AppliChrom GmbH
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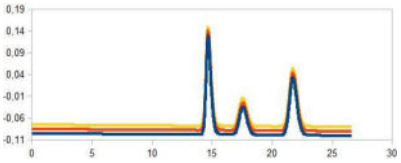
www.applichrom .com
www.sugar-hplc.com

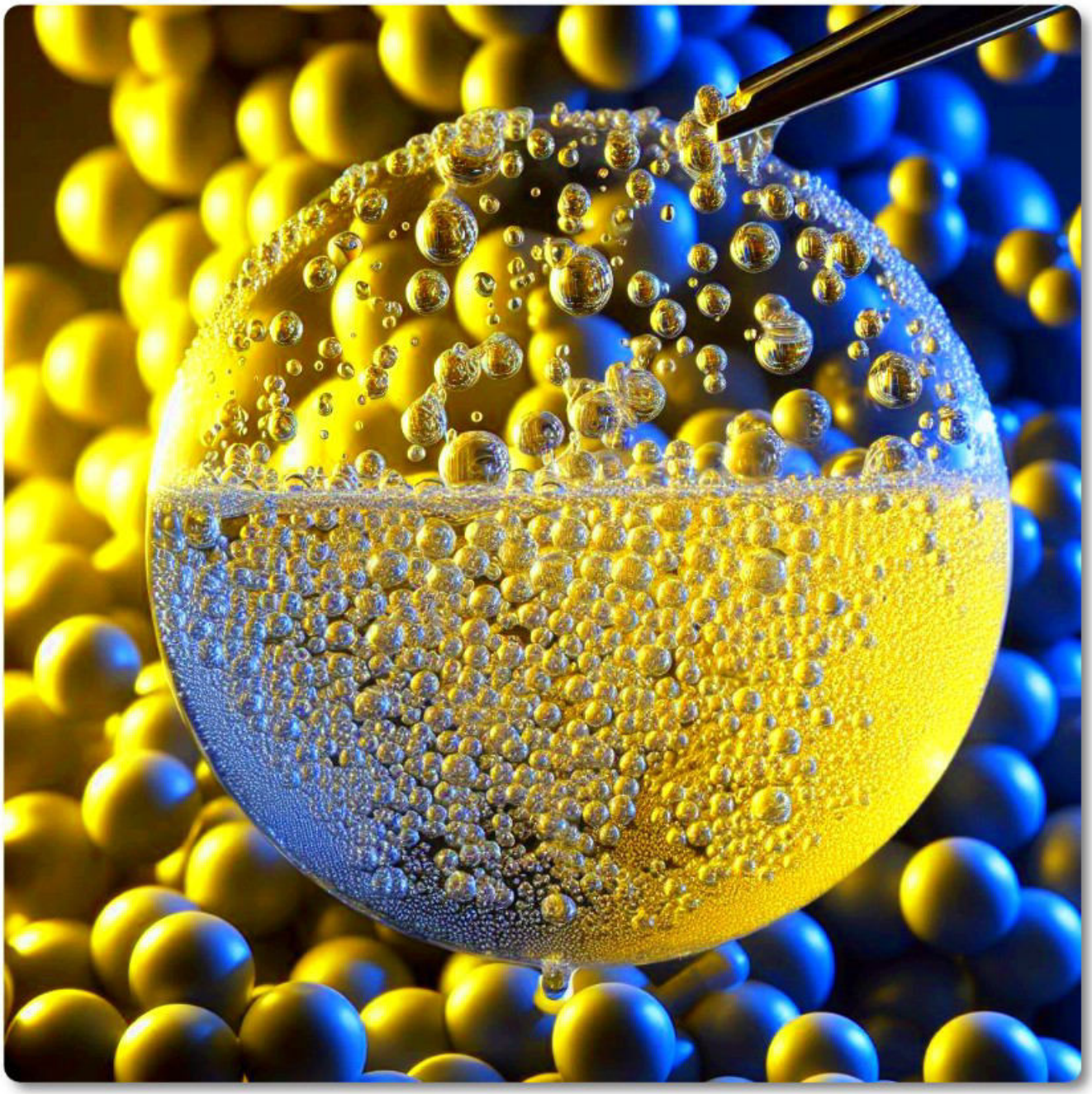
Excellent results are our aim

GPC / SEC / HPLC Columns

Made by AppliChrom GmbH



Products and Inspirations - Catalog 2025



AppliChrom GmbH-
Innovative chromatography products for the highest demands

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Excellent results are our aim

Discover AppliChrom GmbH - your first choice for polymeric chromatography materials and chromatography columns!

At AppliChrom, quality and innovation take centre stage.
Our state-of-the-art chromatography materials and precision-manufactured chromatography columns are the perfect solution for your analytical challenges.
Whether you are active in research, the pharmaceutical industry or food analysis - we offer you customised products that optimise your separation processes and increase the efficiency of your analyses.

Why AppliChrom?

- Highest quality: Our products are manufactured under strict quality controls to guarantee you reliable results.

- Diverse selection: From standard solutions to specialised columns - we have the right material for every application.

- Customer support: Our dedicated team is always available to support you in the selection and application of our products.

Put your trust in AppliChrom and take your chromatographic analyses to the next level! Visit our website or contact us directly to find out more about our products and services. Together we will find the optimal solution for your requirements.

Table of Content

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About Us

The AppliChrom team and its customers grow together by supporting chromatographers in their challenging and often difficult separations. You can count on AppliChrom with its own production facility for chromatography media, columns and applications and more than 50 years of HPLC/GPC experience at the traditional historic site where chromatography was invented by Professor Runge in 1850.

13 Reasons for AppliChrom

1) We take it personally

Especially the support of our customers. From the analytical question up to the chromatographic process, we discuss and accompany you on the way to your chromatographic result.

2) Application and Technical Support from one Source

As your chromatography partner we organize and look at the whole chromatographic process – also under optimal use of the HPLC/GPC/SEC-devices already in use.

3) Increasing Quality

You are looking for the best way to get your optimum chromatographic result in HPLC, GPC or SEC. We do not only offer high quality and highly reproducible products for high resolution and lifetime, but also a suitable consultation to your individual chromatographic task.

4) Saving Time

Chromatographers who start developing a method have to finally produce a reliable method that give complete information about all components of interest from a sample. Maybe the method has to be compatible to different kinds of chromatography systems or environments later – taking these aspects into account from the beginning saves much time and cost for our customers. Our product specialists are glad to assist you from the beginning of a project to make you successful.

5) Experience

AppliChrom's experience of own production of chromatography media, columns and applications (HPLC, GPC and SEC) allows us to support you with the background knowledge of the chromatography media producer with staff having more than 50 years of relevant experience.

6) Individual

From the beginning of your request we integrate your individual wishes, ideas and needs into the support to your optimal chromatographic solution. Resolution, selectivity, compatibility to existing systems, time saving or all of this – please ask us. AppliChrom has own application laboratories, own manufacturing capacities and own development unions to support you with your individual needs.

7) Innovative

AppliChrom chromatography media are typically based on special customers' needs that were covered via the AppliChrom development process unit finishing with the process validation to high end products that are available now for your reliable product solutions. Thus many very unique and powerful solutions are offered now for HPLC, SEC and GPC by AppliChrom.

8) Reproducibility

AppliChrom works at the headquarter Oranienburg has its own quality control laboratories, the production of chromatography columns in small and large series but also units to produce chromatography media in small scale and for larger bulk amounts. The quality of each batch and each column is controlled to ensure the highest level of reproducibility, column for column, batch to batch and year after year.

9) OEM business

AppliChrom supplies well-chosen OEM customers with individual chromatography bulk or column lines. The production also contains customized lines for special needs. You do not find these products necessarily in our public catalogue. If you have a special need – please speak with us.

10) Chromatography – Origin from Oranienburg, innovations from Oranienburg

Maybe it is interesting for you when and where chromatography was invented. It was in 1850 in Oranienburg where professor Runge invented, published and commercialized chromatography products first in the world – it was an early form of paper chromatography – he called it: „Bilder die sich selber malen“ known also as Runge pictures. These are the roots of chromatography and the heritage of Oranienburg that we develop here at Oranienburg to innovative high end products to support you with your specific chromatographic solution.

11) Made in Europe

AppliChrom brand products are quality products made in Germany, coming from Oranienburg located in the Berlin region. Surrounded by several universities and institutes dealing with live and material science we get a continuous input of actual scientific challenges to get inspirations for needed new high end products. Anyway we are glad to hear what AppliChrom can do for you.

12) Carefree

Chromatographic separation should not be an adventure for the customer. We serve you from your request with the needed individual assistance in the beginning up to the after sales service/consultation.

13) Satisfaction

At the end AppliChrom´s goal is to only have satisfied customers. This is our endeavour.

Important facts about AppliChrom

Founded: 2006, first market presence in 2009, since 2021 AppliChrom GmbH.
Company founder: Dipl.-Ing. (FH) Susanne Dauwe (Chemical engineer)
Research, development and chromatography applications: Dr. Christian Dauwe (Chemist)
Products:
Silica- and polymeric based liquid chromatography media (HPLC, GPC, SEC)
HPLC-columns –
C8, C18, HILIC & hybrid, ion exchanger and ion exclusion columns and media
Special easy to use HPLC columns for sugars, alcohols, acids
(HILIC, ion exclusion, ion exchangers)
SEC/GPC columns for water soluble biopolymers,
SEC/GPC columns for organic soluble polymers

F.F. Runge memorial plaque
(Photo D.v.d.Stück)

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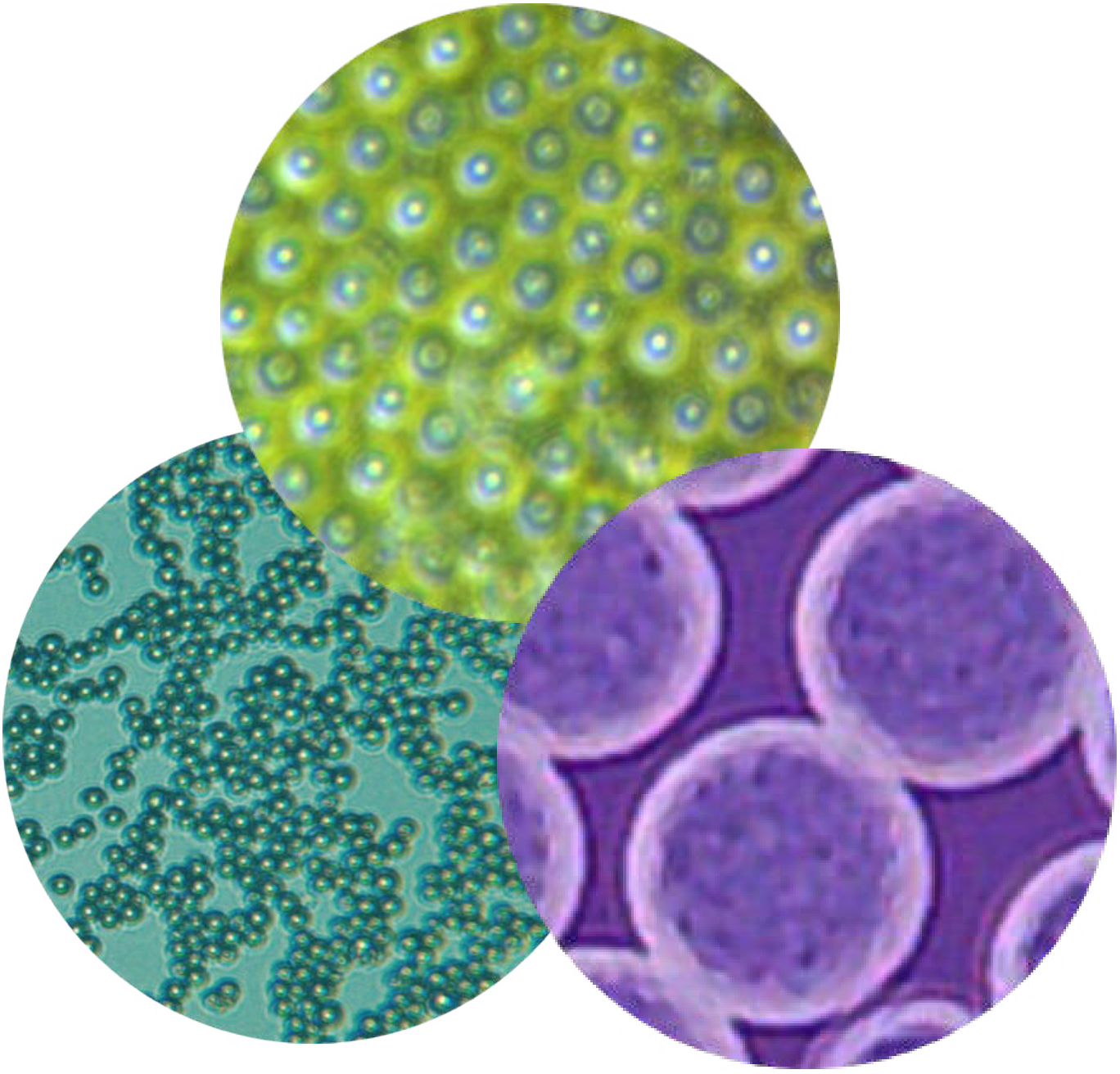

AppliChrom -
discover the world of polymeric chromatography materials

AppliChrom Column Selection Guide By Sample Properties

Excellent results are our aim

Solubility: Aqueous - hydrophilic

Molecular Weigh Range [Da]: 60 ~ 2500Da

Chromatography Mechanism	Temperature / pH Stability	Analyte, Examples	Typical Solvent / Eluent	AppliChrom Column	Comments, Examples in more detail.
Reversed Phase	10-90°C pH 1-14	Vitamins, Peptides	H_2O/ACN or MeOH	AppliChrom RPeptide	1 % TFA, 1 % NaOH, long-term stable at higher temperatures, wide pH range can be used - ideal for peptide analysis/purification, LC-MS
	10-40°C pH 2-8	Polar, medium polar and hydrophobic small molecules	H_2O/ACN or MeOH	AppliChrom OTU LipoMare C18	High performance universal use high purity medium polar C18 column. Eluent : 100 % water up to 100 % organics
	10-40°C pH 1,5-9	Medium polar and hydrophobic small molecules	H_2O/ACN or MeOH	AppliChrom OTU TriKala C18	High performance high purity hydrophobic C_{18} column for medium polar to hydrophobic analytes
Ligand Exchange	10-90°C	Mono-disaccharides, oligosaccharides, sugar alcohols, alcohols	H_2O	AppliChrom SugarSep-Ca AppliChrom SugarSep-Pb AppliChrom SugarSep-Ag AppliChrom SugarSep-Na	Orthogonal selectivity for saccharide analysis against AppliChrom OTU Amino. Eluent pure water works perfectly. Largest database with selectivities at www.sugar-hplc.com
HILIC	10-40°C	Mono-, disaccharides, oligosaccharides	ACN/H2O // 70/30	AppliChrom OTU Amino	Orthogonal selectivity for saccharides compared to the AppliChrom SugarSep series. Good selectivity and exceptionally long service life even in high-throughput applications.
Ion Exclusion	10-90°C pH 1-7	Saccharides, sugar alcohols, alcohols, acids	H_2O, 0,1 % H_2SO_4	AppliChrom SugarSep-H I / II / III / IV / V	Simultaneous analysis of sugars and organic acids. High sensitivity even in combination with RI-detection.
		Ascorbic acid in complex matrice	H_2O, special buffer	AppliChrom VitaC	Easy and accurate determination of ascorbic acid / vitamin C even in complex matrix
		Taurine in drinks	H_2O, special buffer	AppliChrom ASA Energy	Easy and accurate determination of taurine, sugars and more in energy drinks

AppliChrom Column Selection Guide By Sample Properties

Excellent results are our aim

Solubility: Aqueous - hydrophilic

Molecular Weigh Range [Da]: > 2500

Chromatography Mechanism: SEC

Temperature / pH Stability	Analyte, Examples	Typical Solvent / Eluent	AppliChrom Column	Comments, Examples in more detail.
10-90°C pH 2-11	Aqueous soluble neutral or anionic polymers, technical and biopolymers. Oligomers up to 40Mio Da	H_2O, buffers, organic additives	AppliChrom SuperOH-P	Your workhorse for most water soluble, technical and biopolymers. Large database, very powerful tool for neutral and anionic charged polymers
10-90°C pH 2-11	Water soluble proteins, humic substances. Oligomers up to 40Mio Da	H_2O, buffers	AppliChrom VivoSep SEC	Designed for simple, accurate and easy-to-use SEC analysis of a wide range of aqueous soluble proteins and humic substances. Pressure-stable material, short analysis times, high separation performance, buffers analogous to dextrans can be used, no degenerating surfactants required for protein analysis.
10-90°C pH 2-11	Oligomers up to 40Mio Da	H_2O, buffers	AppliChrom CatPhil-P	Enables accurate pure SEC analysis of polycations, polyamines and polyelectrolytes even at low salt concentrations. Up to 40 million Da also for block copolymers containing a polycation on one side and a polyanion on the other - a unique feature. Calibration with neutral PEG/PEO, pullulan/dextran. Compatible for light scattering. Examples: Water soluble analytes with focus on polyelectrolytes, polycations including polycation-block-co-polyanions, poly-DADMAc, polyquat/polyquaternium, chitosan...

AppliChrom Column Selection Guide By Sample Properties

Solubility: Organic - hydrophobic

Molecular Weigh Range [Da]	Chromatography Mechanism	Temperature / pH Stability	Analyte, Examples	Typical Solvent / Eluent	AppliChrom Column	Comments, Examples in more detail.
60 ~ 2500Da	Reversed Phase	10-90°C pH 1-14	Vitamins, Peptides	H_2O/ACN or MeOH	AppliChrom RPeptide	1 % TFA, 1 % NaOH, long-term stable at higher temperatures, wide pH range can be used - ideal for peptide analysis/purification, LC-MS
		10-40°C pH 2-8	Polar, medium polar and hydrophobic small molecules	H_2O/ACN or MeOH	AppliChrom OTU LipoMare C18	High performance universal use high purity medium polar C18 column. Eluent : 100 % water up to 100 % organics
		10-40°C pH 1,5-9	Medium polar and hydrophobic small molecules	H_2O/ ACN or MeOH	AppliChrom OTU TriKala C18	High performance high purity hydrophobic C_{18} column for medium polar to hydrophobic analytes
> 2500Da	GPC	10-145° C	Hydrophobic oligo- and polymer oligomers up to 40Mio Da	THF, Toluene, $CHCl_3$, dichlorobenzene, hexane/ethyl-acetate 10/90	AppliChrom StyDiViBe-P	High-performance and high-purity GPC columns for most standard applications with high resolution; PVC, polymethyl methacrylate - PMMA, epoxy resins, polystyrene - PS, bitumen, polyethylene - PE, polypropylene - PP, polyester, polylactide - PLA, bisphenol A resin, enrichment of impurities from fats/vegetable oils for subsequent HPLC or GC analysis - enrichment by automated GPC sample pretreatment, olive oil and fat analysis, analysis of degradation products from hydrophobic polymers and resins. Calibration against polystyrene. PMMA or polyethylene oxides also possible
		40-90°C (145° C)	Polar, non-water-soluble oligo/polymers. Oligomers up to 40Mio Da	DMSO 0,075M NaNO3	AppliChrom DMSO-Phil-P	Perfect tool for simple and accurate GPC analysis of many weakly and strongly polarised analytes. Advantages include tolerance to water traces in the eluent. Calibration: Dextran or Pullulan. Analytes: Starch, amylose, amylopectin, starchy protein fraction from plants/legumes (pea, bean, ...), (melamine)-urea-formaldehyde resins, (M)UF/UF resins, lignin, humic substances, humic acid, coniferous wood bark extracts, polysaccharides...

AppliChrom Column Selection Guide By Sample Properties

Excellent results are our aim

Solubility	Molecular Weigh Range [Da]	Chromatography Mechanism	Temperature / pH Stability	Analyte, Examples	Typical Solvent / Eluent	AppliChrom Column	Comments, Examples in more detail.
Organic - hydrophobic	> 2500Da	GPC	35-50°C	Crystalline high performance polymers. Oligomers up to 40Mio Da	HFIP (0,1 % KTFa)	AppliChrom HFIP-P	Precise GPC analysis of high-performance plastics, including crystalline polymers, for use in HFIP. The AppliChrom broad pore technology (BPT) tool enables the most precise measurements and calibration of molecular mass in the range of 100-1mio Da while avoiding the classic effects of the inflection points
			20-50°C	Hydrophobic oligo- and polymers. Oligomers up to 40Mio Da	DMAc, DMF, NMP (typical addition of LiBr)	AppliChrom DMAc-Phil-P	For your precise GPC analysis of slightly polar polymers. Optimized for the medium polar eluents DMF, NMP and DMAc. Calibration: PMMA, polyacrylonitrile, ABS rubber (acrylonitrile-butadiene-styrene), carboxymethylcellulose, cellulose, butadiene-acrylonitrile, polyacetal /POM/polyoxymethylene, polyamide, polyethersulfone, some lignin methods...
			40-50°C	Polyphenoles / antioxidants, secondary plant products, organosolv liginin. Oligomers up to 40Mio Da	Acetone / water	AppliChrom Aceton-Aq-Phil-P	Unique instrument for analysing antioxidants, lignin and oligophenols by GPC-MS or Prep-GPC fractionation. High loading capacity. Calibration: PEG/PEO in water

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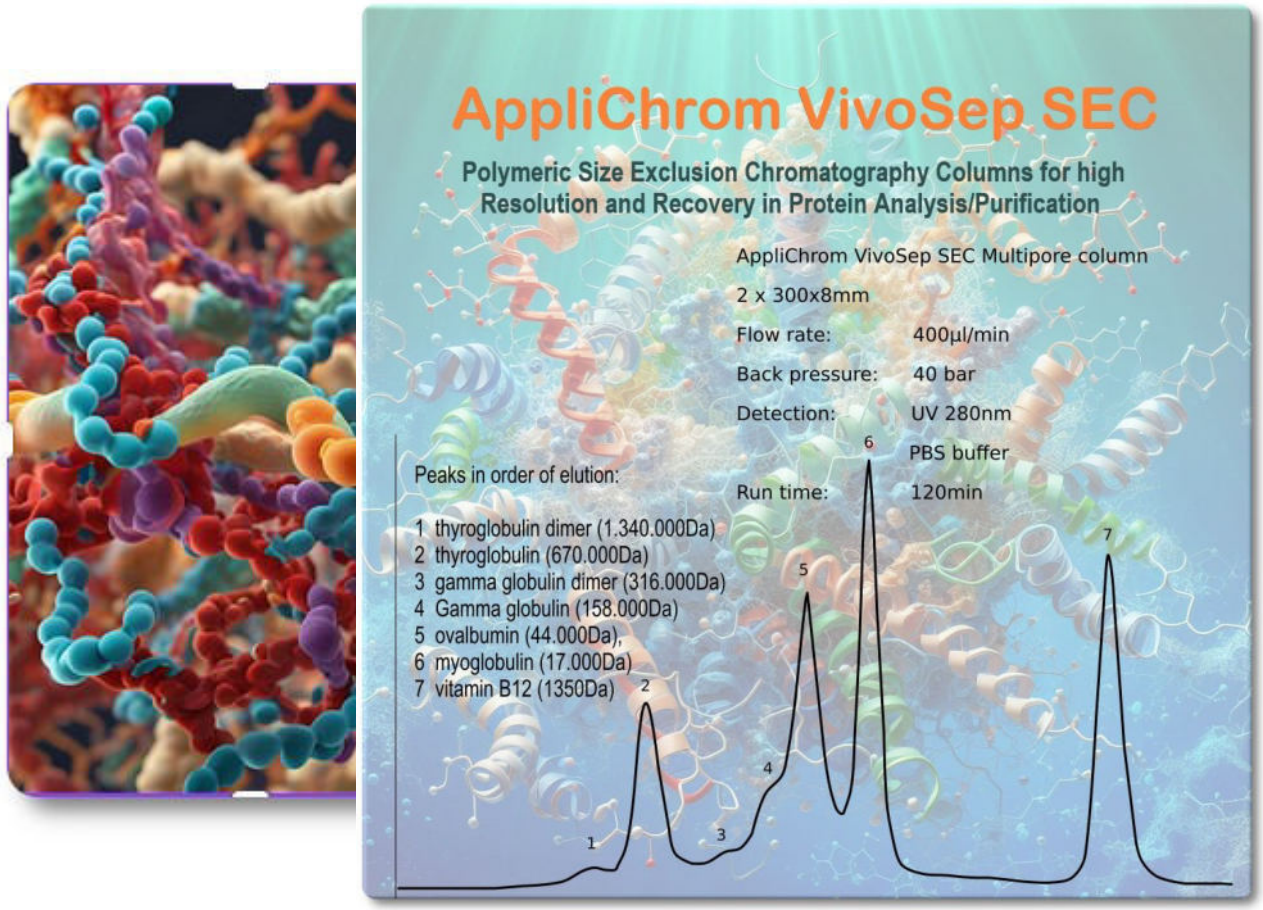
AppliChrom VivoSep SEC

Designed for simple, accurate and easy-to-use SEC analysis of a wide range of aqueous soluble proteins and humic substances.
Pressure-stable material, short analysis times, high separation performance, buffers analogous to dextrans can be used, no degenerating surfactants required for protein analysis.



