	95.0%	85.0%
Urokinase	Capture	High resolution; High selectivity (efficient in removing small moleculars)	20mg/ml	99.0%	75.0%
Recombinant Human Albumin (rHSA)	Capture	High flow rate; Low non-specific binding ; High binding capacity	40mg/ml	60.0%	90.0%
	Intermediate Purification	High flow rate and efficient impurity removal	25mg/ml	80.0%	95.0%
	Intermediate Purification	High resolution; Efficient aggregate removal	40mg/ml	99.0%	80.0%
	Intermediate Purification		40mg/ml	99.0%	81.0%
	Polishing	Special selectivity: cis-diol structure can form stable five-membered cyclic complex, binding at high pH value and eluting at low pH value.	20mg/ml	99.0%	85.0%
Membrane Protein (His-tag)	Polishing	High rigidity; Efficient removal of protein impurities	30mg/ml	95.0%	90.0%
	Polishing		30mg/ml	95.0%	91.0%
Low Molecular Heparin	Capture	High flow rate; High resolution; High selectivity (efficient removal of chondroitin sulfate)	10mg/ml	95.0%	86.0%
PEG Recombinant Human Growth Hormone (PEG-rhGH)	Intermediate Purification	High flow rate; Low back pressure; High binding capacity; High resolution	2.5mg/ml	95.0%	86.0%

* For reference only. Results obtained based on specific sample and separation strategies. Please consult our Application Specialist for more information or assistance

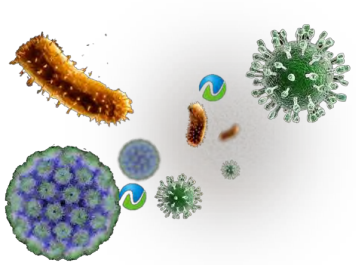


Virus & Vaccine Purification

Summary of Application References about Vaccine Purification

Project	Purification Step	Competitive Advantages of Nanomicro's Products	Application Results Summary		
			Binding Capacity	Purity	Recovery
Rabies Virus (RV)	Polishing	High flow rate; More activity recovered	100mg/ml	99.0%	90.0%
Recombinant Expressed Rotavirus	Capture	High rigidity; Long Life	10mg/ml	80.0%	95.0%
	Polishing	High hydrophobicity; High resolution	15mg/ml	99.5%	90.0%
Tetanus Immunoglobulin(TT)	Capture	Low non-specific binding ; Excellent selectivity	80mg/ml	80.0%	90.0%
	Intermediate Purification	High binding capacity	15mg/ml	90.0%	85.0%
PCV-Cap2 Protein (Insect baculovirus expression)	Capture	High binding capacity; High Resolution	10mg/ml	90.0%	80.0%
Pertussis Protein (PT, FHA)	Capture	Special selectivity	5-10mg/ml	PT>85.0% FHA>90.0%	85.0%
	Capture	High salt tolerancy (300mM NaCl); Special selectivity; High Resolution	20mg/ml	PT>85.0% FHA>95.0%	80.0%
Lentivirus (LV)	Capture	High binding capacity; High recovery	5-10mg/ml	PT>85.0% FHA>90.0%	30.0%
Plasmid	Polishing	High binding capacity; High recovery	5mg/ml	99.0%	60.0%

* For reference only. Results obtained based on specific sample and separation strategies. Please consult our Application Specialist for more information or assistance



Abbreviations

Monodisperse particles

Particles having a uniform distribution of size or diameter. provide consistency in pore size, surface properties, and chromatography peak shape.

Column Materials

SS: Stainless Steel (Typical Unless otherwise indicated)