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Polymeric Size Exclusion Chromatography Columns for high Resolution and Recovery in Protein Analysis/Purification

AppliChrom VivoSep SEC columns for easy going SEC of proteins

- AppliChrom VivoSep SEC, special multistage hydrophilically modified polymeric SEC (size exclusion chromatography).
  Column materials to facilitate/enable many previously difficult protein SEC analyses/separations with high resolution.

- AppliChrom VivoSep SEC materials contain only polymeric material free of silica; means: no silanol activity and no unwanted silica leachables!

- AppliChrom VivoSep SEC columns show high desorption power that is great for SEC of many proteins but – in the past – this was still mostly connected with low-pressure stability in case of some in market used cross-linked dextran- based media (e.g. p max approx 5bar)

- AppliChrom VivoSep SEC columns show good pressure stability of 50-200 bar (depending on pore size) compared to cross-linked dextran SEC columns, which are only stable in the range of 5 bar or less.

- AppliChrom VivoSep SEC columns allow (due to their pressure stability) the use of smaller particles, e.g. 7-10µm for delivering a large separation power extending even 20,000 plates/m for good separation of proteins.
  These are much more plate-counts/m than you get from 20-50 or larger particles that are cross-linked dextran based.

- AppliChrom VivoSep SEC media show stability in pressurized water up to 121°C.

- AppliChrom VivoSep SEC columns can be used at temperatures from 10-90°C

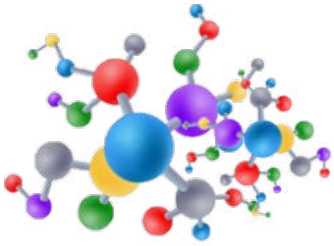
- pH stability 2-11

- AppliChrom VivoSep SEC columns are available with an enormous exclusion limits of 70,000 and > 1,000,000Da*) (many cross-linked dextran based SEC-media for proteins are limited to a maximum molecular size of 100-150kDa or less).

- AppliChrom VivoSep SEC column heads are connected at both sides with 10-32 UNF female thread – making these columns perfect to use with the standard analytical HPLC systems**).

- SEC molecular size measurement/calculation of hydrodynamic size of protein [nm] can be done on base of SEC-system calibration using PEO/PEG reference substances

proteins – peptides – amino acids



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AppliChrom VivoSep SEC

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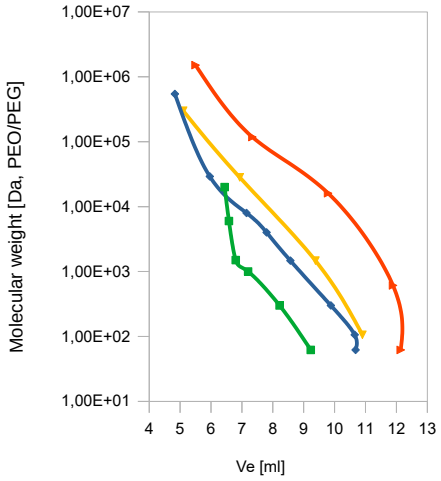
AppliChrom VivoSep SEC calibration curves:
Polymeric high pressure stable high resolution SEC material special designed for demands on SEC of proteins.



Red line:	AppliChrom VivoSep SEC Multipore
Yellow Line:	AppliChrom VivoSEP SEC 300
Blue line:	AppliChrom VivoSEP SEC 250XL
Green Line:	AppliChrom VivoSEP SEC 100

Column size 300x8mm e.a.
1.0 ml/min H_2O
molecular weight (PEO/PEG) vs. elution time

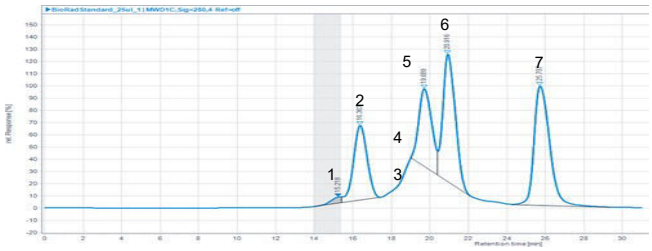
How to use a PEO/PEG SEC calibration data for molecular size determination of an unknown substance?

General: 2 molecules of equal size elute from SEC column in SEC mode at identical elution volume!
E.g.:

PEO 110.000Da in pure water: hydrodynamic size = 12.6nm
=> If IgM elutes at elution volume of PEO 110.000Da, IgM = 12,6nm size.

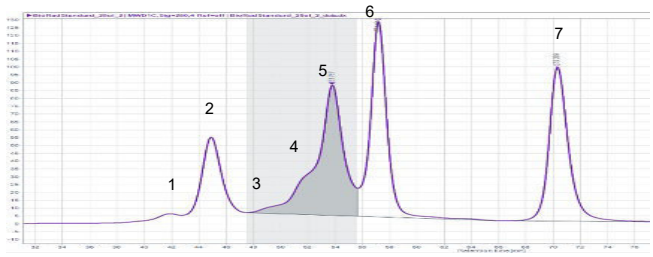
PEO 26.000Da in pure water: hydrodynamic size = 5,3nm
=> If IgG elutes of elution volume of PEO 26.000Da, IgG = 5,3nm

AppliChrom VivoSep SEC for SEC-separation/analysis of 5 proteins + dimers



AppliChrom VivoSep SEC Multipore column
1x 300x8mm

Flow rate:	500µl/min
Back pressure:	40 bar
Detection:	UV 280nm
	PBS buffer
Run time:	30 min



AppliChrom VivoSep SEC Multipore column
2 x 300x8mm

Flow rate:	400µl/min
Back pressure:	40 bar
Detection:	UV 280nm
	PBS buffer
Run time:	120min

Peaks in order of elution:

1 thyroglobulin dimer (1.340.000Da)
2 thyroglobulin (670.000Da)
3 gamma globulin dimer (316.000Da)
4 Gamma globulin (158.000Da)
5 ovalbumin (44.000Da),
6 myoglobulin (17.000Da)
7 vitamin B12 (1350Da)

Chromatograms provided from:

Dr. Max Gilbert
Professor Dr. Pitter Huesgen
Forschungszentrum Jülich
Zentralinstitut für Engineering, Elektronik und Analytik
Institutsbereich Analytik (ZEA-3)
Wilhelm-Johnen-Straße
52428 Jülich

Order information:

AppliChrom VivoSep SEC Multipore
300x8mm
P/N: AVSSEC3008

Precolumn AppliChrom VivoSep SEC Multipore
50x8mm
P/N: AVSSEC508

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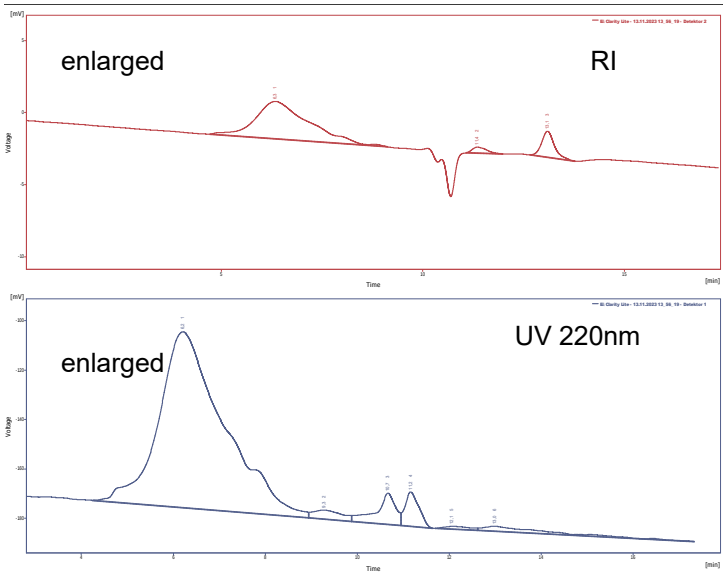
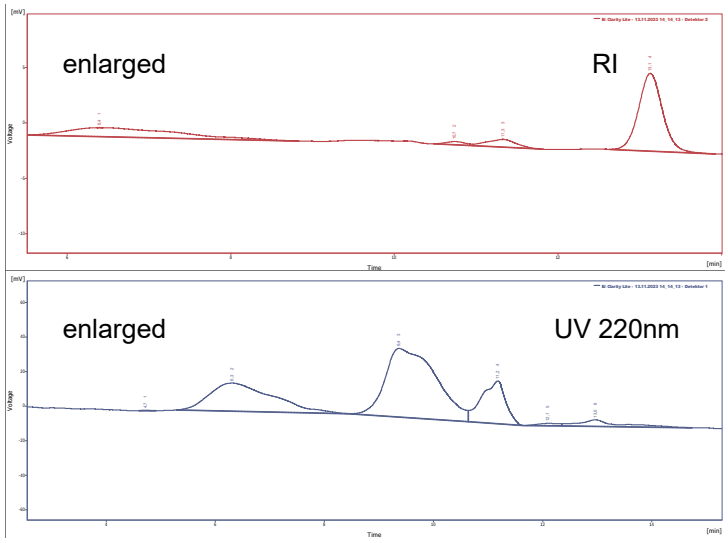
SEC "porcine gastric mucins" and "bovine submaxillary mucins“ (200kDa – 5.5MDa)



Analyte:
"bovine submaxillary mucins“ (200kDa bis 3MDa)

Column: AppliChrom VivoSep SEC 350 (300x8mm)
separation range 2,500 – 1,000,000Da (PEG)

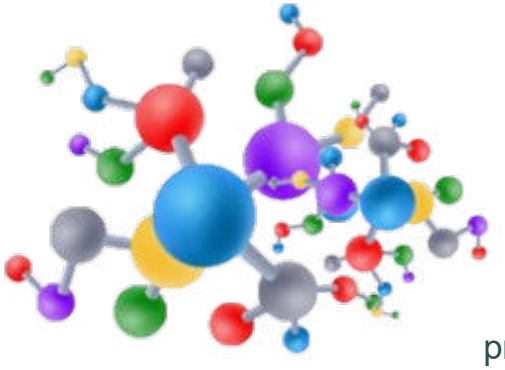
Flow:	1 ml/min,
Eluent:	H_2O / PBS-Buffer
Temperature:	ambient
Injection volume	8µl
Detection:	RI / UV (220nm)
Software:	Clarity GPC
Analysis run:	0 - 20min
HPLC system:	Knauer Azura Line



Analyte:
"porcine gastric mucins" (500 -5,5MDa)

Column: AppliChrom VivoSep SEC 350 (300x8mm)
separation range 2,500 – 1,000,000Da (PEG)

Flow:	1 ml/min,
Eluent:	H_2O / PBS-Buffer
Temperature:	ambient
Injection volume	8µl
Detection:	RI / UV (220nm)
Software:	Clarity GPC
Analysis run:	0 - 20min
HPLC system:	Knauer Azura Line



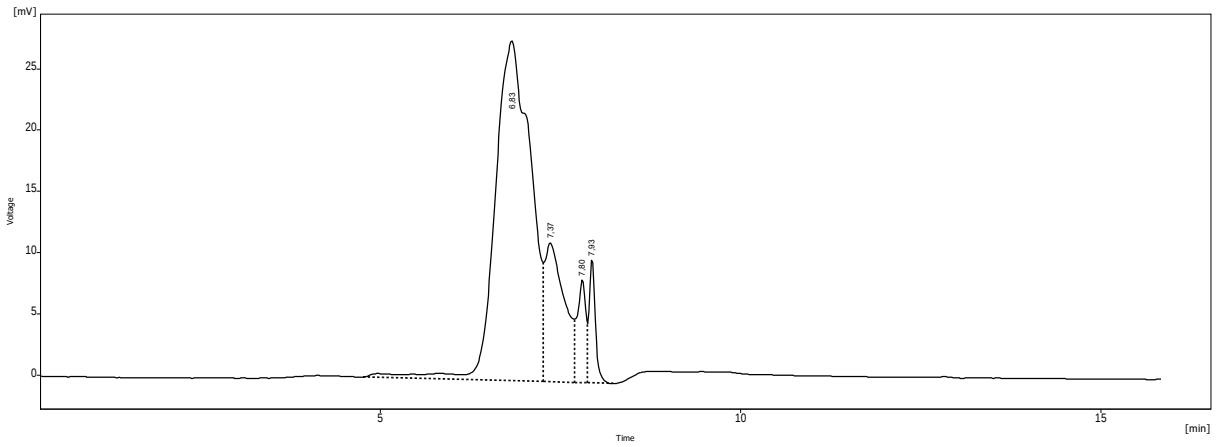
proteins – peptides – amino acids

Humic acids from drinking water or polyphenols in tea, the AppliChrom Vivosep SEC is the all-rounder for these applications.

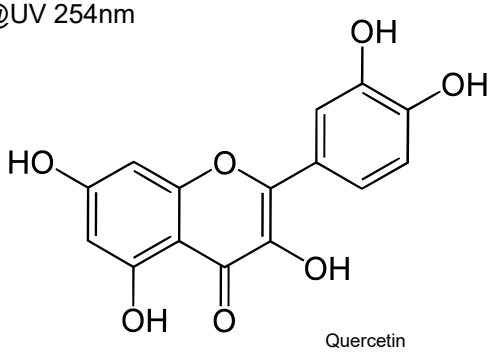
With the VivoSep SEC column you can reliably quantify and characterise polyphenols and humic substances.
Polyphenols and humic substances are quantified and characterised based on their molecular weight distribution, giving you valuable insights into the composition and bioactivity of these compounds. Rely on the precision and efficiency of the AppliChrom VivoSep SEC column for all your chromatography needs.

Humic substance analysis with the AppliChrom VivoSep SEC 300

Analyte	“Stolpewasser“
SEC-Column	AppliChrom VivoSep SEC 300
Dimension	300x8mm / PN AVSSEC3008
Flow	1.0mL/min
Buffer	**22mmol Phosphate buffer**
Eluent	DI H_2O
Temperature	Ambient



@UV 254nm



Quercetin

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AppliChrom VivoSep SEC Column Short Overview

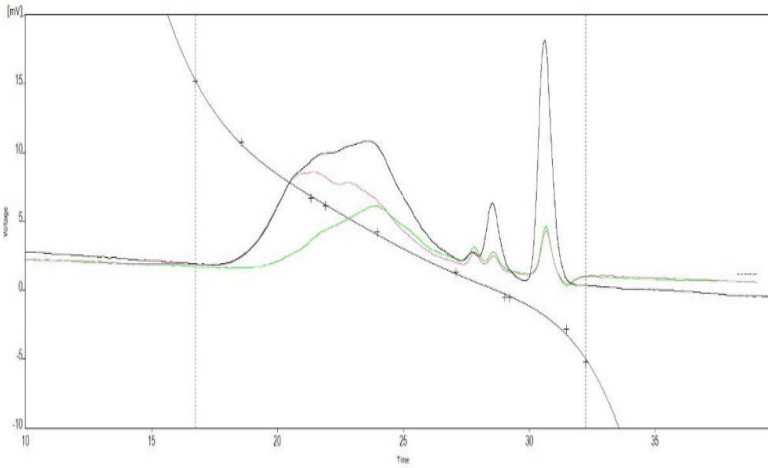
AppliChrom VivoSep SEC Series

Polymeric Size Exclusion Chromatography Columns for high Resolution and Recovery in Protein Analysis/Purification.
Special multistage hydrophilically modified polymeric SEC (size exclusion chromatography). Column materials to facilitate/enable many previously difficult protein SEC analyses/separations with high resolution.
For aqueous applications with low buffer.

Dimensions
300 x 8mm (...3008)
50 x 8mm (...508)

also available
250 x 8mm
300 x 20mm
other dimension availble on request

Type	Separation range [Da]	Max. pressure drop / column[bar]	Max. Flow [mL/min]	Particle Size [µm]	Temperatur range [°C]
AppliChrom VivoSep SEC 150	100 – 5.000	70	1.0*	7	10 – 90
AppliChrom VivoSep SEC 200	100 – 20.000	70	1.0*	7	
AppliChrom VivoSep SEC 250	100 – 70.000	70	1.0*	7	pH range
AppliChrom VivoSep SEC 250 XL	100 – 100.000	70	1.0*	7	
AppliChrom VivoSep SEC 300	1.000 – 300.000	60	1.0*	7	2 -11
AppliChrom VivoSep SEC 350	2.500 – 1.000.000	60	1.0*	10	
AppliChrom VivoSep SEC 400	10.000 – 5.000.000	35	1.0*	10	
AppliChrom VivoSep SEC Multipore	100 – 1.000.000	60	1.0*	7	
			*recomemended Flow rate: 0.5mL/min		



Analyte: **Gelatin**

1x Gelatin; 3 different sample treatments

Column: AppliChrom VivoSep SEC 250
AppliChrom VivoSep SEC 350
AppliChrom VivoSep SEC 400

Dimension: e.a. 300mm x 8mm
Mobil Phase: 0.075M $NaNO_3$ in H_2O
Flow: 1.0ml/min
Temperature: 20°C
Detection: RI
Injection: 20µl sample

AppliChrom VivoSep SEC Column Ordering Information

AppliChrom VivoSep SEC Columns 300x8mm, Particle Size 7µ – 10µm – (15 µm)

Descritption	MW Separation Range (PEG/PEO)	Order No.
AppliChrom VivoSep SEC 150	100 – 5 000	AVSSEC1503008
AppliChrom VivoSep SEC 200	100 – 20 000	AVSSEC2003008
AppliChrom VivoSep SEC 250	100 – 70 000	AVSSEC2503008
AppliChrom VivoSep SEC 250 XL	100 – 100 000	AVSSEC250XL3008
AppliChrom VivoSep SEC 300	1 000 – 300 000	AVSSEC3003008
AppliChrom VivoSep SEC 350	2 500 – 1 000 000	AVSSEC3503008
AppliChrom VivoSep SEC Multipore	100 – 1 000 000	AVSSECM3008

AppliChrom VivoSep SEC Guard/Pre-Columns 50x8mm

Descritption	MW Separation Range (PEG/PEO)	Order No.
AppliChrom VivoSep SEC 150	100 – 5 000	AVSSEC150508
AppliChrom VivoSep SEC 200	100 – 20 000	AVSSEC200508
AppliChrom VivoSep SEC 250	100 – 70 000	AVSSEC250508
AppliChrom VivoSep SEC 250 XL	100 – 100 000	AVSSEC250XL508
AppliChrom VivoSep SEC 300	1 000 – 300 000	AVSSEC300508
AppliChrom VivoSep SEC 350	2 500 – 1 000 000	AVSSEC350508
AppliChrom VivoSep SEC Multipore	100 – 1 000 000	AVSSECM508

Coulmn Design and Manufacture
Do you need customised SEC columns for your specific application?
Contact us to discuss your individual requirements.
We will be glad to help you.

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AppliChrom SuperOH-P

Your workhorse for most water soluble, technical and biopolymers.

Large database, very powerful tool for neutral and anionic charged polymers

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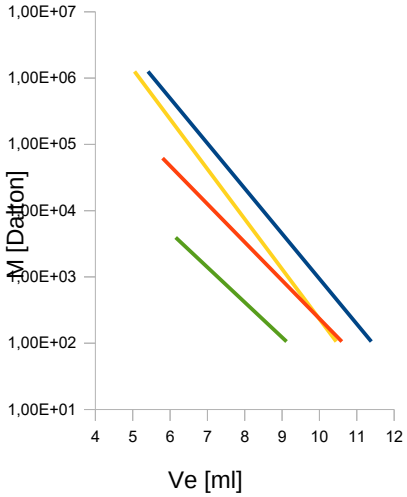
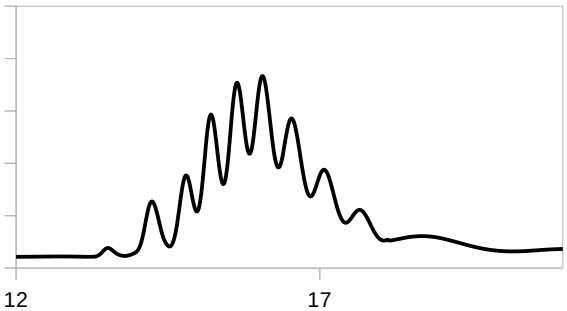
- → optimized for aqueous GPC/SEC-separations
- → aqueous high hydrophilic polymeric base material
- → low column bleeding for low detector noise
- → 7µ particle technology (standard) for high platecounts and high resolution*)
- → large pore volume for high resolution
- → pH stable 2.5-12
- → pressure stability 30-80bar (depending on poresize)
- → temperaturestability 10-85°C
- → individual poresizes for individual molecular weight ranges
- → multi-pore technology for broad range of molecular size
- → increased livetime of GPC/SEC columns by combination of proprietary particle- and packing technology
  service-applicationcenter for methodscreening available in Oranienburg (Germany / Europe)

***) 7µ Particletechnology is standard for the small porous series – 100 and – 200.**

GPC Calibration Curves AppliChrom SuperOH-P



Analyte:	**PEO/PEG**
Column:	AppliChrom SuperOHl-P-100 AppliChrom SuperOH-P-200 AppliChrom SuperOH-P-300 AppliChrom SuperOH-P-400
Dimension:	e.a. 300mm x 8mm
Mobil Phase:	H_2O
Flow:	0.5ml/min
Temperature:	20°C
Detection:	RI
Injection:	20µl sample



For aqueous applications

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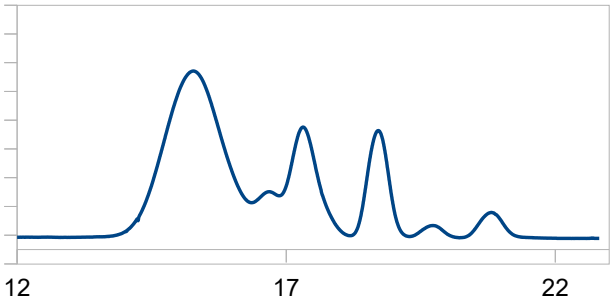
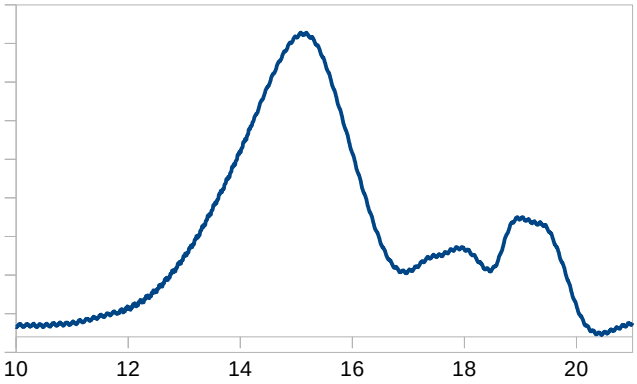


Analyte: **Oligosaccharide**

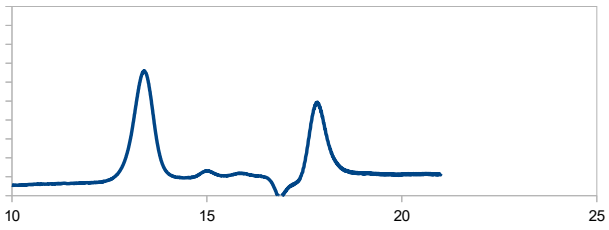
Column:	AppliChrom SuperOH-P-100
Dimension:	2x 300mm x 8mm
Mobil Phase:	H_2O
Flow:	0.5ml/min
Temperature:	40°C
Detection:	RI
Injection:	20µl sample



Analyte: **Pectin**

sample with high content of oligomers

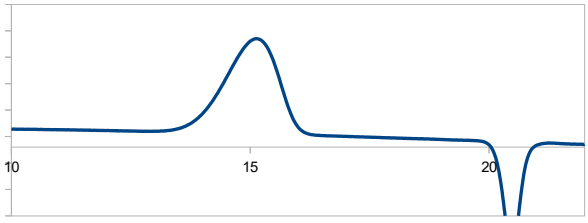
Column:	AppliChrom SuperOH-P-100 AppliChrom SuperOH-P-350
Dimension:	e.a. 300mm x 8mm
Mobil Phase:	H_2O, $NaKHPO_4$ (pH 6.8 0.07M) + 50mM NaCl
Flow:	1.0ml/min
Temperature:	20°C
Detection:	RI
Injection:	20µl sample



Analyte: **PEGylated protein**

Separation of an approx. 5 000Da product of a PEGylated protein of approx. 100 000Da

Column:	AppliChrom SuperOH-P-100 AppliChrom SuperOH-P-350
Dimension:	e.a. 300mm x 8mm
Mobil Phase:	0.05% NaN_3 in H_2O
Flow:	1.0ml/min
Temperature:	20°C
Detection:	RI
Injection:	20µl sample



Analyte: **Starch hydrolysate**

analysis of a 100 000Da fraction

Column:	AppliChrom SuperOH-P-100 AppliChrom SuperOH-P-350
Dimension:	e.a. 300mm x 8mm
Mobil Phase:	0.2M $NaNO_3$ in H_2O
Flow:	1.0ml/min
Temperature:	20°C
Detection:	RI
Injection:	20µl sample

High resolution

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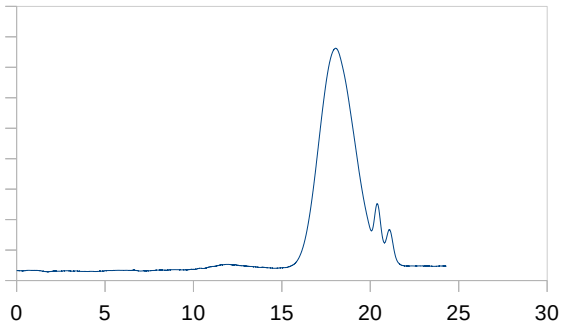
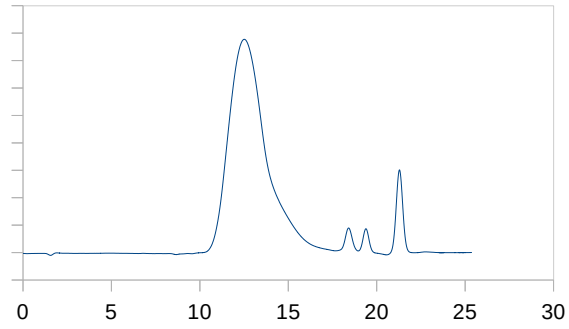


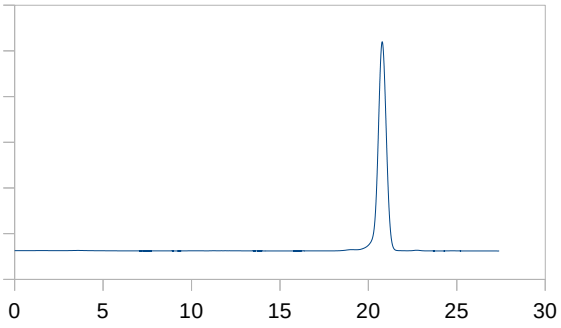
Analyte: **Inulin**
analysis of a 100Da- 1 000 000Da including oligomer separation

Column:	AppliChrom SuperOH-P-250 AppliChrom SuperOH-P-350
Dimension:	e.a. 300mm x 8mm
Mobil Phase:	0.075M $NaNO_3$, 5g/l $Na_2HPO_4x7H_2O$ in H_2O
Flow:	1.0ml/min
Temperature:	20°C
Detection:	RI
Injection:	20µl sample



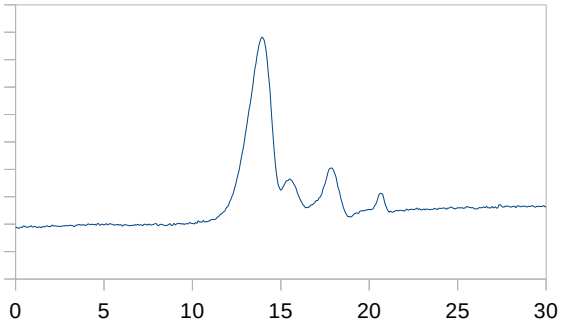
Analyte: **Hyaluronic acid**
including oligomer separation

Column:	AppliChrom SuperOH-P-250 AppliChrom SuperOH-P-350
Dimension:	e.a. 300mm x 8mm
Mobil Phase:	0.075M $NaNO_3$, 5g/l $Na_2HPO_4x7H_2O$ in H_2O
Flow:	1.0ml/min
Temperature:	20°C
Detection:	RI
Injection:	20µl sample



Analyte: **Corn syrup**
analysis of a 100Da- 1 000 000Da area

Column:	AppliChrom SuperOH-P-250 AppliChrom SuperOH-P-350
Dimension:	e.a. 300mm x 8mm
Mobil Phase:	H_2O
Flow:	1.0ml/min
Temperature:	20°C
Detection:	RI
Injection:	20µl sample



Analyte: **Water-based acrylate dispersion**
analysis of a 100Da- 1 000 000Da area

Column:	AppliChrom SuperOH-P-250 AppliChrom SuperOH-P-350
Dimension:	e.a. 300mm x 8mm
Mobil Phase:	1.0M $NaNO_3$ in H_2O
Flow:	1.0ml/min
Temperature:	20°C
Detection:	RI
Injection:	20µl sample

Including polyanions

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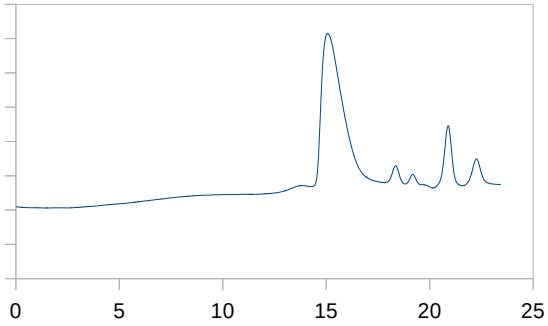
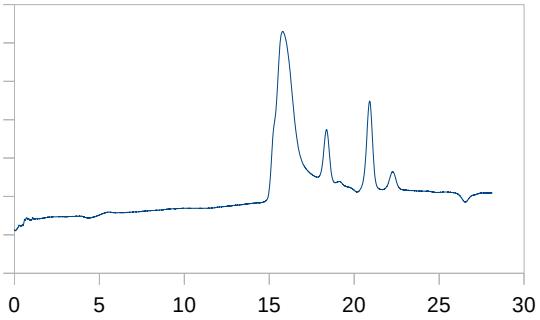


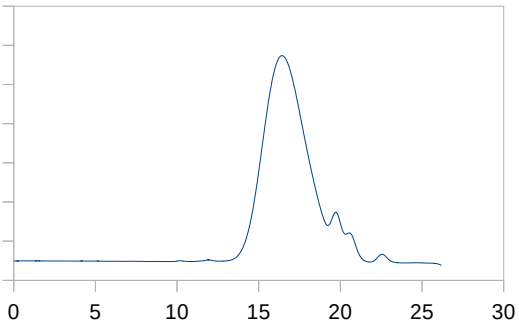
Analyte: **Heparin-Na, 8-25kDa**
including oligomer separation

Column:	AppliChrom SuperOH-P-250 AppliChrom SuperOH-P-350
Dimension:	e.a. 300mm x 8mm
Mobil Phase:	0.075M $NaNO_3$, 5g/l $Na_2HPO_4x7H_2O$ in H_2O
Flow:	1.0ml/min
Temperature:	20°C
Detection:	RI
Injection:	20µl sample



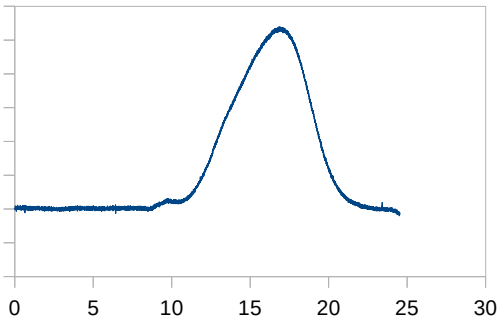
Analyte: **Dextran sulfate-Na**
analysis of a 100Da- 1 000 000Da area

Column:	AppliChrom SuperOH-P-250 AppliChrom SuperOH-P-350
Dimension:	e.a. 300mm x 8mm
Mobil Phase:	0.075M $NaNO_3$, 5g/l $Na_2HPO_4x7H_2O$ in H_2O
Flow:	1.0ml/min
Temperature:	20°C
Detection:	RI
Injection:	20µl sample



Analyte: **Alginate-Na**
analysis of a 100Da- 1 000 000 Da area

Column:	AppliChrom SuperOH-P-250 AppliChrom SuperOH-P-350
Dimension:	e.a. 300mm x 8mm
Mobil Phase:	0.075M $NaNO_3$, 5g/l $Na_2HPO_4x7H_2O$ in H_2O
Flow:	1.0ml/min
Temperature:	20°C
Detection:	RI
Injection:	20µl sample



Analyte: **Carrageenan**
analysis of a 1 000Da- 5 000 000Da area

Column:	AppliChrom SuperOH-P-350 AppliChrom SuperOH-P-450
Dimension:	e.a. 300mm x 8mm
Mobil Phase:	0.075M $LiNO_3$ in H_2O
Flow:	1.0ml/min
Temperature:	20°C
Detection:	RI
Injection:	20µl sample

Biopolymers

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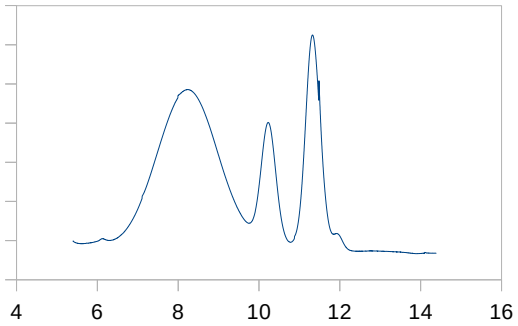
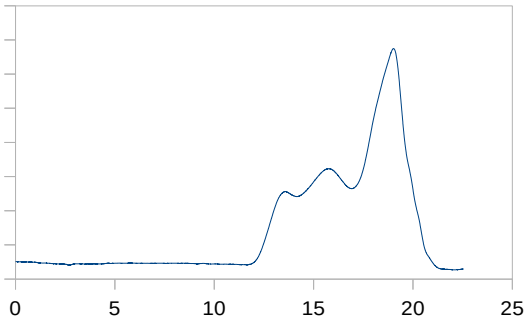


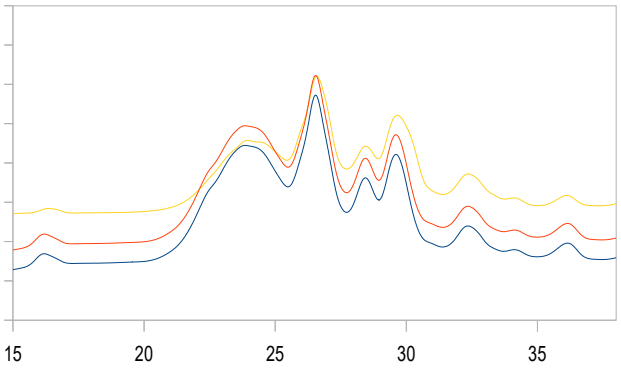
Analyte: **Pullulan**
including oligomer separation

Column:	AppliChrom SuperOH-P-Screening
Dimension:	300mm x 8mm
Mobil Phase:	0.075M $NaNO_3$ in H_2O
Flow:	1.0ml/min
Temperature:	20°C
Detection:	RI
Injection:	20µl sample



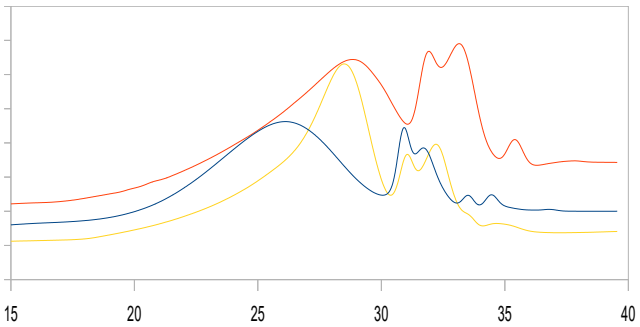
Analyte: **Maltodextrin 12**
analysis of a 100Da-1 000 000Da area

Column:	AppliChrom SuperOH-P-250 AppliChrom SuperOH-P-350
Dimension:	e.a. 300mm x 8mm
Mobil Phase:	0.075M $NaNO_3$ in H_2O
Flow:	1.0ml/min
Temperature:	20°C
Detection:	RI
Injection:	20µl sample



Analyte: **Fish protein hydrolysates**
3 different batches
analysis of a 100Da-70 000 Da area
including oligomer separation

Column:	AppliChrom SuperOH-P-250
Dimension:	3x 300mm x 8mm
Mobil Phase:	0.05M $NaNO_3$ + 0,07M $Na_{1,5}H_{1,5}PO_4$ in H_2O
Flow:	1.0ml/min
Temperature:	30°C
Detection:	RI
Injection:	20µl sample



Analyte: **Polycarboxylate ether**
3 different batches

Column:	AppliChrom SuperOH-P-350
Dimension:	3x 300mm x 8mm
Mobil Phase:	0.1M $NaNO_3$+0.05M Na_2HPO_4 in H_2O
Flow:	1.0ml/min
Temperature:	20°C
Detection:	RI
Injection:	20µl sample

Aqueous anionic technical polymers

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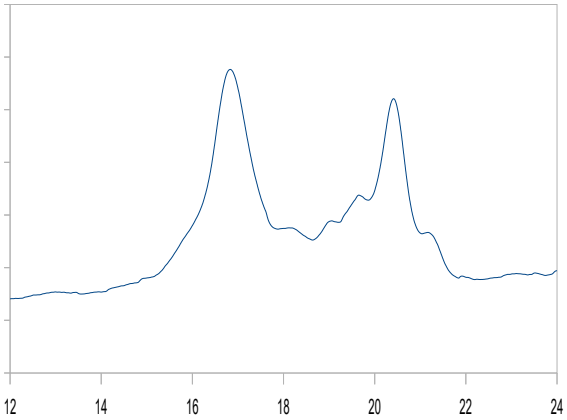
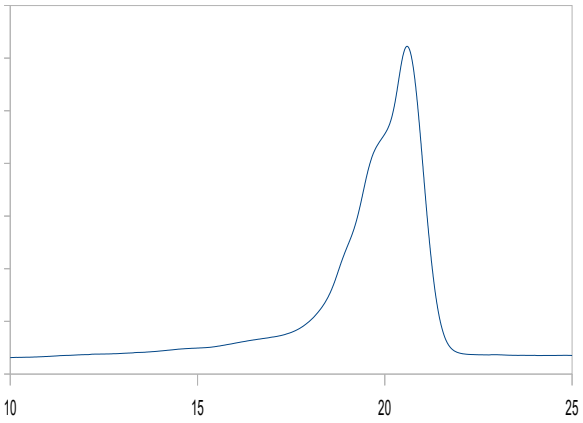


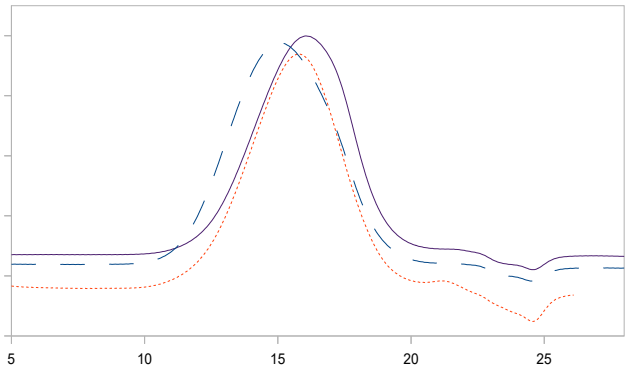
Analyte: **Water-soluble casein fraction**

Column:	AppliChrom SuperOH-P-250 AppliChrom SuperOH-P-350
Dimension:	e.a. 300mm x 8mm
Mobil Phase:	0.01M $Na_{1,5}H_{1,5}PO_4$ & 0.3M NaCl in H_2O
Flow:	1.0ml/min
Temperature:	30°C
Detection:	RI
Injection:	50µl sample



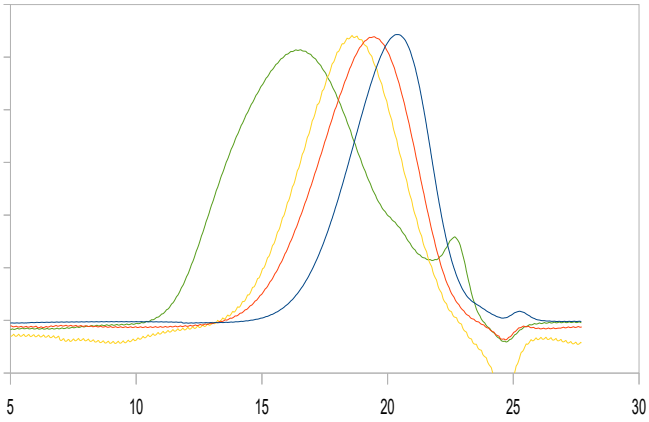
Analyte: **Jelly Bean „Gummibärchen“**

Column:	AppliChrom SuperOH-P-250 AppliChrom SuperOH-P-350
Dimension:	e.a. 300mm x 8mm
Mobil Phase:	0.01M $Na_{1,5}H_{1,5}PO_4$ & 0.3M NaCl in H_2O
Flow:	1.0ml/min
Temperature:	50°C
Detection:	RI
Injection:	20µl sample Ingredient according to label: 6.9% protein (gelatin) dissolved in the eluent



Analyte: **Polyvinyl alcohols,**
88% degree of hydrolysis
3 different batches
including oligomer separation

Column:	AppliChrom SuperOH-P-350
Dimension:	2x 300mm x 8mm
Mobil Phase:	0.05M Na_2HPO_4 + 0.1M $NaNO_3$ in H_2O
Flow:	1.0ml/min
Temperature:	30°C
Detection:	RI
Injection:	20µl sample



Analyte: **PVP, polyvinyl pyrolidone**
3 different batches
including oligomer separation

Column:	AppliChrom SuperOH-P-350
Dimension:	2x 300mm x 8mm
Mobil Phase:	0.1M $NaNO_3$ in H_2O + 20% ACN
Flow:	1.0ml/min
Temperature:	30°C
Detection:	RI
Injection:	50µl sample PVP (M = 8,3 / 23,4 / 33,7 / 175kDa) dissolved in the eluent

Aqueous neutral technical polymers

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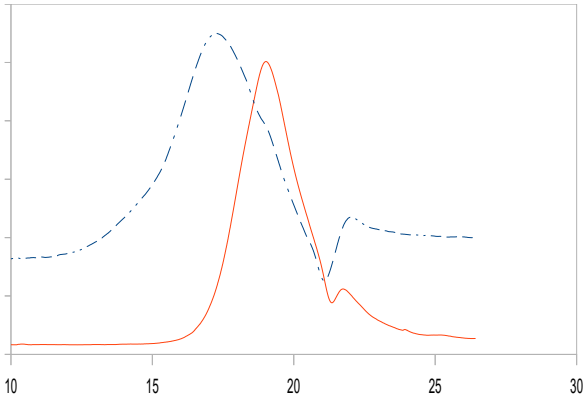
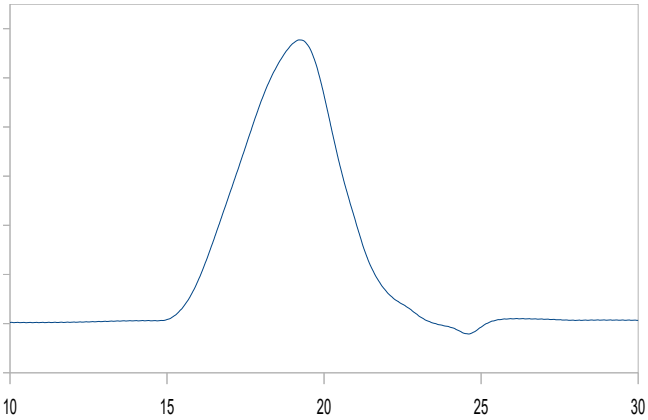


Analyte: **Pork gelatin vs. gelatin from collagen hydrolysate**
including oligomer separation

Column: AppliChrom SuperOH-P-250
AppliChrom SuperOH-P-350

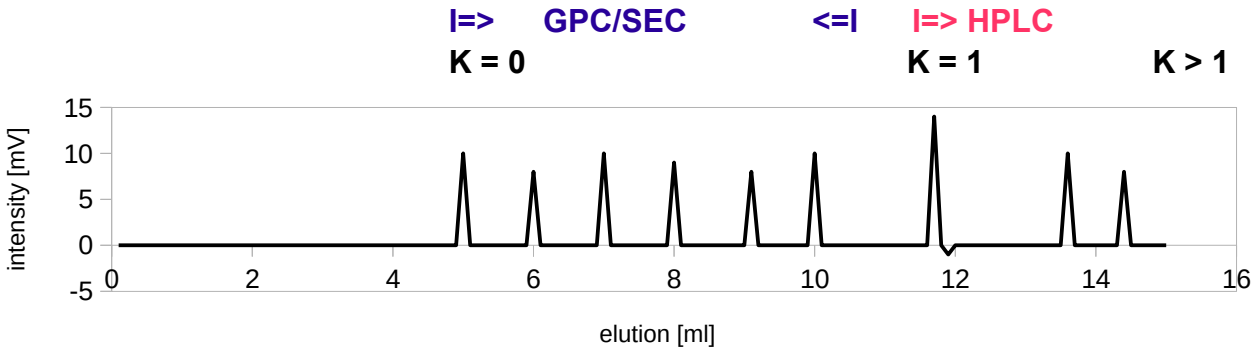
Dimension: e.a. 300mm x 8mm
Mobil Phase: 0.01M $Na_{1,5}H_{1,5}PO_4$ & 0.3M NaCl in H_2O
Flow: 1.0ml/min
Temperature: 30°C
Detection: RI
Injection: ea. 50µl sample
Pork gelatine (blue- - - -),
Gelatin from collagen hydrolyzate (red ----)



Analyte: **Pork gelatin**
analysis of a 100Da- 1 000 000Da,

Column: AppliChrom SuperOH-P-250
AppliChrom SuperOH-P-350

Dimension: e.a. 300mm x 8mm
Mobil Phase: 0.075M $NaNO_3$, 5g/l $Na_2HPO_4x7H_2O$ in H_2O
Flow: 1.0ml/min
Temperature: 20°C
Detection: RI
Injection: 20µl sample



GPC/SEC – Separation by size (ΔS) II **HPLC** – Separation according to bond strength (ΔH)
K = Partition coefficient

GPC/SEC finishes when HPLC begins

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AppliChrom SuperOH-P Column Short Overview

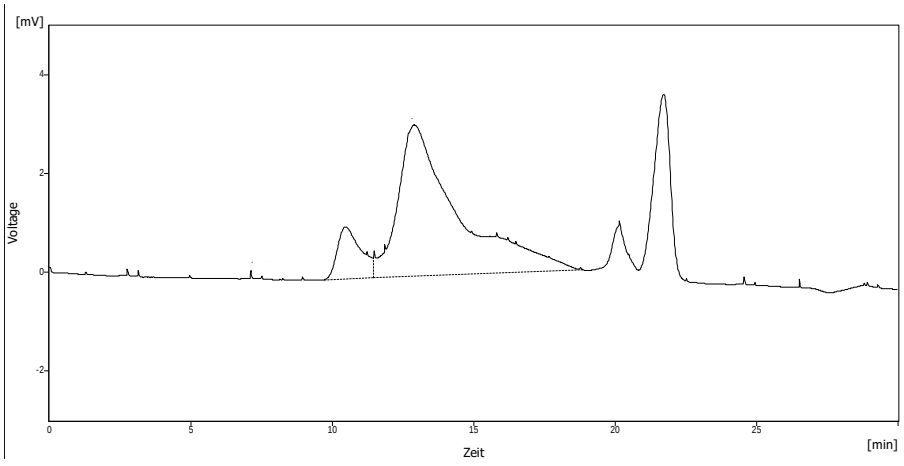
AppliChrom SuperOH-P Series

For SEC of neutral and anionic Polymers
- optimized for aqueous GPC/SEC-separations
- aqueous high hydrophilic polymeric base material
- low column bleeding for low detector noise
- 7 – 10 µm particle technology (standard) for high platecounts and high resolution
- large pore volume for high resolution
- individual poresizes for individual molecular weight ranges
- multi-pore technology for broad range of molecular size
- pH stable 2 - 11, pressure stability 30-70bar (depending on poresize), temperature stability 10-90°C
- eluent: water with salts / Buffers, MeOH (50%), ACN (25%) (Storage under 0.05 % NaN_3 in water, avoid drying)

Dimensions
300 x 8mm (SASOH...3008)
50 x 8mm (VASOH...508)

also available
250 x 8mm
300 x 20mm
other dimension availble on request

Type	Separation range [Da]	Max. pressure drop / column[bar]	Max. Flow [mL/min]	Particle Size [µm]	Temperatur range [°C]
AppliChrom SuperOH-P-100	100 – 2.500	70	1.0	7	10 – 90
AppliChrom SuperOH-P-150	100 – 5.000	70	1.0	7	
AppliChrom SuperOH-P-200	100 – 20.000	70	1.0	7	
AppliChrom SuperOH-P-250	100 – 70.000	70	1.0	7	pH range
AppliChrom SuperOH-P-250 XL	100 – 100.000	60	1.0	7	2 - 11
AppliChrom SuperOH-P-300	1.000 – 300.000	60	1.0	7	
AppliChrom SuperOH-P-350	2.500 – 1.000.000	60	1.0	10	
AppliChrom SuperOH-P-400	10.000 – 5.000.000	30	0.7	10	
AppliChrom SuperOH-P-450	50.000 – > 10.000.000	30	0.7	10	
AppliChrom SuperOH-P-Multipore	100 – 1.000.000	60	1.0	10	



Analyte: **Dextran**

Column: AppliChrom SuperOH-P-300
AppliChrom SuperOH-P-350

Dimension: e.a. 300mm x 8mm
Mobil Phase: H_2O / Buffer PBS
Flow: 1.0ml/min
Temperature: 20°C
Detection: RI
Injection: 20µl sample