PP: Polypropylene

GL: Glass

Product Names or and Descriptions

Uni: Monodisperse Media

NM: Non-monodisperse Media

NP: Non-porous

Functional Groups or Bonded Phase

C18: Octadecyl group bonded silica

C8: Octyl group bonded silica Butyl

C4: group bonded silica

Silica: Silica without bonded groups

NH_2 or Amino: Propylamino or amino

CN or Cyano: Propylcyano or cyano

Diol: Diol or propanediol

Phenyl: Phenyl or propylphenyl

Butyl: Butyl

IDA: $-N(CH_2COOH)_2$

NTA: $-N(CH_2COOH)_3$

SCX: $-(SAXCH_2)_3SO^{3-}$

WCX: $-CH_2COO^-$

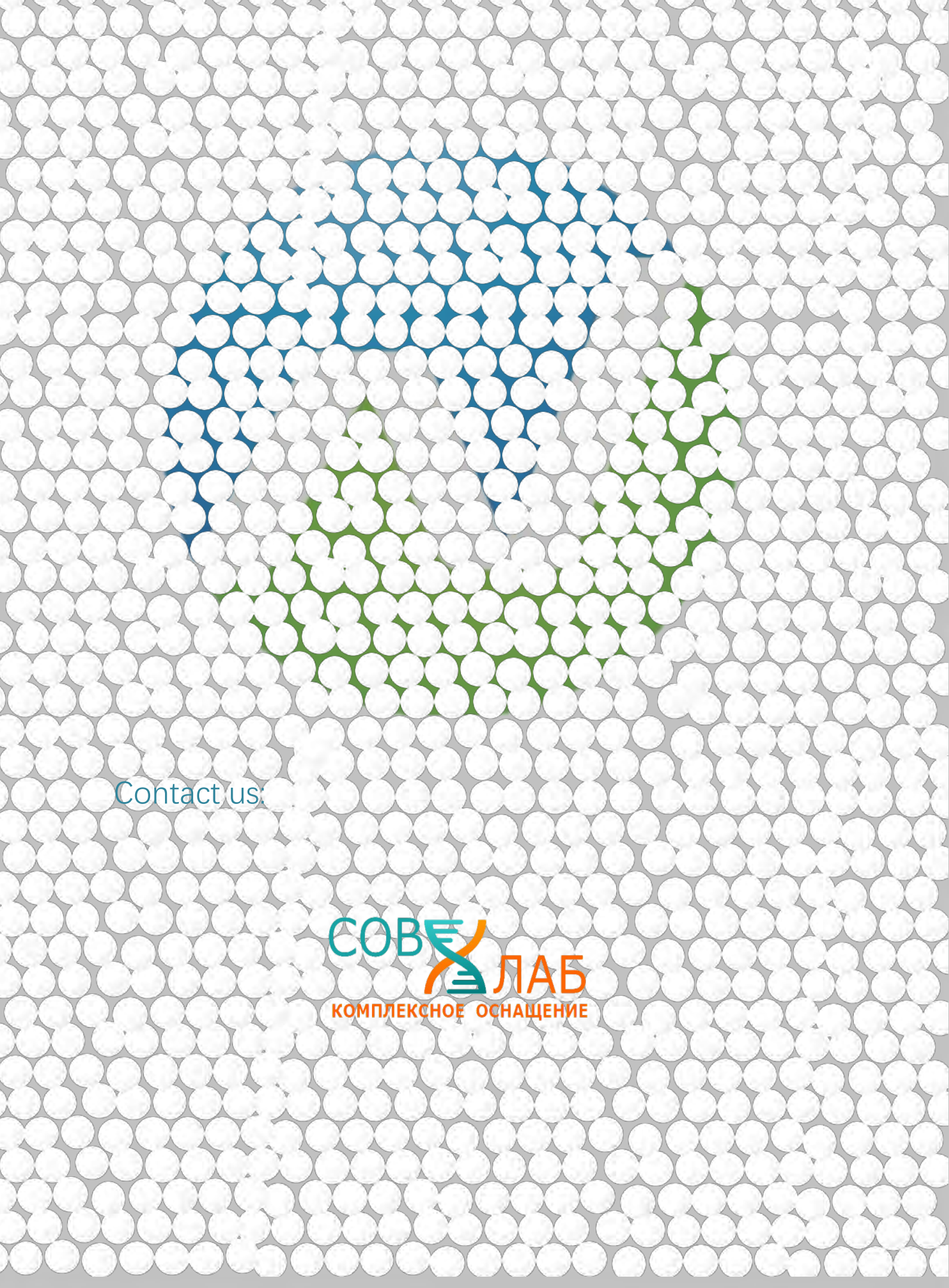
SAX: $-CH_2N^+(CH_3)_3$

WAX: $-CH_2CH_2N(C_2H_3)_2$

HILIC: Hydrophilic interaction chromatography

Abbreviations

Trademark	Abbr.	Trademark	Abbr.
Uni-XXX	U	Nano SP	NAP
UniSil	US	UniMab	UMB
UniRPC	UR	NanoMab	NMB
UniGel	UG	UniIDA	IDA
UniCM	UC	UniNTA	NTA
UniSP	USP	NM	NM
UniDEAE	UD	UniMC	UMC
UniQ	UQ	UniCharial OD	UOD
UniMSP	UM	UniBPC	UB
UniPS	UPS	NM-BPC	NMBPC
UniPSN	UPN	UniH	UNH
UniPSA	UPA	UniCore CM	UCC
UniPA	UP	UniCore SP	UCP
UniPMM	UPM	UniCore DEAE	UCD
UniHIC	UH	UniCore Q	UCQ
Nano S	NAS	UniHR Phenyl	UHP
Nano Q	NAQ	UniPhenyl	UPH
Nano CM	NAC	NanoHR Phenyl	NHP
Nano DEAE	NAD	NanoHR Butyl	NHB
UniIDA	IDA	NanoButyl	NBU
UnNTA	NTA	NanoPhenyl	NPH
UniPB	UPB	MagneStar MS	MS
NMSil	NS	MagneStar MP	MP



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СОВЛАБ

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