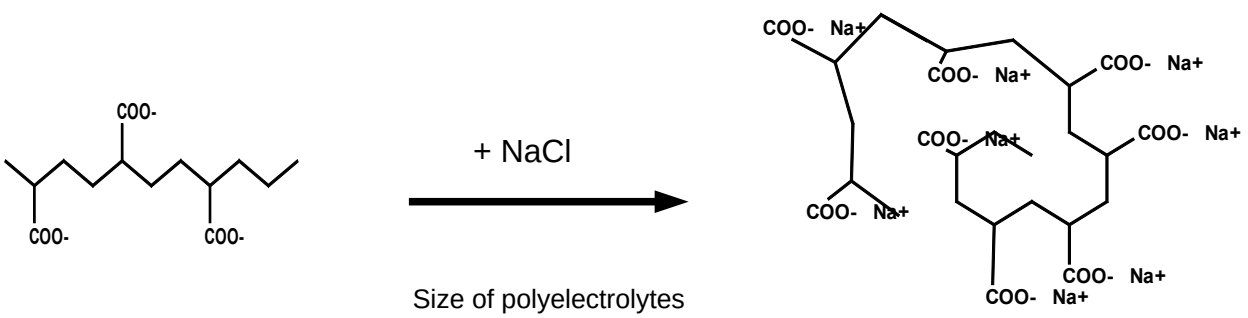
AppliChrom SuperOH-P Column Ordering Information

AppliChrom SuperOH-P Columns 300x8mm, Particle Size 5µ – 10µm – 15 µm

Descritption	MW Separation Range (PEG/PEO)	Order No.
AppliChrom SuperOH-P- 100	100 – 2 500	SASOH1003008
AppliChrom SuperOH-P- 150	100 – 5 000	SASOH1503008
AppliChrom SuperOH-P- 200	100 – 20 000	SASOH2003008
AppliChrom SuperOH-P- 250	100 – 70 000	SASOH2503008
AppliChrom SuperOH-P- 300	1 000 – 300 000	SASOH3003008
AppliChrom SuperOH-P- 350	2 500 – 1 000 000	SASOH3503008
AppliChrom SuperOH-P- 400	10 000 – 5 000 000	SASOH4003008
AppliChrom SuperOH-P- 450	50 000 - → 10 000 000	SASOH4503008
AppliChrom SuperOH-P- Screening	100 – 1 000 000	SASOHS3008

AppliChrom SuperOH-P Guard/Pre-Columns 50x8mm

Descritption	MW Separation Range (PEG/PEO)	Order No.
AppliChrom SuperOH-P- 100	100 – 2 500	SASOH150508
AppliChrom SuperOH-P- 150	100 – 5 000	SASOH200508
AppliChrom SuperOH-P- 200	100 – 20 000	SASOH250508
AppliChrom SuperOH-P- 250	100 – 70 000	SASOH250XL508
AppliChrom SuperOH-P- 300	1 000 – 300 000	SASOH300508
AppliChrom SuperOH-P- 350	2 500 – 1 000 000	SASOH350508
AppliChrom SuperOH-P- 400	10 000 – 5 000 000	SASOH400508
AppliChrom SuperOH-P- 450	50 000 - → 10 000 000	SASOH450508
AppliChrom SuperOH-P- Screening	100 – 1 000 000	SASOHS508



Size of polyelectrolytes

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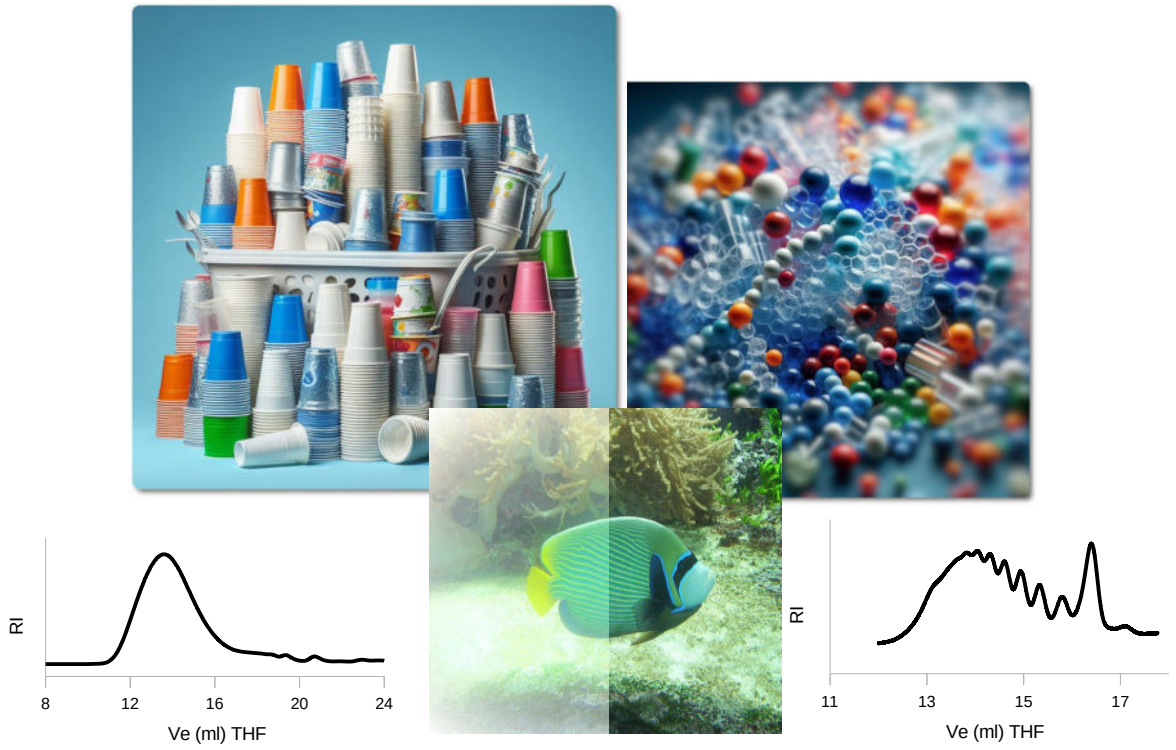
Excellent results are our aim

AppliChrom StyDiViBe-P

High-performance and high-purity GPC columns for most standard applications with high resolution;
PVC, polymethyl methacrylate - PMMA, epoxy resins, polystyrene - PS, bitumen, polyethylene - PE, polypropylene - PP, polyester, polylactide - PLA, bisphenol A resin, enrichment of impurities from fats/vegetable oils for subsequent HPLC or GC analysis - enrichment by automated GPC sample pretreatment, olive oil and fat analysis, analysis of degradation products from hydrophobic polymers and resins.
Calibration against polystyrene. PMMA or polyethylene oxides also possible



PMMA

PMMA Oligomer

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AppliChrom GPC-columns for GPC analysis of organic molecules using (THF, toluene, chloroform)**.
Oligomers and polymers including the new GPC media line from **AppliChrom BPT* synthesis technology**
for large range, high resolution separations with increased accuracy in calibration

→ spherical high porous styrene-divinylbenzene GPC-media
→ large molecular weight range: 100 →10 000 000Da
→ optimized for 1ml/min flowrate when using 8mm ID-columns
→ high pressure stability of 150-50bar, depending on porosity
→ high capacity from AppliChrom 8mm ID GPC columns
(5% more capacity than 7.8mm columns, 14% more capacity than 7.5mm ID columns)
→ plus extra high pore volume from AppliChrom GPC synthesis technology for an extra increasing of peak capacity and resolution
→ proprietary AppliChrom GPC column packing procedure for accurate peak performance, low back pressures and an extension of column livetime
→ long column livetime for reduction of costs even at high througput screening applications
high level of reproducibility
→ high purity of AppliChrom GPC particles and columns for pure GPC mechanisms, low signal noise and reduction of „systempeaks“ after GPC run

GPC-examples (THF): Amylose acetat, amylose propionat,
butyl rubber, cellulose diacetat, cellulosenitrat, polybutadiene, polycarbonate,
polyisoprene, PMMA (polymethylmethacrylate), propylenglycol, polystyrene,
polymethylstyrene, natural rubber, PVC (polyvinylchloride), polyvinylacetate, epoxid resins, polyisocyanate, polyols,
polyurethans, plant oils/triglycerids/diglycerids,....
GPC-examples (toluene): Silicones, polydimethylsiloxan

For the GPC of epoxid resins, oligomers, isocyanates, PMMA / polymethylmethacrylate, polyethylmethacrylate, PS/polystyrene, vegetable oils /triglycerides/diglycerides,..., polybutadiene, polyisoprene, silicon / siliconoil / polydimethylsiloxane (in toluene), PEG / polyethylenglyol, polypropylenoxide, polyethylenglycol-polypropylenglycol-copolymer, PVC/polyvinylchloride, PU / polyurethane, celluloseacetate, diallylphthalate, dialkylphthalate, alkyd resin e.g...

* BPT: Broad Poredistribution Technology – easy calibration curve for large range of molecular sizes; lowered calibration artefacts compared to single pore combination columns.
** Eluent THF, toluene or chloroform must be dry. If other eluents are planned – please ask us in advance. Please avoid: Eluent containing e.g. water, alcohols, acetonitril – can be relevant e.g. when using a combined HPLC/GPC system and/or in case a degasser is part of the chromatography system, avoid drying of column.

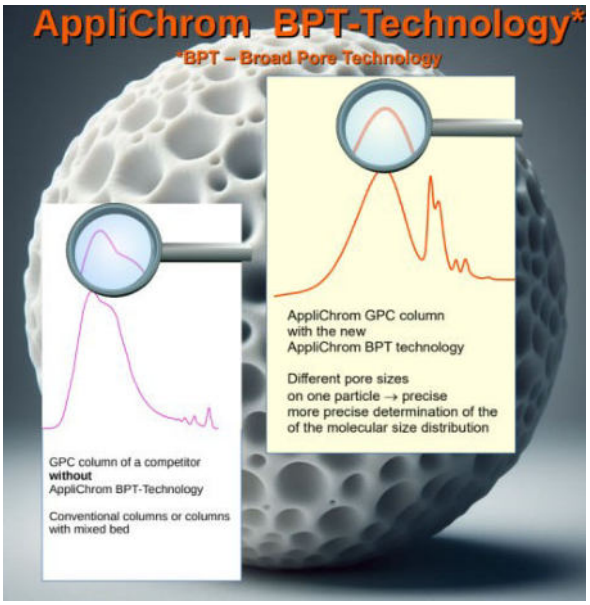
* AppliChrom BPT Technology:

A combination of small, medium and large pores in each particle provides an increase in the calibration range.
No inappropriate porosity effects
Artificial shoulders in chromatograms, known from many column combinations, are significantly reduced - to improve your GPC chromatography.

AppliChrom StyDiViBe

molecular weight range and optimum range of molecular weights

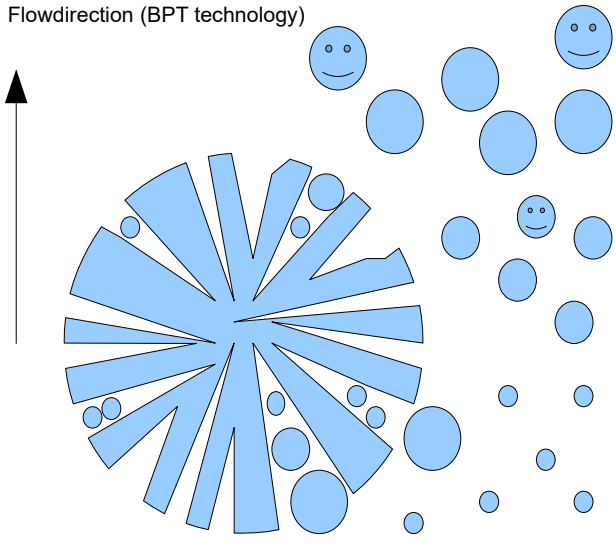
	Range of molar mass	Optimum resolution
35A	100 -2 500	<400
100A	100 -10 000	ca. 800
500A	100 -30 000	1 000 -3 000
1 000A	100 -70 000	3 000 -10 000
1 500A - BPT	100 -120 000*)	4 000 – 15 000
10E5A - BPT	500 -1 500 000*)	10 000 -150 000
10E6A - BPT	10 000-4 000 000*)	20 000 - 400 000
10E6.5A-BPT	500 - 7 000 000*)	
10E7A - BPT	1 000 →10 000 000*)	30 000 - 2 000 000



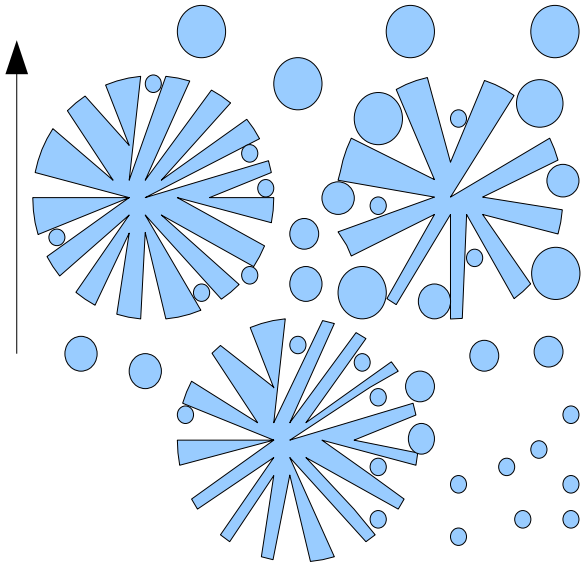
AppliChrom BPT Technology: a combination of small, medium and large pores in each particle ensures an increase of calibration range. No matching porosities effects – respecive artifical shoulders in chromatogrammes known from many column combinations are significant reduced – for improving your GPC Chromatography.

Conventional GPC technology: combining columns of various poresize or by combining different poresizes in one column enlarges the calibration range – but it can lead to artefacts in the exact calibration of the GPC system that reduces molecular size accuracy determination

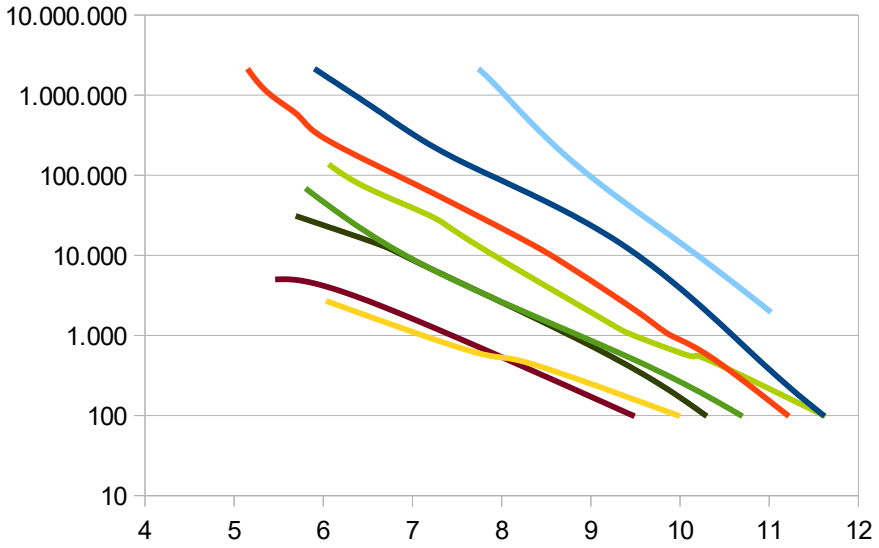
Flowdirection (BPT technology)



Flowdirection (conventional mixed technology)

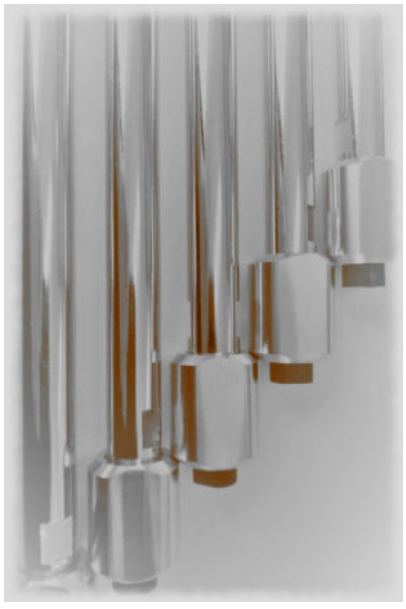


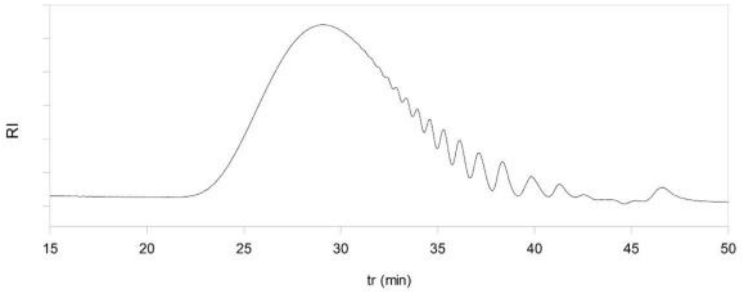
Molecular sizes range of AppliChrom StyDiViBe GPC-Serie in detail:
THF GPC-Calbration curves

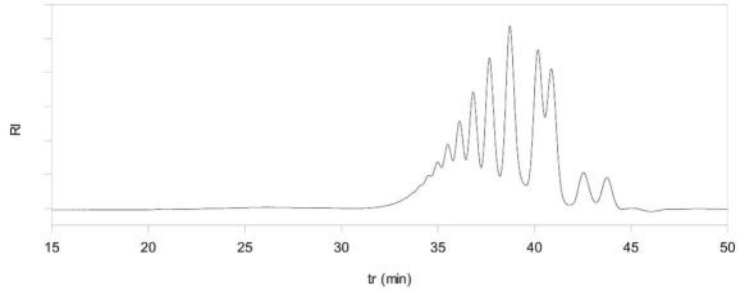


Analyte:	**PMMA Standards**
Column:	AppliChrom StyDiViBe-P-**35A**
	AppliChrom StyDiViBe-P-**100A**
	AppliChrom StyDiViBe-P-**500A**
	AppliChrom StyDiViBe-P-**1000A**
	AppliChrom StyDiViBe-P-**1500A**
	AppliChrom StyDiViBe-P-**10E5A**
	AppliChrom StyDiViBe-P-**10E6A**
	AppliChrom StyDiViBe-P-**10E7A**
Dimension:	e.a. 300mm x 8mm
Mobil Phase:	THF
Flow:	1.0ml/min
Temperature:	20°C
Detection:	RI
Injection:	100µl sample

To cover a large range of molecular sizes GPC columns of suited porosities can be combined. This is the typical state of the art in many GPC laboratories. Also now it is useful if a special range of molecular sizes should be zoomed by GPC. But – in some single cases this also results in more or less obvious inhomogenities of calibration curves that itself makes accurate mathematics of calibration challenging. To increase accuracy and to simplify the calibration AppliChrom developed the BPT* synthesis technology for significant lowering the inhomogenities phenomena and to improve the results.







Solvent polarity

Polar **Non-polar**

DMF/DMAc/NMP > 90/10 $CHCl_3$/MeOH > THF > Acetic acid ethylester > $CHCl_3$ > CH_2Cl_2 > Toluene*)

*) In case of using polar and viscous DMF/NMP/DMAc – reduction of flowrate, heating of column and in many cases some salt in solvent is necessary got get separation. Please ask for columns prepacked with final solvent that should be used.

AppliChrom StyDiViBe-P GPC columns are tested and supplied in THF as standard. They are also available in other common solvents on request. When changing the solvent, the swelling behaviour must be taken into account.

GPC solvents can be divided into four groups according to their swelling behaviour, from very strong to weak.
The following tables show which solvents exhibit which swelling behaviour during rinsing. This results in the following conversion options:

Please note.
We only guarantee for a single rinse with a different solvent. Multiple rinsing with different solvents can destroy the column bed due to the different swelling behaviour of the column material in the different solvents.

Recommended solvent	Application
THF	epoxy resin, monoglycerides, phenoxy resin, poly(methylmethacrylate), poly(styrene-acrylonitrile), poly(styrene-butadiene), polybutadiene, polycarbonate, polyisoprene, polyvinyl chloride, poly isopropylmethacrylat, motor oil (lubricant),bisphenol-A-epichlorhydrin resin, Bitumen, lignin (milled wood, organosolv, craft), derivatisation: trimethylsilyation or acetylation, plant oil/fat (sunflower oil, olive oil, palm oil,…), poly butadiens, poly ethylmethacrylat, polyester (aliphatic polyester, adipate polyester), polyester (aromatic polyol ester), polyether polyol, polyethylenoxid (PEO), polyethylenoxid-co-polypropylenoxid polyethylenoxid-co-polypropylenoxid (PEO-Co-PPO) polymethylmethacrylate (PMMA), polyol hard foam, polyol soft foam, polystyrene, polyvinylchloride (PVC), tall oil triglycerides from fatty acids
Chloroform	acrylic resin, epoxy resin, polycarboxylic ether, polystyrene (nylon, polyamide, polyester, poly (ethylene terephthalate))
Toluene	polybutadiene, poly (methyl phenyl siloxane), poly dimethylsiloxan
N,N-Dimethylformamide (DMF) + 5 mmol/L LiBr	polyacrylonitrile, polyester, polyimido ester, polyphenol (aqueous solution), polystyrene,,polyurethane, polyvinyl fluoride, urea resins,polyimido ether, polyvinyl chloride
o-Dichlorobenzene (ODCB)	polyethylene, polypropylene

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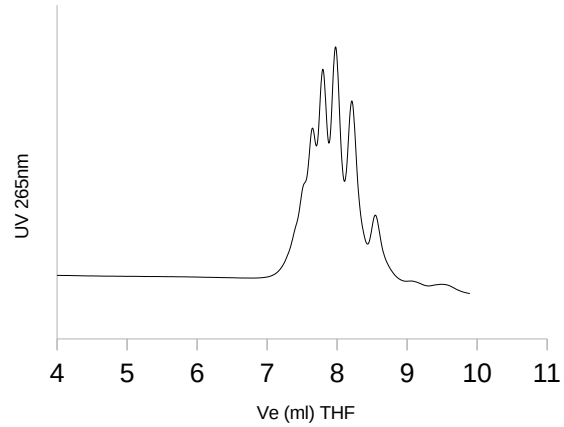
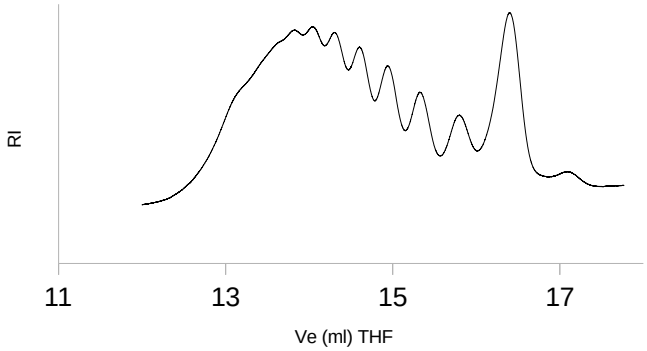


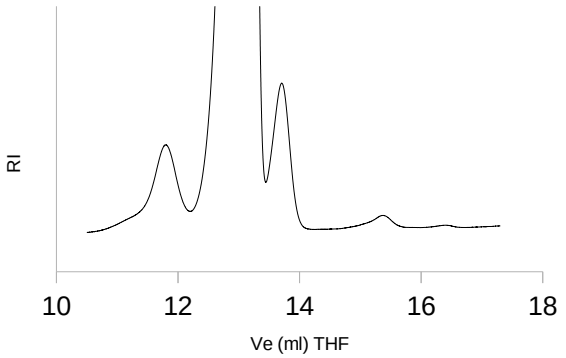
Analyte: **Polystryrene (PS)**
Mp = 578Da

Column:	AppliChrom StyDiV-Be-P-35A
Dimension:	300mm x 8mm
Mobil Phase:	THF
Flow:	1.0ml/min
Temperature:	20°C
Detection:	UV 265nm
Injection:	20µl sample



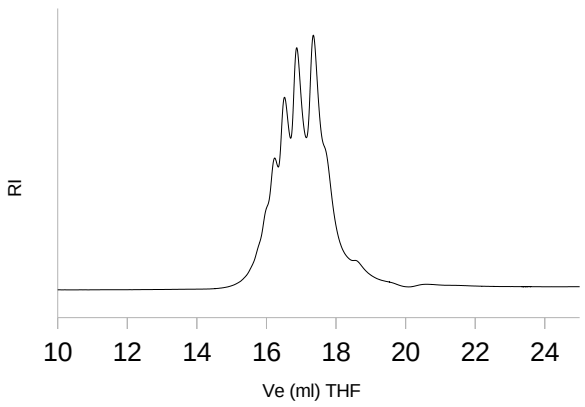
Analyte: **Polymethylmethacrylate (PMMA) oligomer**

Column:	AppliChrom StyDiV-Be-P-100A
Dimension:	2x 300mm x 8mm
Mobil Phase:	THF
Flow:	1.0ml/min
Temperature:	20°C
Detection:	RI
Injection:	20µl sample



Analyte: **Grapeoil (Triglyceride GPC)**

Column:	AppliChrom StyDiV-Be-P-100A
Dimension:	2x 300mm x 8mm
Mobil Phase:	THF
Flow:	1.0ml/min
Temperature:	20°C
Detection:	RI
Injection:	20µl sample



Analyte: **Polyethylene glycol (PEG)**
Mp = 200Da

Column:	AppliChrom StyDiV-Be-P-100A
Dimension:	2x 300mm x 8mm
Mobil Phase:	THF
Flow:	1.0ml/min
Temperature:	20°C
Detection:	RI
Injection:	20µl sample

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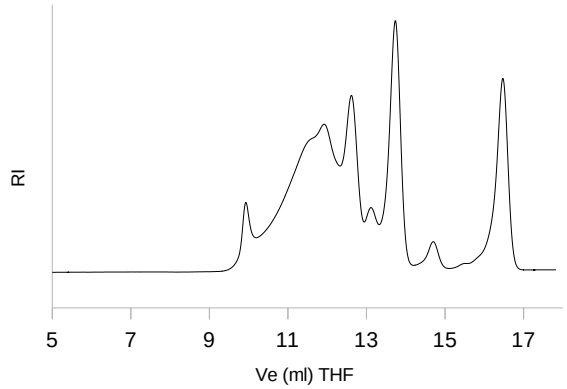
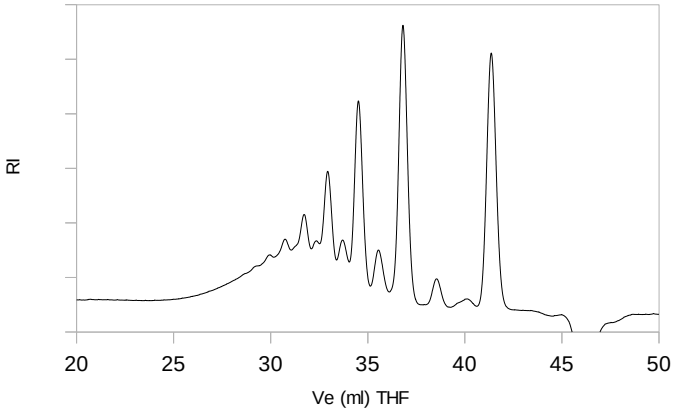


Pore to small

Analyte: Bisphenol-A-Epichlorhydrin resin (I)

Column:	AppliChrom StyDiV-Be-P-100A
Dimension:	2x 300mm x 8mm
Mobil Phase:	THF
Flow:	1.0ml/min
Temperature:	20°C
Detection:	RI
Injection:	20µl sample

High resolving GPC up to 10.000Da.

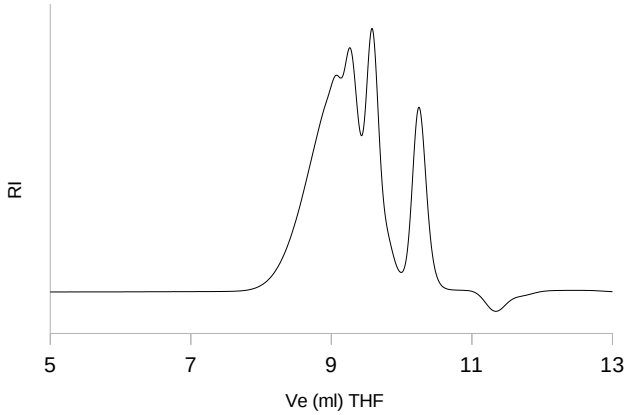


Pore perfect

Analyte: Bisphenol-A-Epichlorhydrin resin (I)

Column:	AppliChrom StyDiV-Be-P-1500A-BPT
Dimension:	2x 300mm x 8mm
Mobil Phase:	THF
Flow:	0.5ml/min
Temperature:	20°C
Detection:	RI
Injection:	20µl sample

Good resolution, calibration range respective linearity in the range of 100-120 000Da, obtained from the special AppliChrom BPT-technology. No „surprising“ porosity artefacts from mixing particles with pores of differnent size for covering the full range of molecular sizes. Great resolution even if 8µl RI measuring cell is used.



Pore to large

Analyte: Bisphenol-A-Epichlorhydrin resin (I)

Column:	AppliChrom StyDiV-Be-P-10E5A-BPT
Dimension:	300mm x 8mm
Mobil Phase:	THF
Flow:	1.0ml/min
Temperature:	20°C
Detection:	RI
Injection:	20µl sample

Good linearity from monomer up to 1 500 000Dalton, ideal for porosity gap artefact reduced GPC screening of large ranges of molecular weights combined with maintaining of oligomer resolution

Resins

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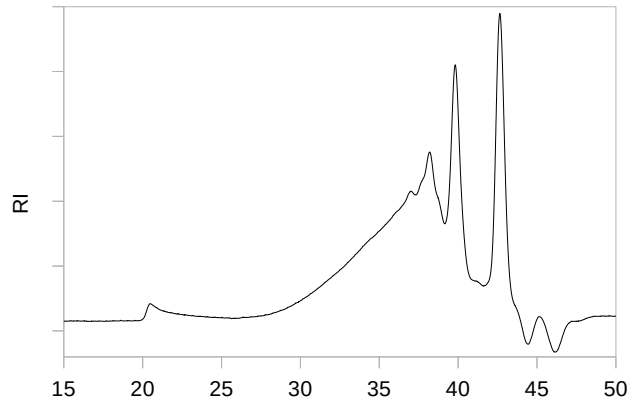
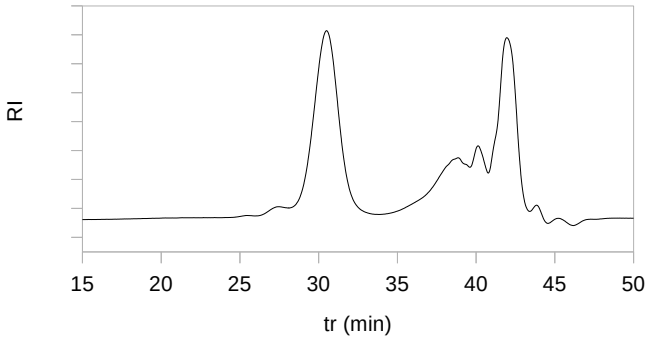


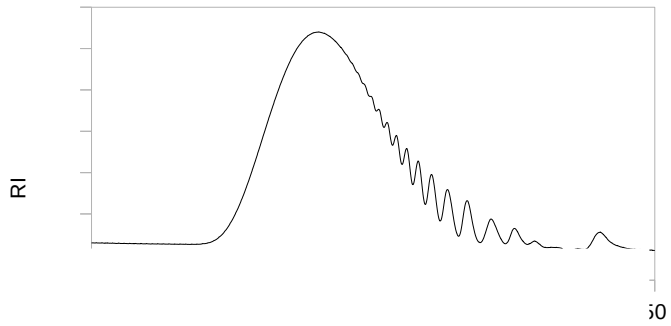
Analyte: **Polyol hard foam**

Column:	AppliChrom StyDiV-Be-P-1500A-BPT
Dimension:	2x 300mm x 8mm
Mobil Phase:	THF
Flow:	0.5ml/min
Temperature:	45°C
Detection:	RI
Injection:	20µl sample



Analyte: **Polyol soft foam**

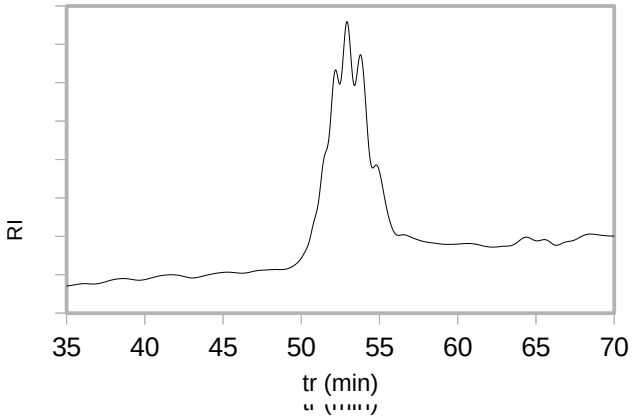
Column:	AppliChrom StyDiV-Be-P-1500A-BPT
Dimension:	2x 300mm x 8mm
Mobil Phase:	THF
Flow:	0.5ml/min
Temperature:	45°C
Detection:	RI
Injection:	20µl sample



Analyte: **Aliphatic polyester**

(adipate polyester)
including fingerprint

Column:	AppliChrom StyDiV-Be-P-1500A-BPT
Dimension:	2x 300mm x 8mm
Mobil Phase:	THF
Flow:	0.5ml/min
Temperature:	45°C
Detection:	RI
Injection:	20µl sample



Analyte: **Polyether polyol**

Column:	AppliChrom StyDiV-Be-P-1500A-BPT
Dimension:	2x 300mm x 8mm 1x 50mmx 8mm
Mobil Phase:	THF
Flow:	0.5ml/min
Temperature:	45°C
Detection:	RI
Injection:	20µl sample

High resolution

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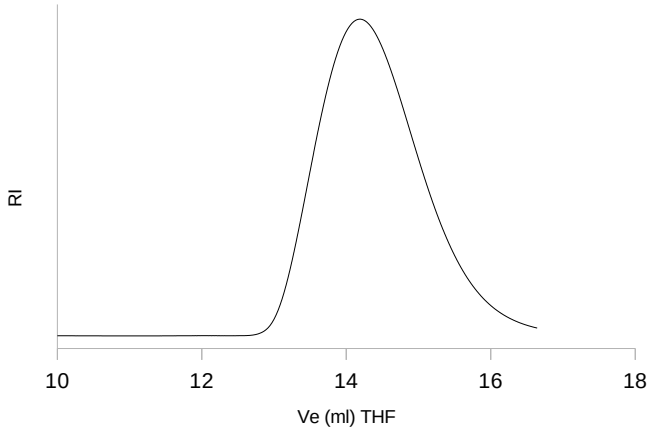
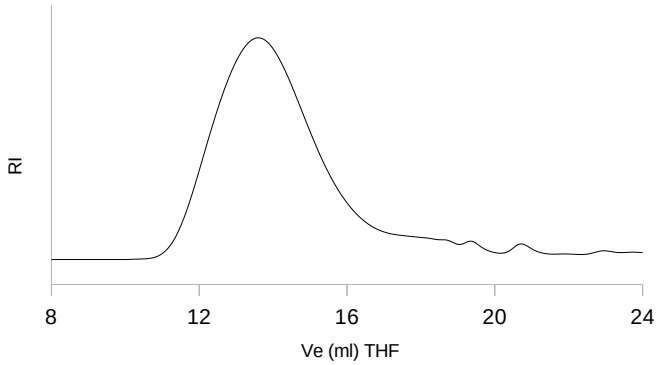


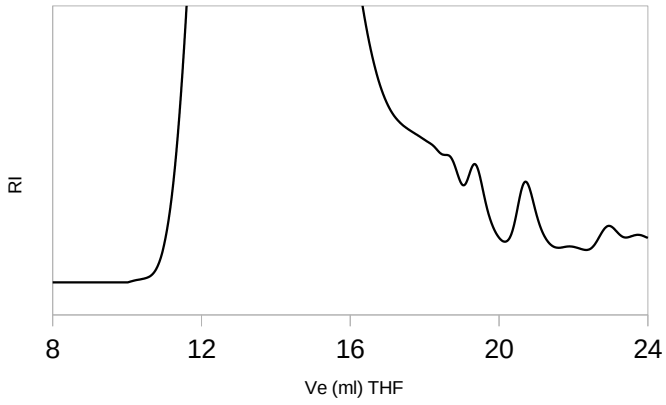
Analyte: PVC

Column:	AppliChrom StyDiV-Be-P-10E5A-BPT
Dimension:	2x 300mm x 8mm
Mobil Phase:	THF
Flow:	1.0ml/min
Temperature:	45°C
Detection:	RI
Injection:	20µl sample



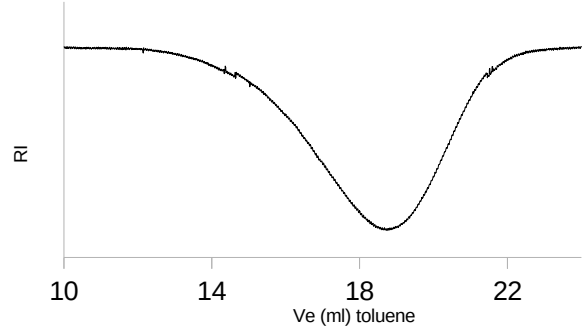
Analyte: PMMA

Column:	AppliChrom StyDiV-Be-P-10E5A-BPT
Dimension:	2x 300mm x 8mm
Mobil Phase:	THF
Flow:	1.0ml/min
Temperature:	45°C
Detection:	RI
Injection:	20µl sample



Analyte: PMMA enlarged

Column:	AppliChrom StyDiV-Be-P-10E5A-BPT
Dimension:	2x 300mm x 8mm
Mobil Phase:	THF
Flow:	1.0ml/min
Temperature:	45°C
Detection:	RI
Injection:	20µl sample



Analyte: Silicone

Column:	AppliChrom StyDiV-Be-P-10E5A-BPT
Dimension:	2x 300mm x 8mm
Mobil Phase:	Toluene
Flow:	1.0ml/min
Temperature:	20°C
Detection:	RI
Injection:	20µl sample

Broad calibration range, no porosity artefacts observed

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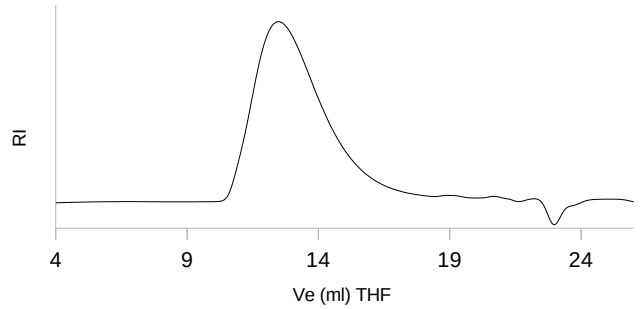
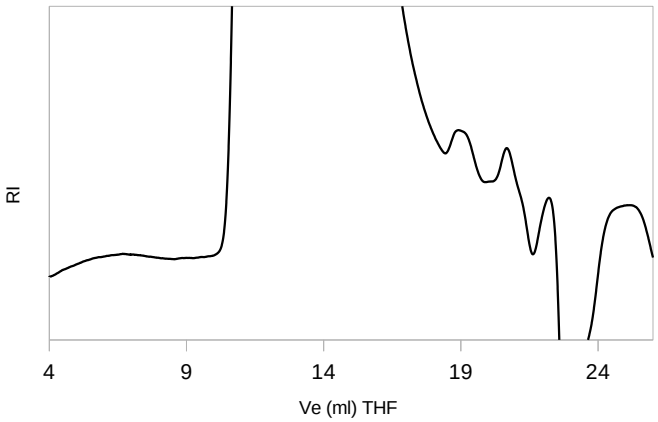
Analyte: Polystyrene



Column:	AppliChrom StyDiV-Be-P-10E5A-BPT
Dimension:	2x 300mm x 8mm
Mobil Phase:	THF
Flow:	1.0ml/min
Temperature:	45°C
Detection:	RI
Injection:	20µl sample

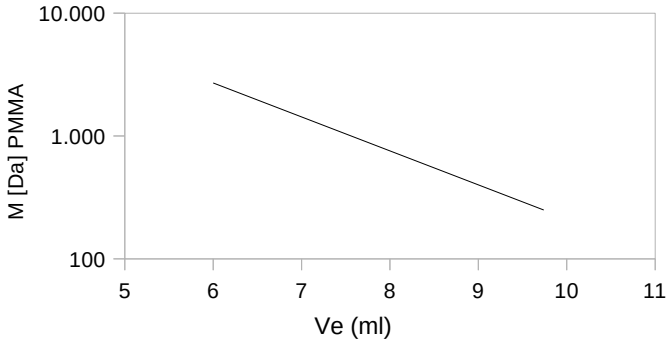
Analyte: Polystyrene enlarged



Column:	AppliChrom StyDiV-Be-P-10E5A-BPT
Dimension:	2x 300mm x 8mm
Mobil Phase:	THF
Flow:	1.0ml/min
Temperature:	45°C
Detection:	RI
Injection:	20µl sample

Ve [ml] vs M PMMA [Da]

GPC calibration curve

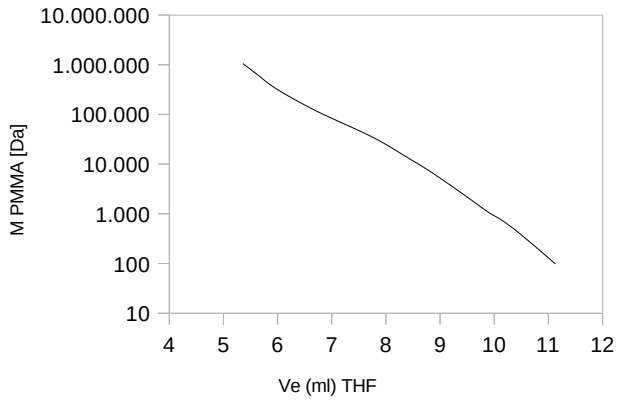


Ve vs. M (PMMA)

Column:	AppliChrom StyDiV-Be-P-35A
Dimension:	300mm x 8mm
Mobil Phase:	THF
Flow:	1.0ml/min
Temperature:	45°C
Detection:	RI
Injection:	20µl sample

GPC calibration cuve, large pore volume plus low exclusion limit for high oligomer resolution even withh low backpressure.

GPC calibration curve



Column:	AppliChrom StyDiV-Be-P-10E5A-BPT
Dimension:	2x 300mm x 8mm
Mobil Phase:	THF
Flow:	1.0ml/min
Temperature:	20°C
Detection:	RI
Injection:	20µl sample

AppliChrom StDiViBe 10E5A BPT-Technology: Large calibration range respective good to calculate calibration curve from monomer up to 1 500 000Dalton, ideal technological step ahead if a combination of porosities results in „artificial shoulders“ of calibration curves and/or in artificial shoulders of broad distributed molecular weight polymers. An easy to use tool to improve quality of results for your analytes.

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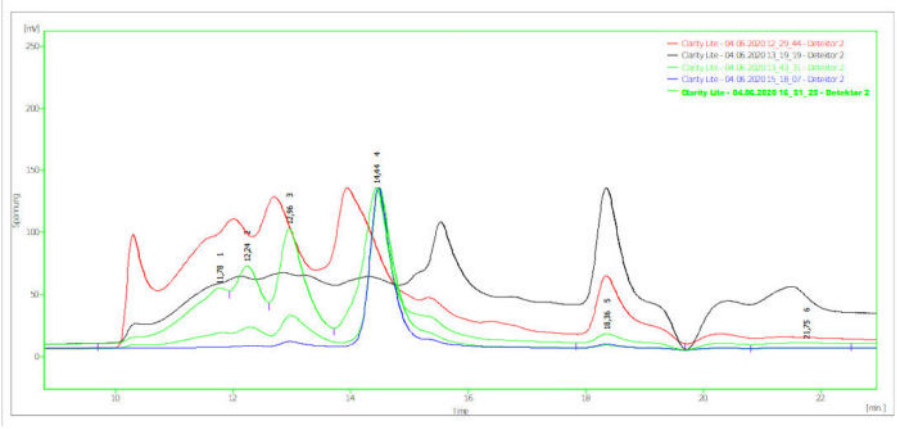
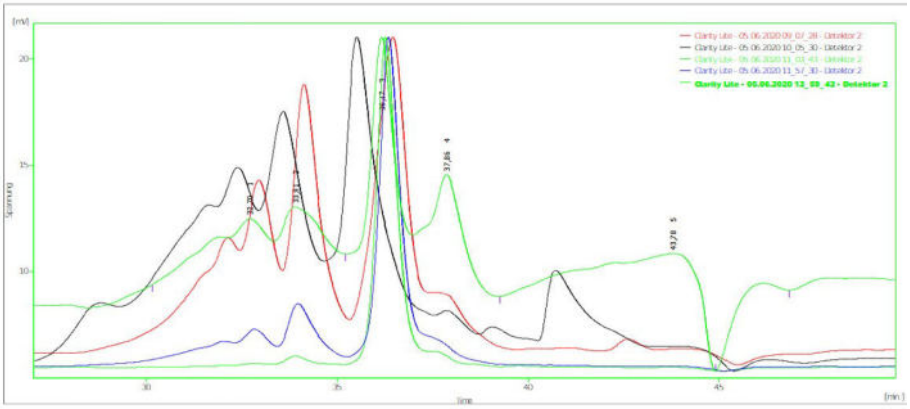
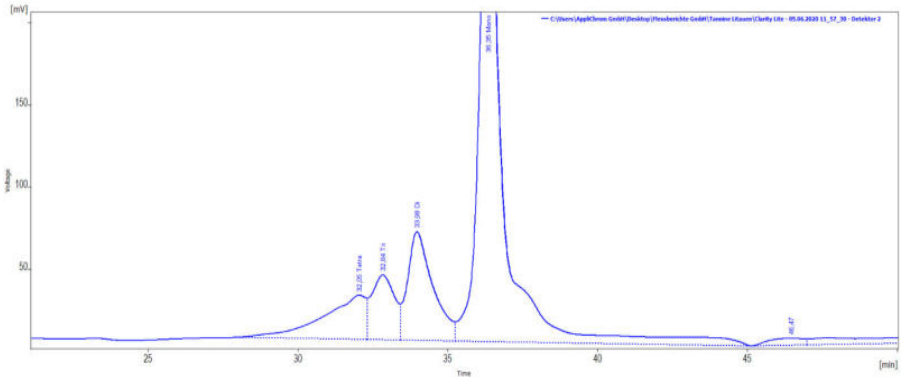
GPC seperation/analysis of 5 different Polyol samles



Analyte:	**Polyol from 5 different Tall Oil**
Column:	1x AppliChrom StyDiV-Be-P-100A, 5µm
Dimension:	300mm x 8mm
Mobil Phase:	THF
Flow:	1.0ml/min
Temperature:	ambient
Detection:	RI
Injection:	20µl sample



Analyte:	**Polyol from 5 different Tall Oil**
Column:	1x AppliChrom StyDiV-Be-P-100A, 5µm 1x AppliChrom StyDiViBe -P-10E4-BPT
Dimension:	300mm x 8mm
Mobil Phase:	THF
Flow:	1.0ml/min
Temperature:	ambient
Detection:	RI
Injection:	20µl sample



Analyte:	**Polyol from Tall Oil**
Column:	1x AppliChrom StyDiV-Be-P-100A, 5µm 1x AppliChrom StyDiViBe -P-10E4-BPT
Dimension:	300mm x 8mm
Mobil Phase:	THF
Flow:	1.0ml/min
Temperature:	ambient
Detection:	RI
Injection:	20µl sample

AppliChrom StyDiViBe-P Columns Short Overview

AppliChrom StyDiViBe-P Series

AppliChrom GPC-columns for GPC analysis of organic molecules using (THF, toluene, chloroform)**. Oligomers and polymers including the new GPC media line from **AppliChrom BPT* synthesis technology (**BPT: Broad Poredistribution Technology – easy calibration curve for large range of molecular sizes; lowered calibration
artefacts compared to single pore combination columns.) for large range, high resolution separations with increased accuracy in calibration
GPC-columns for GPC analysis of organic molecules using (THF, toluene, chloroform)
Optimized for 1ml/min flowrate when using 8mm ID-columns, high pressure stability of 50-150bar, depending on porosity
High capacity from AppliChrom 8mm ID GPC columns (5% more capacity than 7,8mm columns, 14% more capacity than 7,5mm ID columns) plus extra high pore volume from AppliChrom GPC synthesis technology for an extra increasing of peak capacity and resolution proprietary AppliChrom GPC column packing procedure for accurate peak performance, low back pressures and an extension of column livetime

GPC-examples (THF): Amylose acetat, amylose propionat, butyl rubber, cellulose diacetat, cellulosenitrat, polybutadiene, polycarbonate, polyisoprene, PMMA (polymethylmethacrylate), propylenglycol, polystyrene, polymethylstyrene, natural rubber, PVC (polyvinylchloride), polyvinylacetate, epoxid resins, polyisocyanate, polyols, polyurethans, plant oils/triglycerids/diglycerids,....
GPC-examples (toluene): Silicones, polydimethylsiloxan
GPC for epoxid resins, oligomers, isocyanates, PMMA / polymethylmethacrylate, polyethylmethacrylate, PS/polystyrene, vegetable oils /triglycerides/diglycerides,..., polybutadiene, polyisoprene, silicon / siliconoil / polydimethylsiloxane (in toluene), PEG / polyethylenglyol, polypropylenoxide, polyethylenglycol-polypropylenglycol-copolymer, PVC/polyvinylchloride, PU / polyurethane, celluloseacetate, diallylphthalate, dialkylphthalate, alkyd resin e.g...

Dimensions
300 x 8mm (...3008)
50 x 8mm (...508)

also available
250 x 8mm
300 x 20mm
other dimension availble on request

Type	Separation range [Da]	Max. pressure drop/ column [bar]	Max. Flow* [mL/min]	Particle Size [µm]	Temperature range [°C]
AppliChrom StyDiViBe-P-35A	100 – 2.500	70	1.0	5, 10	10 -145
AppliChrom StyDiViBe-P-50A	100 – 5.000	70	1.0	5, 10	
AppliChrom StyDiViBe-P-100A	100 – 10.000	70	1.0	5, 10	
AppliChrom StyDiViBe-P-500A	100 – 30.000	70	1.0	5, 10	
AppliChrom StyDiViBe-P-1.000A	100 – 70.000	60	1.0	5, 10	
AppliChrom StyDiViBe-P-1.500A	100 – 120.000	60	1.0	5, 10	pH range
AppliChrom StyDiViBe-P-10E4A-BPT	100 – 400.000	60	1.0	5, 10	
AppliChrom StyDiViBe-P-10E5A-BPT	500 – 1.500.000	30	1.0	5, 10	
AppliChrom StyDiViBe-P-10E6A-BPT	10.000 – 4.000 000	30	1.0	10	-
AppliChrom StyDiViBe-P-10E6.5A-BPT	500 – 7.000.000	30	1.0	10	
AppliChrom StyDiViBe-P-10E7A-BPT	1.000 – 1.000.000	30	1.0	10	
			* for Eluent THF		

AppliChrom StyDiViBe-P Column Ordering Information

AppliChrom StyDiViBe-P Columns 300x8mm, Particle Size 5µ – 10µm – 15 µm

Descritption	MW Separation Range (PEG/PEO)	Order No.
AppliChrom StyDiViBe-P-35A	100 – 2 500	ASDVBP353008
AppliChrom StyDiViBe-P-100A	100 – 10 000	ASDVBP1003008
AppliChrom StyDiViBe-P-500A	100 – 30 000	ASDVBP5003008
AppliChrom StyDiViBe-P-1.000A	100 – 70 000	ASDVBPE3X3008
AppliChrom StyDiViBe-P-1.500A	100 – 120 000	ASDVBP15003008
AppliChrom StyDiViBe-P-10E4A-BPT	100 – 400 000	ASDVBPE4XB3008
AppliChrom StyDiViBe-P -10E5A-BPT	500 – 1 500 000	ASDVBPE5XB3008
AppliChrom StyDiViBe-P-10E6A-BPT	10 000 - 4 000 000	ASDVBPE6XB3008
AppliChrom StyDiViBe-P-10E6.5A-BPT	500 – 7 000 000	ASDVBPE65XB3008
AppliChrom StyDiViBe-P-10E7A-BPT	10 000 – 10 000 000	ASDVBPE7XB3008

AppliChrom StyDiViBe-P Guard/Pre-Columns 50x8mm

Descritption	MW Separation Range (PEG/PEO)	Order No.
AppliChrom StyDiViBe-P-35A	100 – 2 500	ASDVBP35508
AppliChrom StyDiViBe-P-100A	100 – 10 000	ASDVBP100508
AppliChrom StyDiViBe-P-500A	100 – 30 000	ASDVBP500508
AppliChrom StyDiViBe-P-1.000A	100 – 70 000	ASDVBPE3X508
AppliChrom StyDiViBe-P-1.500A	100 – 120 000	ASDVBP1500508
AppliChrom StyDiViBe-P-10E4A-BPT	100 – 400 000	ASDVBPE4XB508
AppliChrom StyDiViBe-P -10E5A-BPT	500 – 1 500 000	ASDVBPE5XB508
AppliChrom StyDiViBe-P-10E6A-BPT	10 000 - 4 000 000	ASDVBPE6XB508
AppliChrom StyDiViBe-P-10E6.5A-BPT	500 – 7 000 000	ASDVBPE65XB508
AppliChrom StyDiViBe-P-10E7A-BPT	10 000 – 10 000 000	ASDVBPE7XB508

Do you want a different column dimension or particle size? Then simply contact us at

Runge picture
„homemade“

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AppliChrom DMSO-Phil-P

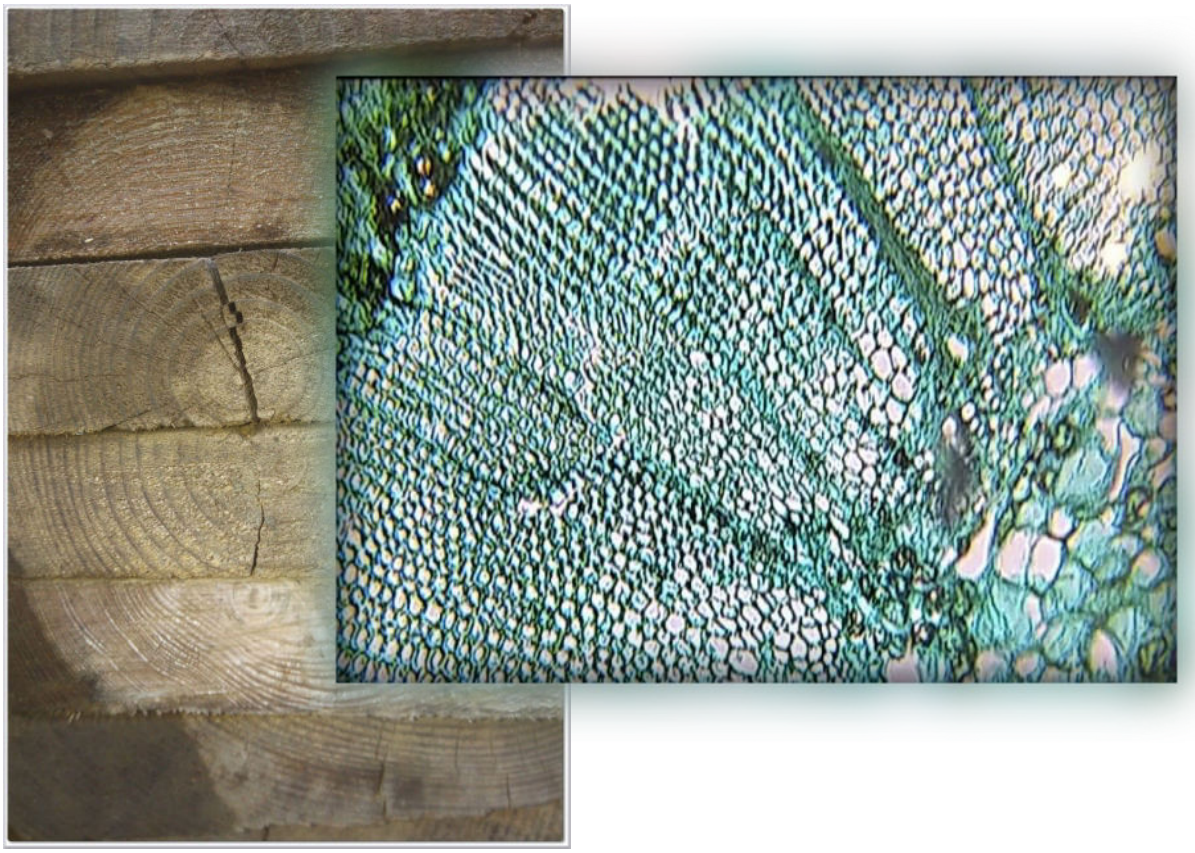
Perfect tool for simple and accurate GPC analysis of many weakly and strongly polarised analytes.

Advantages include tolerance to water traces in the eluent.

Calibration: Dextran or Pullulan.

Analytes:

Starch, amylose, amylopectin, starchy protein fraction from plants/legumes (pea, bean, ...), (melamine)-urea-formaldehyde resins, (M)UF/UF resins, lignin, humic substances, humic acid, coniferous wood bark extracts, polysaccharides...



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AppliChrom DMSO-Phil-P

Special GPC/SEC media for fast, accurate and robust GPC-analysis in DMSO

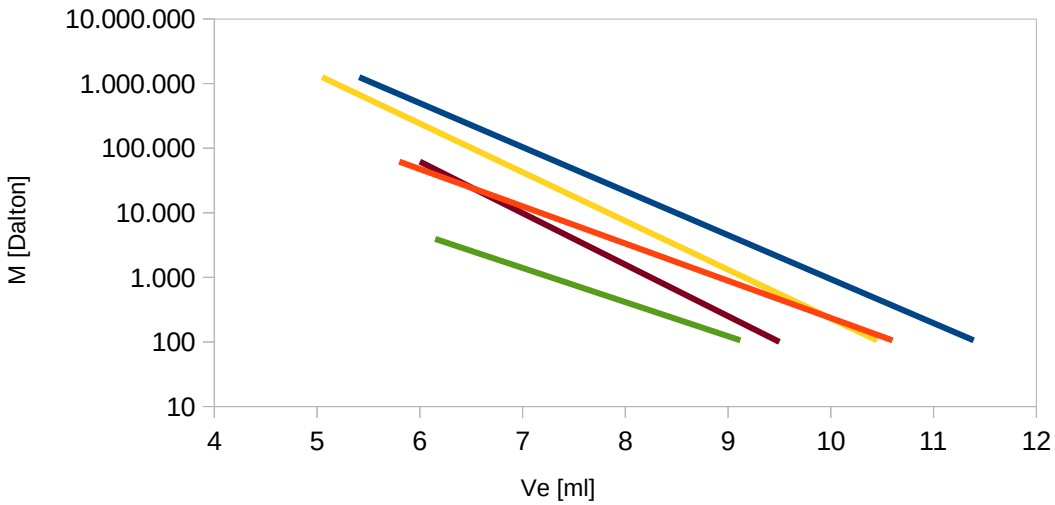
For GPC / SEC analysis in DMSO, examples:

- → amylose, amylopectin, starch
- → urea-formaldehyd resins (UF-resins)
- → melamin-urea-formaldehyd resins (MUF-resins)
- → lignins, humic substances, humic acids, coniferous wood bark essences
- → polysaccharide, polysaccharid derivatives
- → poly(N-isopropylacrylamid) PNIPA
- → poly-vinylpyridin
- → calibration: pullulan, dextran, polyvinylpyridin et al.

Advantages

- → optimized for DMSO-GPC applications
- → interactionfree pure GPC/SEC
- → easy, reliable and robust GPC/SEC-calibration by dextrans, pullulans et al.
- → low column bleeding for low detectornoise for improved lightscattering or viscosity detection
- → 12µ particle technology for low backpressure
- → large porevolume and optimized mass transfer for polymers giving optimized resolution
- → low costs caused by long livetime of column – result of combination of optimized proprietary particle and packingtechnology.

Measuring range of selected AppliChrom DMSO-Phil-P GPC/SEC-columns, 300x8mm, poresizes 100, 200, 250, 350, 400



Different pore sizes available

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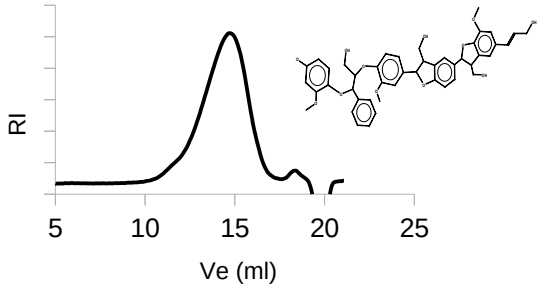
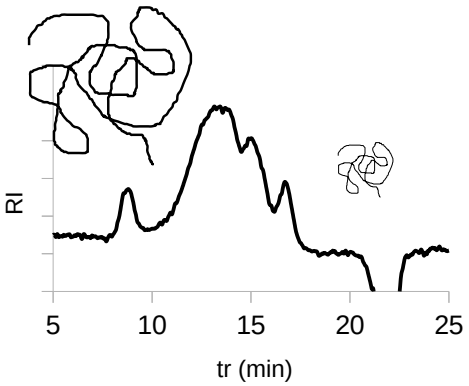


Analyte: **Lignin conifer bark extracts**

Column: AppliChrom DMSO-Phil-P-250
AppliChrom DMSO-Phil-P-350

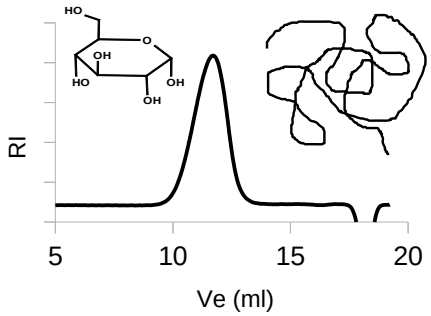
Dimension: ea. 300mm x 8mm
Mobil Phase: DMSO / 0.075M $NaNO_3$
Flow: 0.5ml/min
Temperature: 80°C
Detection: RI



Analyte: **Spruce bark extract**

Column: AppliChrom DMSO-Phil-P-250

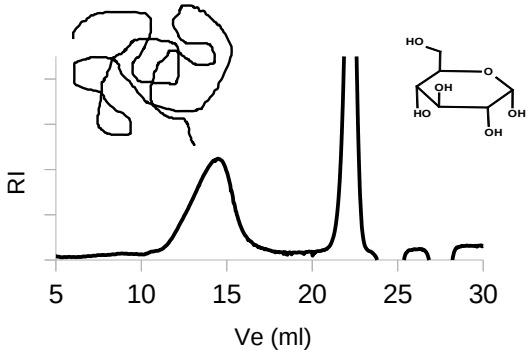
Dimension: 2x 300mm x 8mm
Mobil Phase: DMSO / 0.075M $NaNO_3$
Flow: 0.5ml/min
Temperature: 80°C
Detection: RI



Analyte: **Polysaccharide**
(M ca. 70 000Da)

Column: AppliChrom DMSO-Phil-P-250
AppliChrom DMSO-Phil-P-350

Dimension: ea. 300mm x 8mm
Mobil Phase: DMSO / 0.075M $NaNO_3$
Flow: 0.5ml/min
Temperature: 80°C
Detection: RI



Analyte: **Dextran 650**
Dextran from Leuconostoc spp.,
M = 450 000-650 000Da + fructose

Column: AppliChrom DMSO-Phil-P-200
AppliChrom DMSO-Phil-P-250
AppliChrom DMSO-Phil-P-350

Dimension: ea. 300mm x 8mm
Mobil Phase: DMSO / 0.075M $NaNO_3$
Flow: 0.5ml/min
Temperature: 80°C
Detection: RI

Many applications for DMSO

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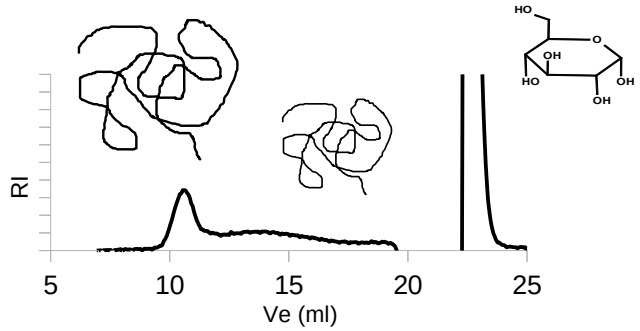
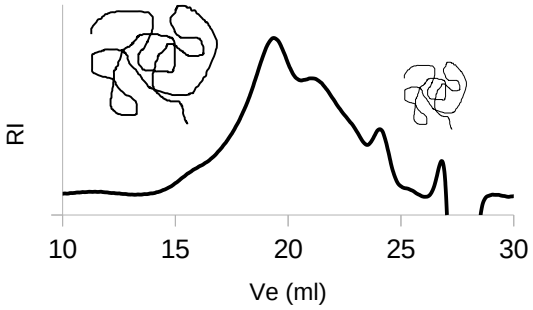


Analyte: **Pea starch**

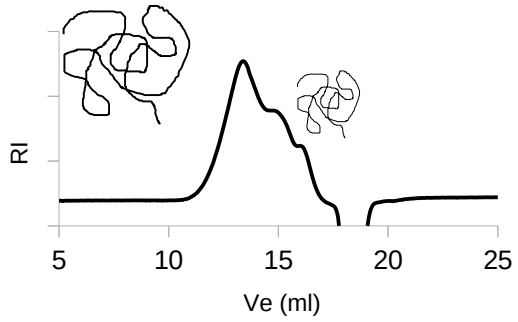
Column:	AppliChrom DMSO-Phil-P-200 AppliChrom DMSO-Phil-P-250 AppliChrom DMSO-Phil-P-350
Dimension:	ea. 300mm x 8mm
Mobil Phase:	DMSO / 0.075M $NaNO_3$
Flow:	0.5ml/min
Temperature:	80°C
Detection:	RI



Analyte: **MUF-resin**

completely DMSO-soluble melamin-urea formaldehyd resin (MUF-resin)

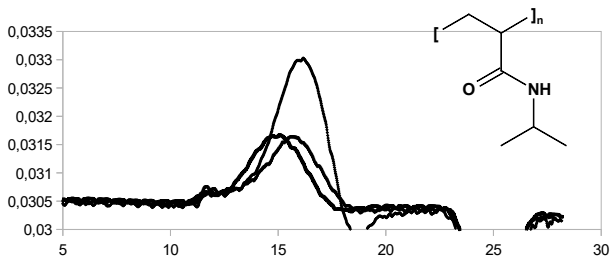
Column:	AppliChrom DMSO-Phil-P-200 AppliChrom DMSO-Phil-P-250 AppliChrom DMSO-Phil-P-350
Dimension:	ea. 300mm x 8mm
Mobil Phase:	DMSO / 0.075M $NaNO_3$
Flow:	0.5ml/min
Temperature:	80°C
Detection:	RI
Injection:	50µl sample



Analyte: **UF-resin**

DMSO-soluble urea formaldehyd resin

Column:	AppliChrom DMSO-Phil-P-200 AppliChrom DMSO-Phil-P-350
Dimension:	ea. 300mm x 8mm
Mobil Phase:	DMSO / 0.075M $NaNO_3$
Flow:	0.5ml/min
Temperature:	80°C
Detection:	RI



Analyte: **Poly(N-isopropylacrylamide)**

Further denominations: PNIPA, PNIPAAm, NIPA, PNIPAA or PNIPAm.
CAS [25189-55-3], formula: $(C_6H_{11}NO)_n$

3 different PNIPA fractions

Column:	AppliChrom DMSO-Phil-P-300
Dimension:	ea. 300mm x 8mm
Mobil Phase:	DMSO / 0.075M $NaNO_3$
Flow:	0.5ml/min
Temperature:	80°C
Detection:	RI

DMSO – easy to handle

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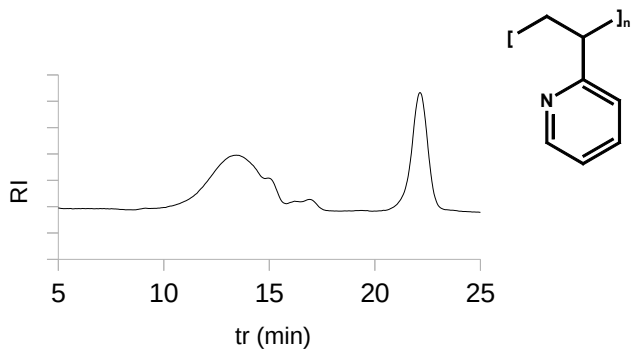
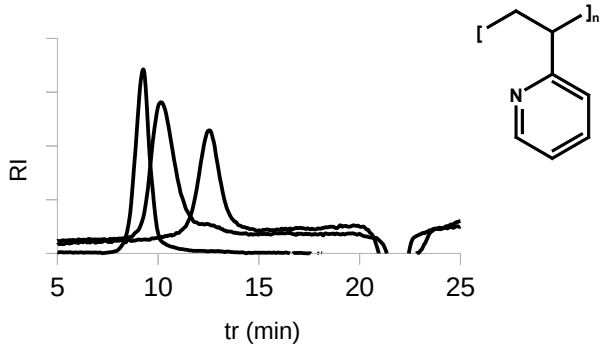


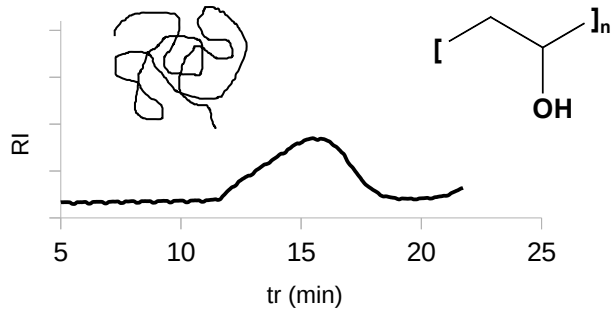
Analyte: **Polyvinylpyridine degradated**
Further denominations: CAS 25014-15-7,
$(C_7H_7N)_n$
low molecular weight (oligomeric) polyvinylpyridin fraction

Column:	AppliChrom DMSO-Phil-P-250
Dimension:	ea. 300mm x 8mm
Mobil Phase:	DMSO / 0.075M $NaNO_3$
Flow:	0.4ml/min
Temperature:	50°C
Detection:	RI



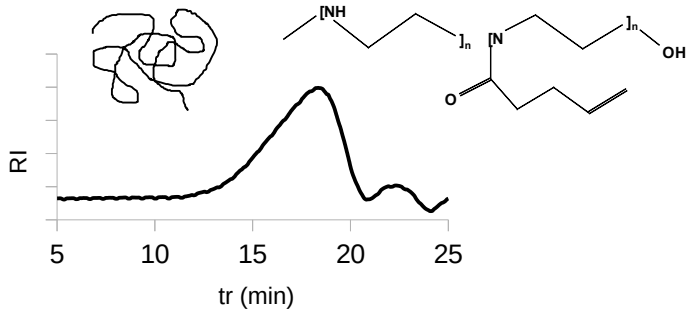
Analyte: **Polyvinylpyridine fractions**
Further denominations: CAS 25014-15-7,
$(C_7H_7N)_n$
75.7kDa, 20.9kDa, 3.2kDa
Superposition of 3 different polyvinylpyridin fractions

Column:	AppliChrom DMSO-Phil-P-250
Dimension:	ea. 300mm x 8mm
Mobil Phase:	DMSO / 0.075M $NaNO_3$
Flow:	0.4ml/min
Temperature:	50°C
Detection:	RI



Analyte: **Polyvinylalcohol M=22kDa**

Column:	AppliChrom DMSO-Phil-P-300
Dimension:	2x 300mm x 8mm
Mobil Phase:	DMSO / 0.075M $NaNO_3$
Flow:	0.4ml/min
Temperature:	50°C
Detection:	RI



Analyte: **Poly[2-(butenyl)2-oxazoline-co-ethylenimine]**
M = 50.000Da

Column:	AppliChrom DMSO-Phil-P-300
Dimension:	ea. 300mm x 8mm
Mobil Phase:	DMSO / 0.075M $NaNO_3$
Flow:	0.4ml/min
Temperature:	50°C
Detection:	RI

Robust applications

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AppliChrom DMSO-Phil-P

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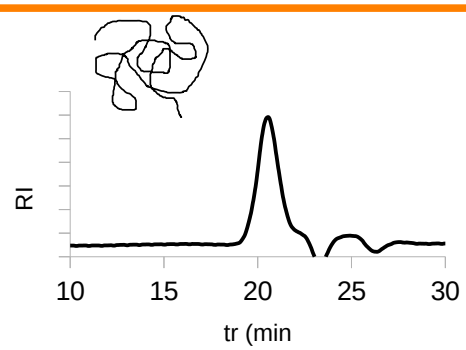
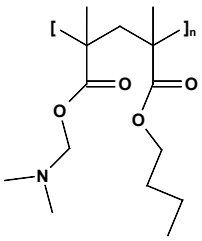
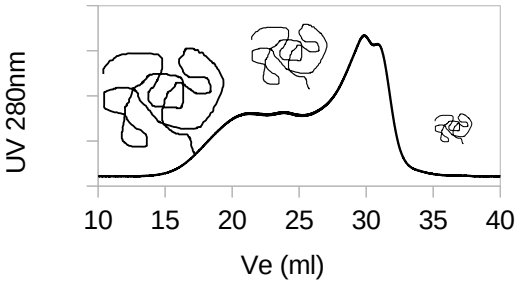




Analyte: **Polybutyl methacrylate/ Poly(dimethylamino-ethylmethacrylate) M=22kDa**

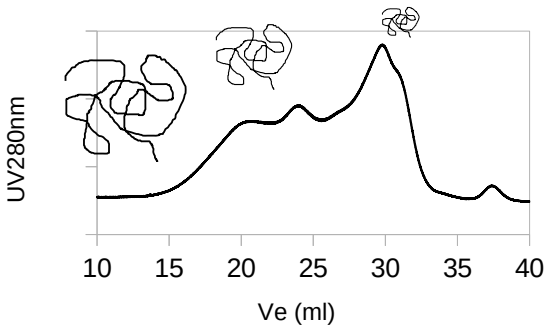
Column:	AppliChrom DMSO-Phil-P-300
Dimension:	2x 300mm x 8mm
Mobil Phase:	DMSO / 0.075M $NaNO_3$
Flow:	0.4ml/min
Temperature:	50°C
Detection:	RI



Analyte: **Pea protein GPC**

covering the calibration range of 100-1 000 000Da (based on dextrans)

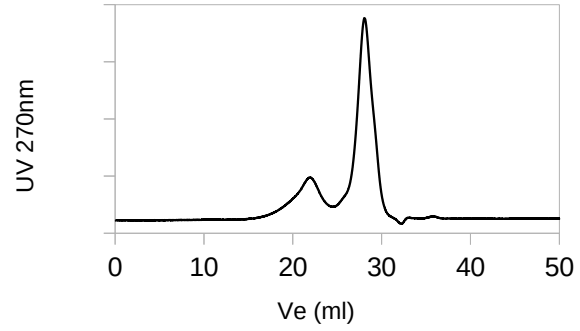
Column:	AppliChrom DMSO-Phil-P-Multipore
Dimension:	3x 300mm x 8mm
Mobil Phase:	DMSO
Flow:	0.4ml/min
Temperature:	55°C
Detection:	UV 280nm
Calibration:	vs. Dextran, pullulan or protein



Analyte: **Soy protein GPC**

covering the calibration range of 100-1 000 000Da (based on dextrans)

Column:	AppliChrom DMSO-Phil-P-Multipore
Dimension:	3x 300mm x 8mm
Mobil Phase:	DMSO
Flow:	0.4ml/min
Temperature:	55°C
Detection:	UV 280nm
Calibration:	vs. Dextran, pullulan or protein



Analyte: **Manuka honey protein GPC**

covering the calibration range of 100-1 000 000Da (based on dextrans)

Column:	AppliChrom DMSO-Phil-P-Multipore
Dimension:	3x 300mm x 8mm
Mobil Phase:	DMSO
Flow:	0.4ml/min
Temperature:	40°C
Detection:	UV 270nm
Calibration:	vs. Dextran, pullulan or protein

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AppliChrom DMSO-Phil-P

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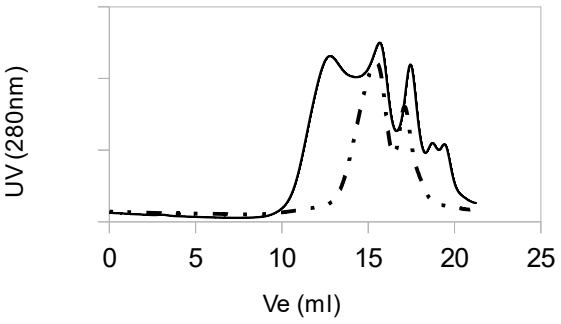
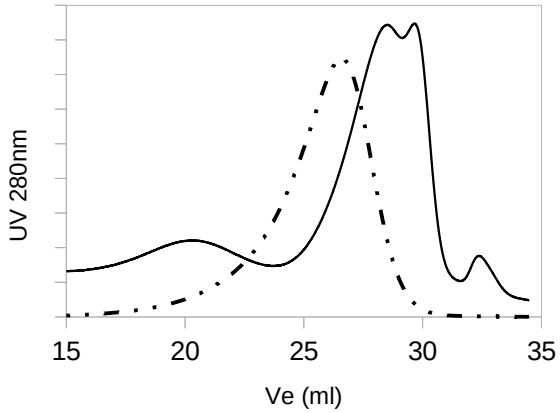


Analyte: **Caramel color GPC**

(range: 100Da-1 500 000Da)

SEC / GPC comparison of 2 Caramel Coulor

Column:	AppliChrom DMSO-Phil-P-100 AppliChrom DMSO-Phil-P-350
Dimension:	ea. 300mm x 8mm
Mobil Phase:	DMSO / 0.075M $NaNO_3$
Flow:	0.3ml/min
Temperature:	60°C
Detection:	UV 280nm

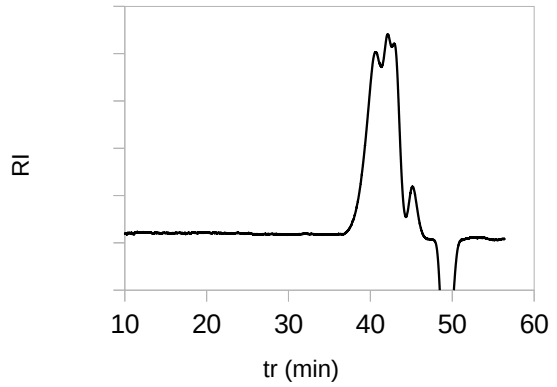


Analyte: **Humic acids / humates GPC**

(range: 100-1 500 000Da)

SEC / GPC comparison GPC / SEC comparison of 2 different humic acids / humates

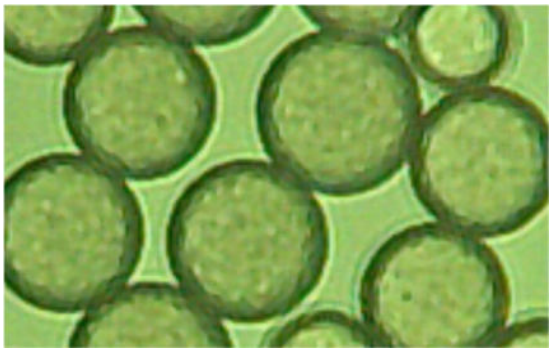
Column:	AppliChrom DMSO-Phil-P-Multipore
Dimension:	3x 300mm x 8mm
Mobile Phase:	DMSO
Flow:	0.4ml/min
Temperature:	70°C
Detection:	UV 280nm



Analyte: **Melamin GPC**

(range: 100-1 500 000Da)

Column:	AppliChrom DMSO-Phil-P-100 AppliChrom DMSO-Phil-P-350
Dimension:	ea. 300mm x 8mm
Mobil Phase:	DMSO / 0.075M $NaNO_3$
Flow:	0.4ml/min
Temperature:	60°C
Detection:	RI



GPC-material – particle size uniformity

AppliChrom DMSO-Phil-P Columns Short Overview

AppliChrom DMSO-Phil-P Series

- optimized for DMSO-GPC applications
- easy, reliable and robust GPC/SEC-calibration by dextrans, pullulans et al.
- low column bleeding for low detectornoise for improved lightscattering or viscosity detection
- 12µ particle technology for low backpressure
- large porevolume and optimized mass transfer for polymers giving optimized resolution
- low costs caused by long livetime of column – result of combination of optimized proprietary particle and packing technology.

Dimensions
300 x 8mm (SADP...3008)
50 x 8mm (VADP...508)

also available
250 x 8mm
300 x 20mm
other dimension availble on request

Type	Separation range [Da]	Max. pressure drop / column[bar]	Max. Flow [mL/min]	Particle Size [µm]	Temperature range [°C]
AppliChrom DMSO-PHIL-P-100	100 – 2.500	70	0.5	12	40 – 90 (145)
AppliChrom DMSO-PHIL-P-150	100 – 5.000	70	0.5	12	
AppliChrom DMSO-PHIL-P-200	100 – 20.000	70	0.5	12	
AppliChrom DMSO-PHIL-P-250	100 – 70.000	70	0.5	12	pH range
AppliChrom DMSO-PHIL-P-300	1.000 – 500.000	60	0.5	12	-
AppliChrom DMSO-PHIL-P-350	5.000 – 1.500.000	60	0.5	12	
AppliChrom DMSO-PHIL-P-400	10.000 – 5.000.000	60	0.4	12	
AppliChrom DMSO-PHIL-P-450	50.000 – 10.000 000	30	0.4	12	
AppliChrom DMSO-PHIL-P-500	~ 20.000.000	30	0.4	12	
AppliChrom DMSO-PHIL-P-M	100 – 1.000.000	60	0.5	12	

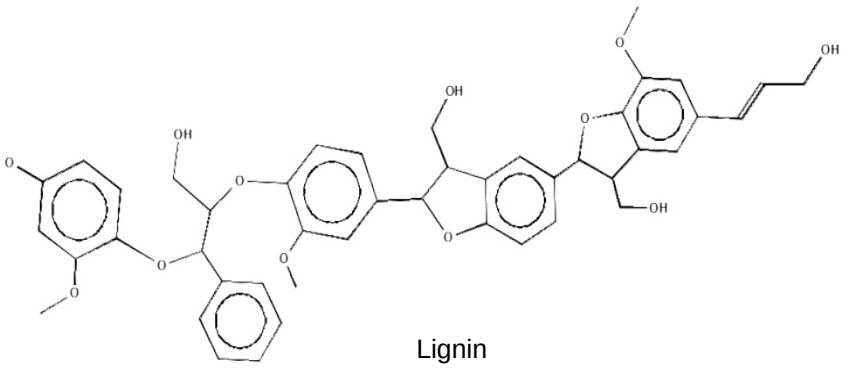
AppliChrom DMSO-Phil-P

AppliChrom DMSO-Phil-P Columns 300x8mm, Particle Size 12 µm

Descritption	MW Separation Range (PEG/PEO)	Order No.
AppliChrom DMSO-Phil-P-100	100 – 2 500	SADP1003008
AppliChrom DMSO-Phil-P-150	100 – 5 000	SADP1503008
AppliChrom DMSO-Phil-P-200	100 – 20 000	SADP2003008
AppliChrom DMSO-Phil-P-250	100 – 70 000	SADP2503008
AppliChrom DMSO-Phil-P-300	1 000 – 500 000	SADP3003008
AppliChrom DMSO-Phil-P-350	5 000 – 1 500 000	SADP3503008
AppliChrom DMSO-Phil-P-400	10 000 – 5 000 000	SADP4003008
AppliChrom DMSO-Phil-P-450	50 000 - 10 000 000	SADP4503008
AppliChrom DMSO-Phil-P-500	→ 20 000 000	SADP5003008
AppliChrom DMSO-Phil-P-M	100 – 1 000 000	SADPM3008

AppliChrom DMSO-PHIL-P Guard/Pre-Columns 50x8mm

Descritption	MW Separation Range (PEG/PEO)	Order No.
AppliChrom DMSO-Phil-P-100	100 – 2 500	VADP100508
AppliChrom DMSO-Phil-P-150	100 – 5 000	VADP150508
AppliChrom DMSO-Phil-P-200	100 – 20 000	VADP200508
AppliChrom DMSO-Phil-P-250	100 – 70 000	VADP250508
AppliChrom DMSO-Phil-P-300	1 000 – 500 000	VADP300508
AppliChrom DMSO-Phil-P-350	5 000 – 1 500 000	VADP350508
AppliChrom DMSO-Phil-P-400	10 000 – 5 000 000	VADP400508
AppliChrom DMSO-Phil-P-450	50 000 - 10 000 000	VADP450508
AppliChrom DMSO-Phil-P-500	→ 20 000 000	VADP500508
AppliChrom DMSO-Phil-P-M	100 – 1 000 000	VADPM508



Lignin

AppliChrom SugarSep

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Here you will find just a small selection of the AppliChrom SugarSep HPLC Column programme. On the website www.sugar-hplc.com you will find countless applications, tips and interesting facts for the analysis of sugars, sugar alcohols and organic acids.

AppliChrom SugarSep-HPLC Columns

- → Low cost for eluent supply. Eluent = water.
- → Environmental friendly because: Eluent = water.
- → Low cost for used eluent waste: Eluent = water.
- → Easy to handle analysis. Direct analyis from aqueous sample!
- → Low invest: Measurement possible with standard HPLC-system if connected with RI or ELSD (evaporative lighscattering detector).

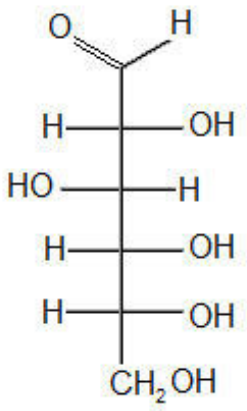
AppliChrom SugarSep-Ca – Analysis of sugars, sugar alcohols, alcohols.

AppliChrom SugarSep-Pb – Analysis of sugars

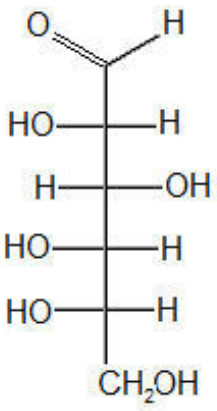
AppliChrom SugarSep-H – Analysis of sugars, sugaralcohols, alcohols and carobxylic acids.

AppliChrom SugarSep-Na – Analysis of sugars, sugaralcohols, alcohols and carobxylic acids

AppliChrom SugarSep-Oligo – Analysis of sugars, sugaralcohols, alcohols and carobxylic acids.



D-Glucose



L-Glucose

AppliChrom SugarSep HPLC columns which material specifications are suitable for which application or analytes?

AppliChrom SugarSep-Coulmn	Form	CLD (%)	Particle Size (µm)	Mobile Phase	Flow (mL/min)	Temp. (°C)	Application
SugarSep-H I	H	8	10	H_2O/0.1% H_2SO_4	0.4	40	organic acids. alcohols. sugar mixtures USP L17, L22
SugarSep-H II	H	8	10	H_2O/0.1% H_2SO_4	0.4	40	organic acids. alcohols. sugar mixtures USP L17, L22
SugarSep-H III	H	6	10	H_2O/0.1% H_2SO_4	0.4	40	organic acids. alcohols. sugar mixtures USP L17, L22
SugarSep-H IV	H	6	10	H_2O/0.1% H_2SO_4	0.4	40	organic acids. alcohols. sugar mixtures USP L17, L22
SugarSep-H V	H	-	10	H_2O/0.1% H_2SO_4	0.3 – 1.0	20 - 85	organic acids. alcohols. sugar mixtures USP L17, L22
SugarSep-Ca I	Ca	8	10	H_2O	0.6	85	General sugar analysis simple sugars. sugar alcohols USP L22, L19 specifications for separation of sorbitol and mannitol
SugarSep-Ca II	Ca	8	10	H_2O	0.6	85	General sugar analysis simple sugars. sugar alcohols USP L22, L19 specifications for separation of sorbitol and mannitol
SugarSep-Ca III	Ca	6	10	H_2O	0.6	85	General sugar analysis simple sugars. sugar alcohols USP L22, L19 specifications for separation of sorbitol and mannitol
SugarSep-Ca IV	Ca	6	10	H_2O	0.6	85	General sugar analysis simple sugars. sugar alcohols USP L22, L19 specifications for separation of sorbitol and mannitol
SugarSep-Ca V	Ca	-	10	H_2O	0.6 – 1.0	40 - 85	General sugar analysis simple sugars. sugar alcohols USP L22, L19 specifications for separation of sorbitol and mannitol
SugarSep-Pb IV	Pb	6	10	H_2O	0.5	60	Monosaccaride and wood sugars
SugarSep-K	K	8	10	H_2O	0.5	30	Saccharide, beet sugar, cane sugar, corn syrup, molasses
SugarSep-Li	Li	8	10	H_2O	0.5	30	Saccharide, beet sugar, cane sugar, corn syrup, molasses
SugarSep-Oligo-Na	Na	4	10, 25	H_2O	0.3	80	Oligosaccaride, corn syrup
SugarSep-Oligo-Ag	Ag	4	10, 25	H_2O	0.25	80	Oligosaccaride, corn syrup

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AppliChrom SugarSep

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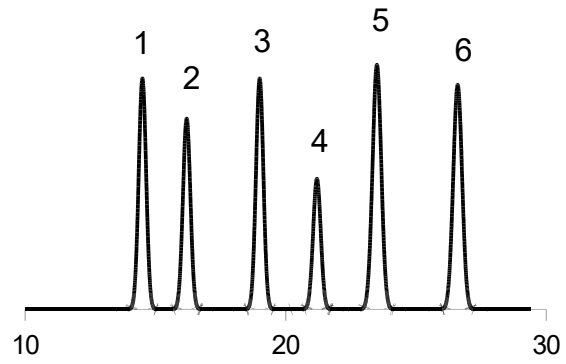
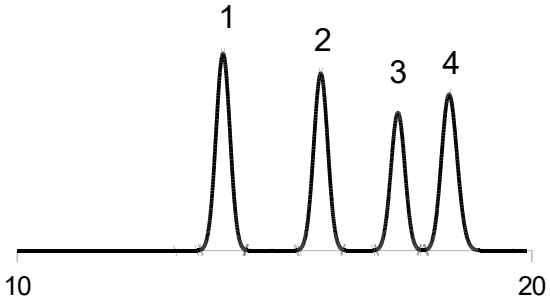
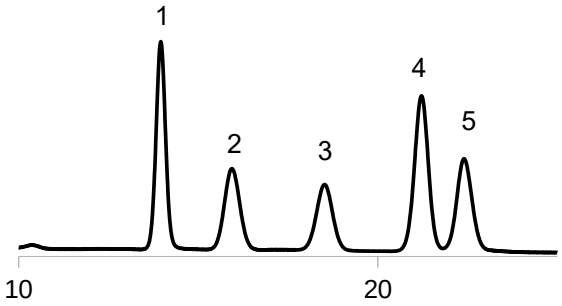


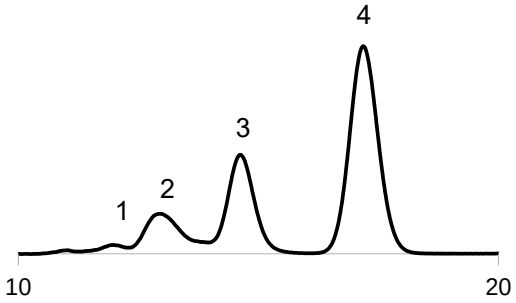
Analyte:	**Mixture of**
	1. Sucrose (Saccarose)
	2. Glucose
	3. Fructose
	4. Glycerin
	5. Mannitol
	6. Sorbitol
Column:	AppliChrom SugarSep-Ca I
Dimension:	300mm x 8mm
Mobil Phase:	H_2O
Flow:	0.5ml/min
Temperature:	80°C
Detection:	RI
Injection:	20µl sample



Analyte:	**Mixture of**
	1. Sucrose (Saccarose)
	2. Glucose
	3. Fructose
	4. Glycerin
Column:	AppliChrom SugarSep-Pb
Dimension:	300mm x 8mm
Mobil Phase:	H_2O
Flow:	0.4ml/min
Temperature:	60°C
Detection:	RI
Injection:	20µl sample



Analyte:	**Mixture of**
	1. Sucrose (Saccarose)
	2. Glucose
	3. Fructose
	4. Glycerin
	5. Ethanol
Column:	AppliChrom SugarSep-Ca
Dimension:	300mm x 8mm
Mobil Phase:	H_2O
Flow:	0.5ml/min
Temperature:	80°C
Detection:	RI
Injection:	20µl sample



Analyte:	**Honey (solvet in H_2O)**
	1. Dp 3
	2. Dp 2
	3. Glucose
	4. Fructose
Column:	AppliChrom SugarSep-Ca
Dimension:	300mm x 8mm
Mobil Phase:	H_2O
Flow:	0.5ml/min
Temperature:	80°C
Detection:	RI
Injection:	20µl sample

Sugar HPLC in water

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AppliChrom SugarSep

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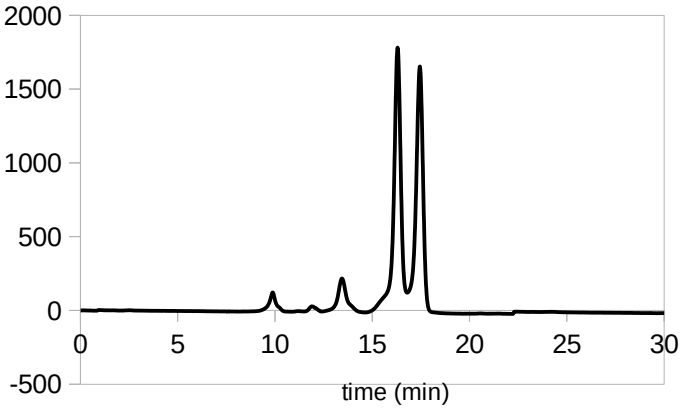
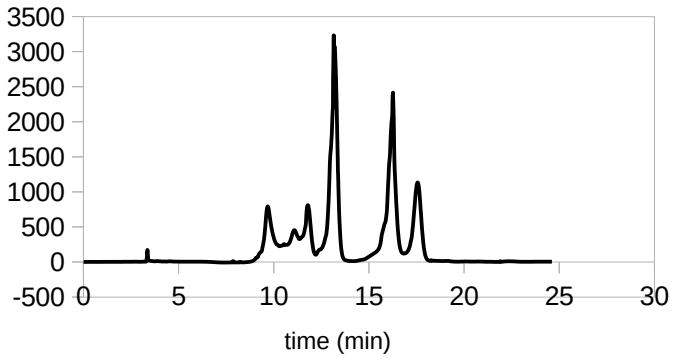


Analyte: Honey

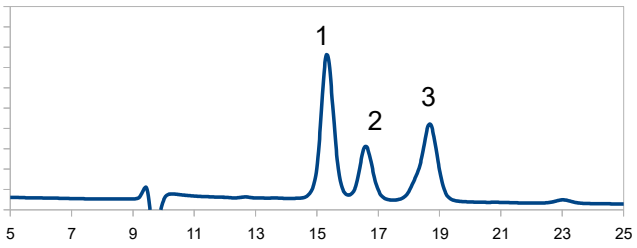
Column:	AppliChrom SugarSep-Na
Dimension:	300mm x 8mm
Mobil Phase:	H_2O
Flow:	0.5ml/min
Temperature:	80°C
Detection:	RI
Injection:	20µl sample



Analyte: Malt Beer

Column:	AppliChrom SugarSep-Na
Dimension:	300mm x 8mm
Mobil Phase:	H_2O
Flow:	0.5ml/min
Temperature:	80°C
Detection:	RI
Injection:	20µl sample

Analysis of the ripening process of redcurrants:

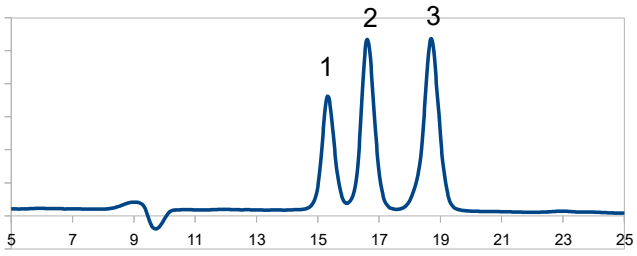


Redcurrants, unripe (green)

Column:	AppliChrom SugarSep-H I
Dimension:	300mm x 8mm
Mobil Phase:	H_2O; 0.1% H_2SO_4
Flow:	0.4ml/min
Temperature:	80°C
Detection:	RI
Injection:	20µl sample

1. Citric Acid
2. Glucose
3. Fructose

RI vs. t_r [min]



Redcurrants, ripe (red)

Column:	AppliChrom SugarSep-H I
Dimension:	300mm x 8mm
Mobil Phase:	H_2O; 0.1% H_2SO_4
Flow:	0.4ml/min
Temperature:	80°C
Detection:	RI
Injection:	20µl sample

1. Citric Acid
2. Glucose
3. Fructose

RI vs. t_r [min]

Observation:
Ripe redcurrants: Decrease in acidity, increase in sugar content.

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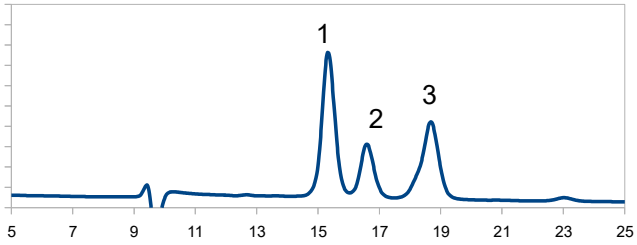
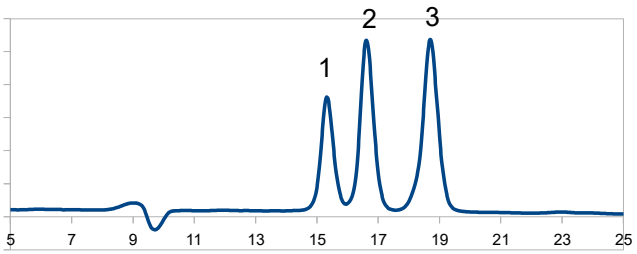
Analysis of the ripening process of red currants:



Red currant
still unripe (green)

Analyte:	**Red Currant**
Column:	AppliChrom SugarSep-H I
Dimension:	300mm x 8mm
Mobil Phase:	H_2O; 0.1% H_2SO_4
Flow:	0.4ml/min
Temperature:	80°C
Detection:	RI
Peaks:	1. Citric acid 2. Glucose 3. Fructose

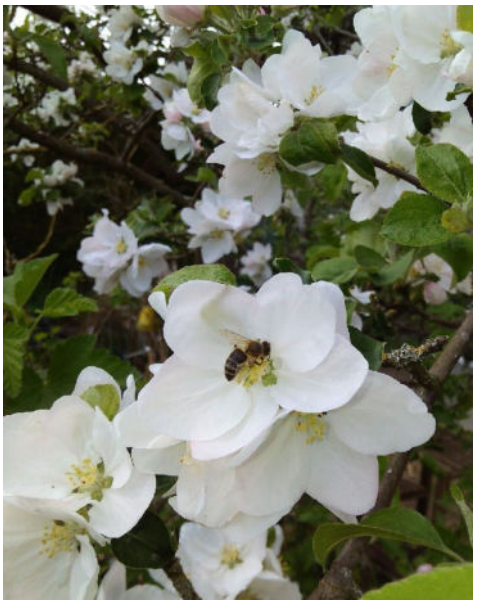


Red currant
ripe (red)

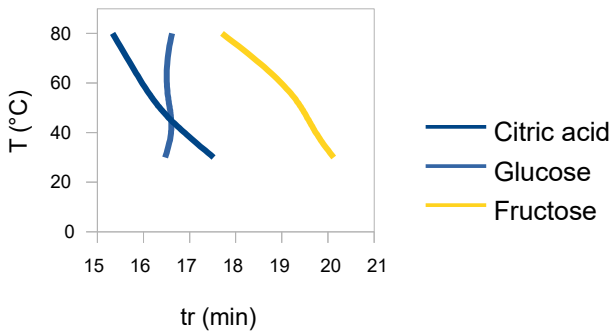
Analyte:	**Red Currant**
Column:	AppliChrom SugarSep-H I
Dimension:	300mm x 8mm
Mobil Phase:	H_2O; 0.1% H_2SO_4
Flow:	0.4ml/min
Temperature:	80°C
Detection:	RI
Peaks:	1. Citric acid 2. Glucose 3. Fructose

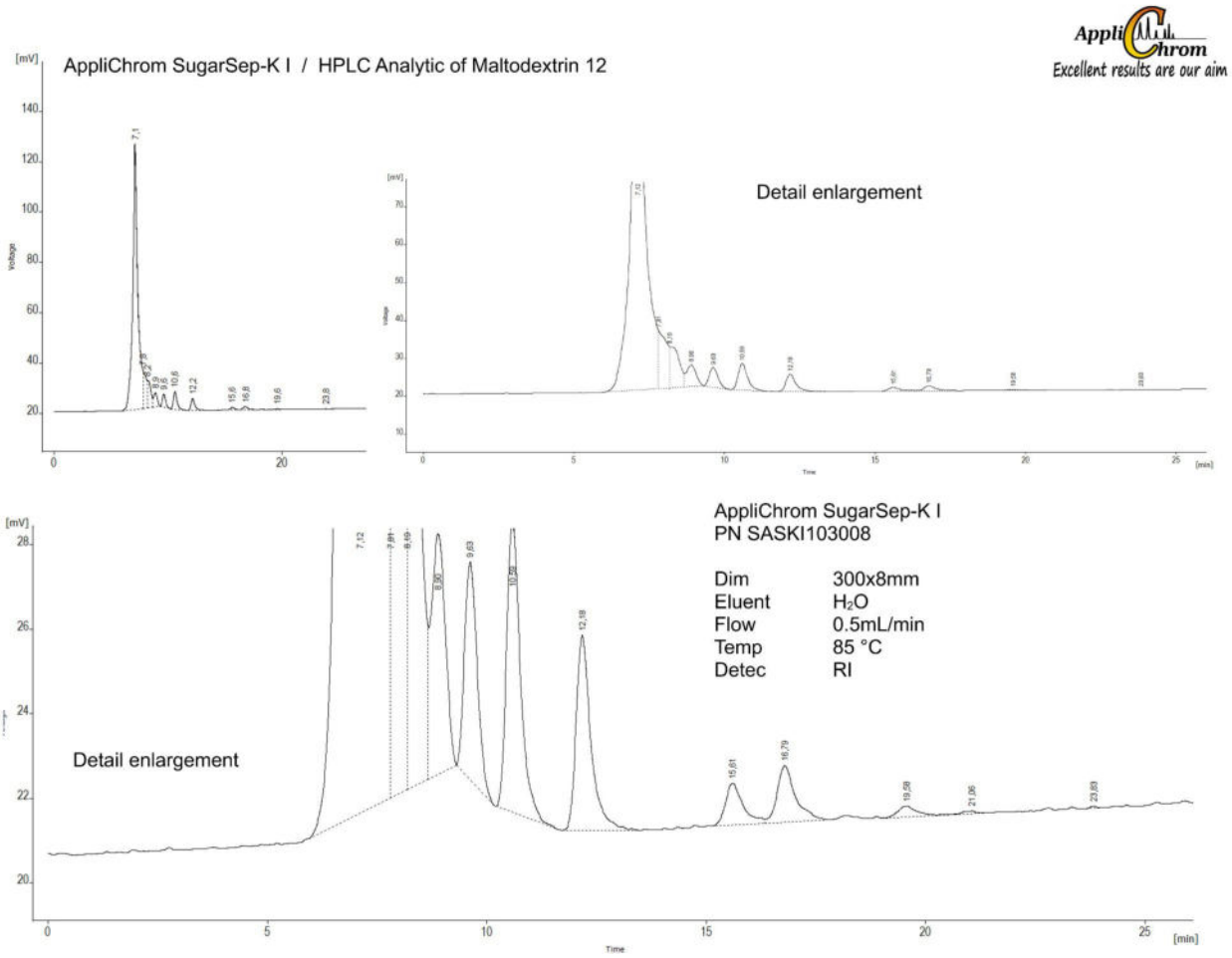
Ripe redcurrants: Decrease in acidity, increase in sugar content.

Temperature-dependent retention times



Column:	AppliChrom SugarSep-H I
Dimension:	300mm x 8mm
Mobil Phase:	H_2O; 0.1% H_2SO_4
Flow:	0.4ml/min
Temperature:	80°C
Detection:	RI
Peaks:	1. Citric acid 2. Glucose 3. Fructose





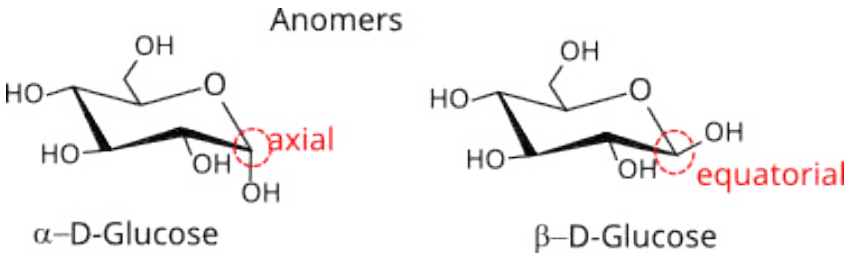
Temperature and Anomers

Anomeric refers to the configuration of a sugar molecule at its anomeric carbon atom. An anomeric carbon atom is the one that is attached to a functional group, such as a hydroxyl group (-OH). It can be present in an alpha or beta configuration.

The alpha configuration means that the hydroxy group is on the opposite side of the ring to the substituent on the anomeric carbon atom. In the beta configuration, the hydroxyl group is on the same side of the ring as the substituent on the anomeric carbon atom.

The anomeric forms of a sugar molecule can differ in their chemical and physical properties. They can have different reactivities and solubilities and can also differ in their ability to form glycosidic bonds.

In some cases, anomers can be separated using HPLC as broadened or split peaks occur under certain conditions. As this is often undesirable when separating different sugars, anomer formation can be prevented by either analysing at an elevated temperature (≥70 °C) or performing the HPLC analysis under alkaline conditions.



Anomers form, for example
arabinose
galactose
glucose
mannose
xylose

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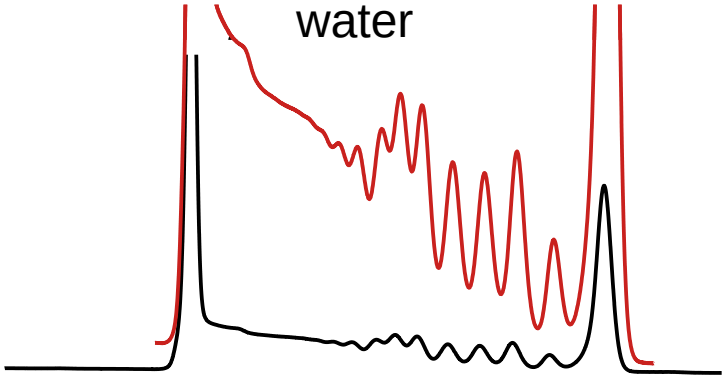
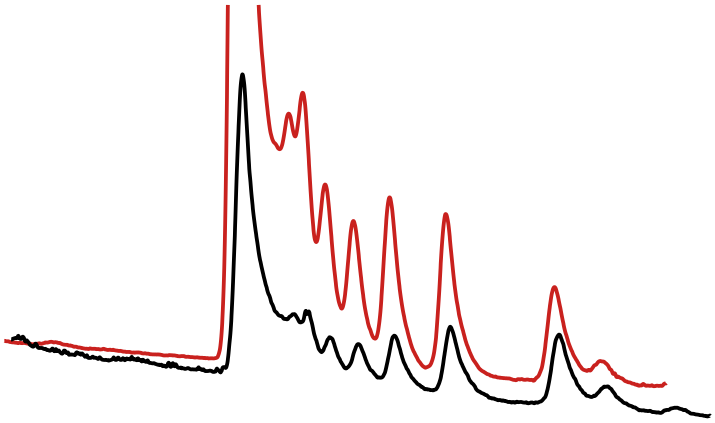
Oligosaccharide analysis in water



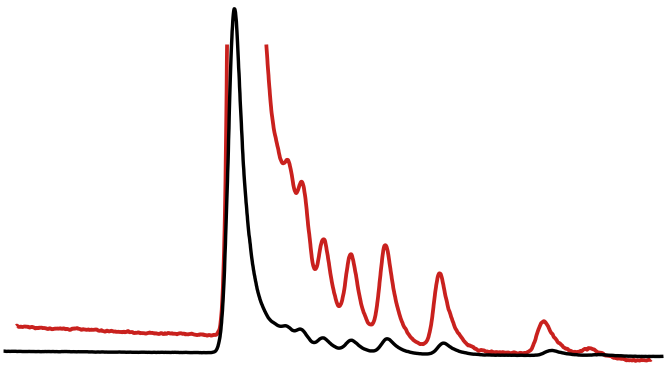
Analyte: **Maltodextrin 19**
Detailed view

Column:	AppliChrom SugarSep-Oligo-Na
Dimension:	300mm x 8mm
Mobil Phase:	H_2O
Flow:	0.25ml/min
Temperature:	70°C
Detection:	RI
Injection:	20µl sample



Analyte: **Maltodextrin 12**
Detailed view

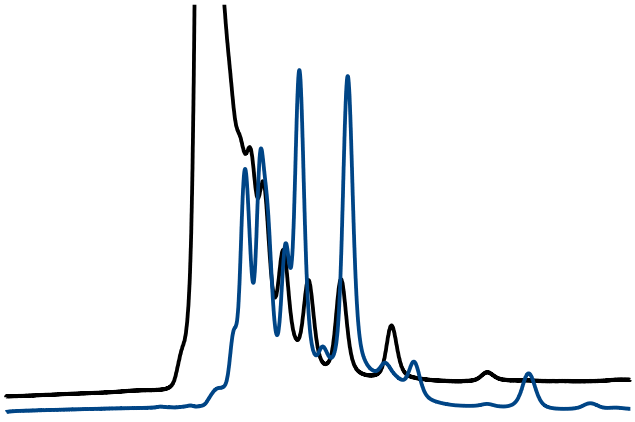
Column:	AppliChrom SugarSep-Oligo-Na
Dimension:	300mm x 8mm
Mobil Phase:	H_2O
Flow:	0.25ml/min
Temperature:	70°C
Detection:	RI
Injection:	20µl sample



Analyte: **Maltodextrin 6**

Detailed view

Column:	AppliChrom SugarSep-Oligo-Na
Dimension:	300mm x 8mm
Mobil Phase:	H_2O
Flow:	0.25ml/min
Temperature:	70°C
Detection:	RI
Injection:	20µl sample

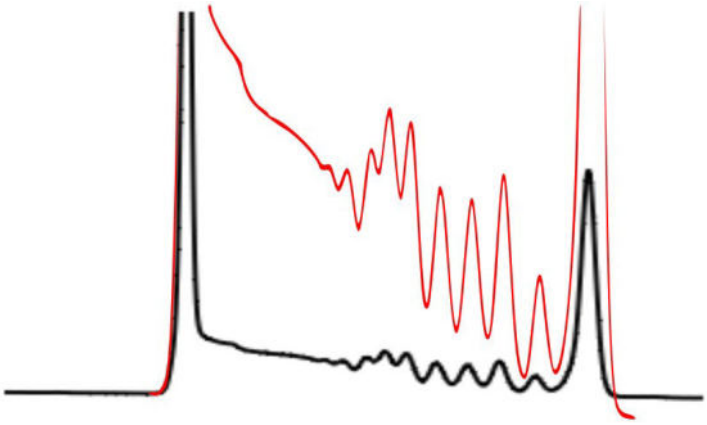


Analyte: **Maltodextrin 12 (black)**
Inulin (blue)

Column:	AppliChrom SugarSep-Oligo-Na
Dimension:	300mm x 8mm
Mobil Phase:	H_2O
Flow:	0,25ml/min
Temperature:	70°C
Detection:	RI
Injection:	20µl sample

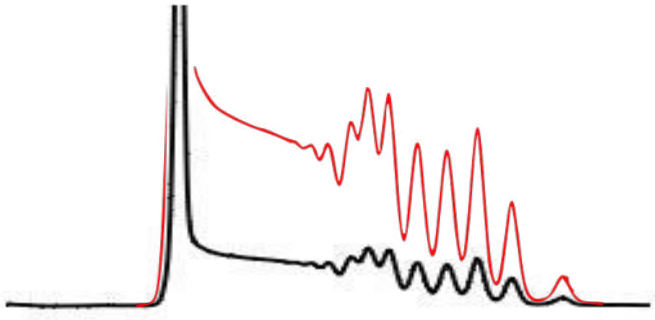
High resolutiom, easy detection with RI-Detector

Oligosaccharide analysis in



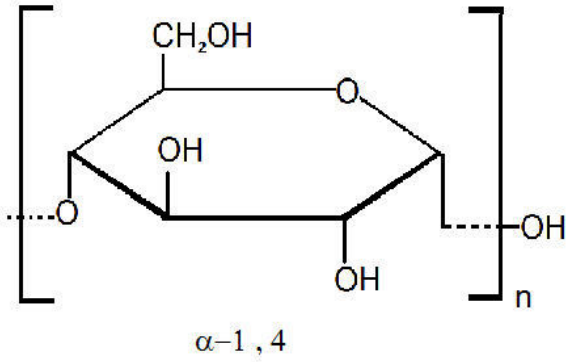
Analyte: **Maltodextrin 12 + extra Glucose**
Detailed view

Column:	AppliChrom SugarSep-Oligo-Ag
Dimension:	300mm x 8mm
Mobil Phase:	H_2O
Flow:	0.25ml/min
Temperature:	80°C
Detection:	RI
Injection:	20µl sample



Analyte: **Maltodextrin 12 without extra Glucose**
Detailed view

Column:	AppliChrom SugarSep-Oligo-Ag
Dimension:	300mm x 8mm
Mobil Phase:	H_2O
Flow:	0.25ml/min
Temperature:	80°C
Detection:	RI
Injection:	20µl sample



α–1 , 4

Maltodextrin

AppliChrom SugarSep Columns 300x8mm, Particle Size 9µm

Description	Application	Order Number
AppliChrom SugarSep-H I	organic acids. alcohols. sugar mixtures USP L17, L22	SASHI103008
AppliChrom SugarSep-H II	organic acids. alcohols. sugar mixtures USP L17, L22	SASHII103008
AppliChrom SugarSep-H III	organic acids. alcohols. sugar mixtures USP L17, L22	SASHIII103008
AppliChrom SugarSep-H IV	organic acids. alcohols. sugar mixtures USP L17, L22	SASHIV103008
AppliChrom SugarSep-H V	organic acids. alcohols. sugar mixtures USP L17, L22	SASHV103008
AppliChrom SugarSep-Ca I	General sugar analysis simple sugars. sugar alcohols USP L22, L19 specifications for separation of sorbitol and mannitol	SASCAI103008
AppliChrom SugarSep-Ca II	General sugar analysis simple sugars. sugar alcohols USP L22, L19 specifications for separation of sorbitol and mannitol	SASCAII103008
AppliChrom SugarSep-Ca III	General sugar analysis simple sugars. sugar alcohols USP L22, L19 specifications for separation of sorbitol and mannitol	SASCAIII103008
AppliChrom SugarSep-Ca IV	General sugar analysis simple sugars. sugar alcohols USP L22, L19 specifications for separation of sorbitol and mannitol	SASCAIV103008
AppliChrom SugarSep-Ca V	General sugar analysis simple sugars. sugar alcohols USP L22, L19 specifications for separation of sorbitol and mannitol	SASCAV103008
AppliChrom SugarSep-Pb IV	Monosaccaride and wood sugars, L39	SASPBIV103008
AppliChrom SugarSep-K	Saccharide, beet sugar, cane sugar, corn syrup, molasses	SASKI103008
AppliChrom SugarSep-Li	Saccharide, beet sugar, cane sugar, corn syrup, molasses	SASLII103008
AppliChrom SugarSep-Oligo-Na	Oligosaccaride, corn syrup, L58	SASOLNA103008
AppliChrom SugarSep-Oligo-Ag	Oligosaccaride, corn syrup	SASOLAg103008

AppliChrom SugarSep Pre-Columns, 30x8mm,are also available.

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AppliChrom CatPhil-P

Special GPC / SEC columns for the aqueous analysis of neutral, anionic and additionally cationic polymers with enhanced hydrophilicity

For GPC / SEC analysis of

- Polycations, polyammonium compounds
- Polyamines (chitosans), polyethylenimines,
- PEGylated polyethyleneimines
- Polysaccharides
- Polyanions (heparins, pectins, ...)

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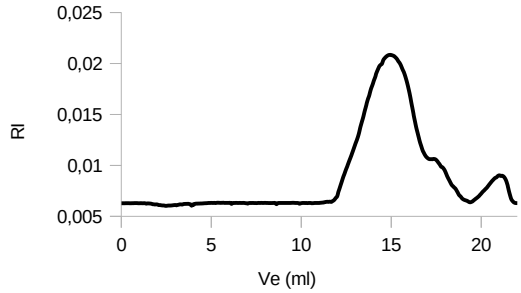
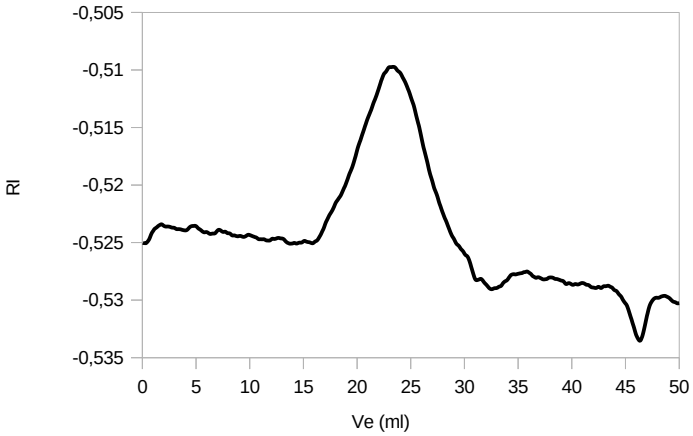


Analyte: Poly DADMAC

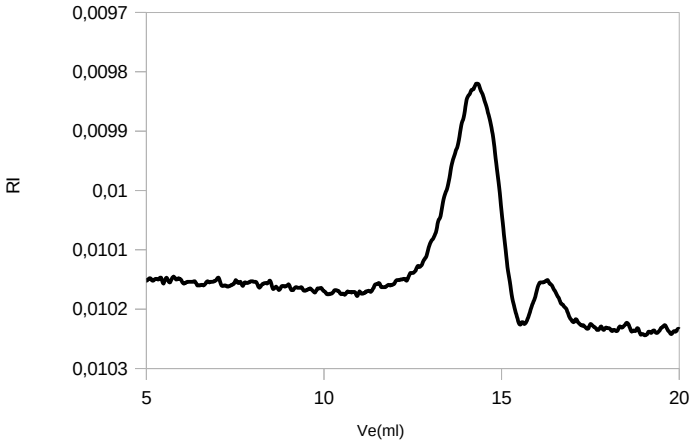
Polydiallyldimethylammonium chloride, polyquaternium-6
Mw = 100-200 000Da, CAS [26062-79-3]

Column:	AppliChrom CatPhil-P-100 AppliChrom CatPhil-P-350
Dimension:	e.a. 300mm x 8mm
Mobil Phase:	$NaNO_3$ + 0.2% formic acid in H_2O
Flow:	1.0ml/min
Temperature:	20°C
Detection:	RI
Injection:	100µl sample



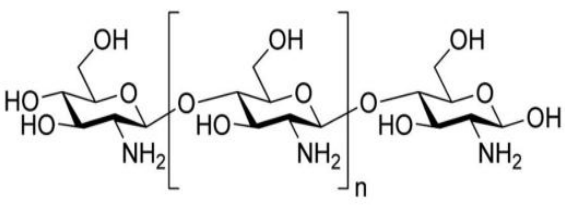
Analyte: High molecular weight chitosan, poliglusam, polyglucosamine,
CAS [9012-76-4]

Column:	AppliChrom CatPhil-P-400
Dimension:	3x 300mm x 8mm
Mobil Phase:	$NaNO_3$ + 0.2% formic acid in H_2O
Flow:	1.0ml/min
Temperature:	20°C
Detection:	RI
Injection:	100µl sample



Analyte: Chitosan sulfate

Column:	AppliChrom CatPhil-P-100 AppliChrom CatPhil-P-350
Dimension:	e.a. 300mm x 8mm
Mobil Phase:	0.05MNa_2HPO_4+ 0.1M $NaNO_3$ in H_2O
Flow:	1.0ml/min
Temperature:	20°C
Detection:	RI
Injection:	100µl sample



For aqueous polycations including

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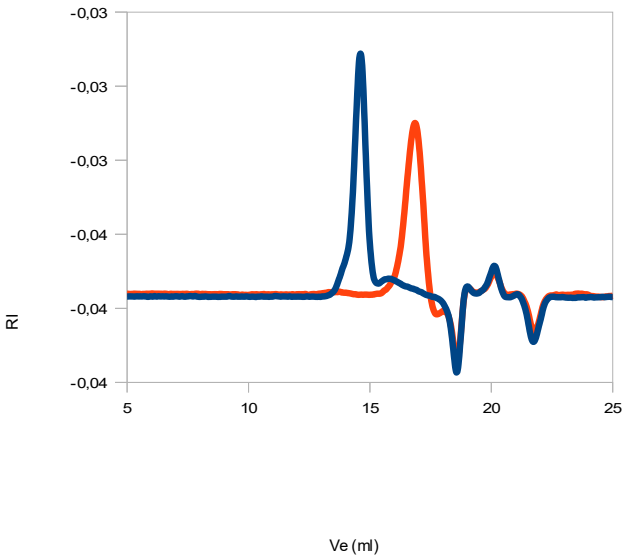


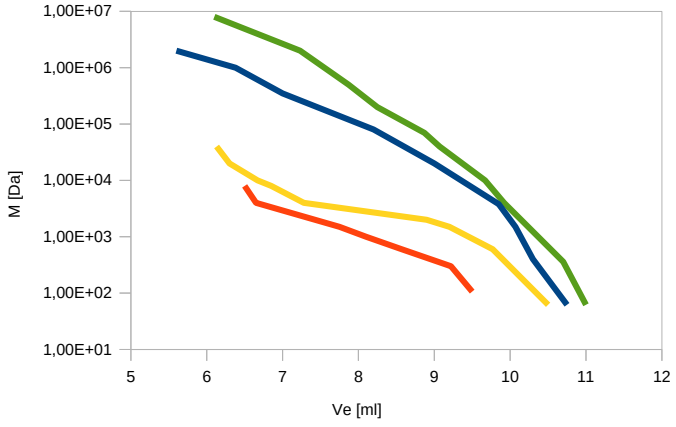
Analyte: **PEI (polyethyleneimine)**
linear, PEI 150, CAS [9002-98-6]
Mn = 4x104, Mw = 4.2x104,
Mp = 3.9x104Da;

PEI (polyethyleneimine)
linear, PEI 25, CAS [9002-98-6]
Mn = 2.1x103, Mw = 2.9x103,
Mp = 2.15x103 Da

Column: AppliChrom CatPhil-P-100
AppliChrom CatPhil-P-350

Dimension: e.a. 300mm x 8mm
Mobil Phase: 0.1M NaCl + 0.2% TFA in H_2O
Flow: 1.0ml/min
Temperature: 20°C
Detection: RI
Injection: 100µl sample

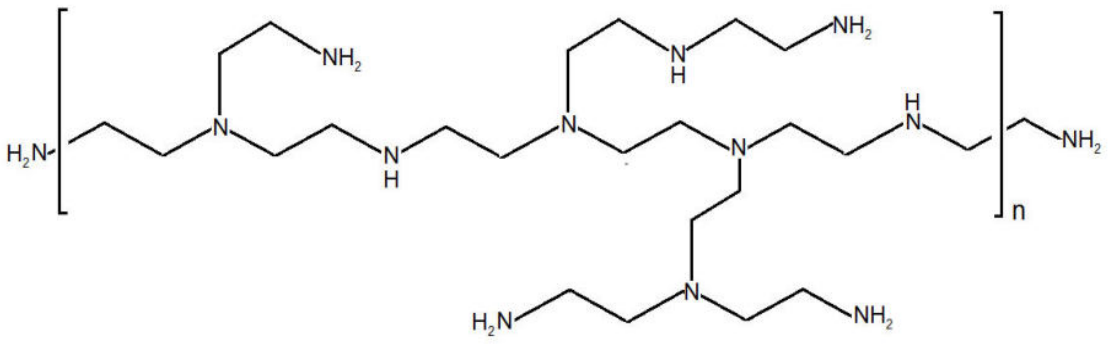
AppliChrom CatPhil-P Calibration curve Porosity P-100, P-200, P-350 and P-400, based on dextrans



Analyte: **Dextrans**

Column: AppliChrom CatPhil-P-**100**
AppliChrom CatPhil-P-**200**
AppliChrom CatPhil-P-**350**
AppliChrom CatPhil-P-**400**

Dimension: e.a. 300mm x 8mm
Mobil Phase: H_2O,
Flow: 1.0ml/min
Temperature: 20°C
Detection: RI
Injection: 100µl sample



Polyethylenimine (PEI)

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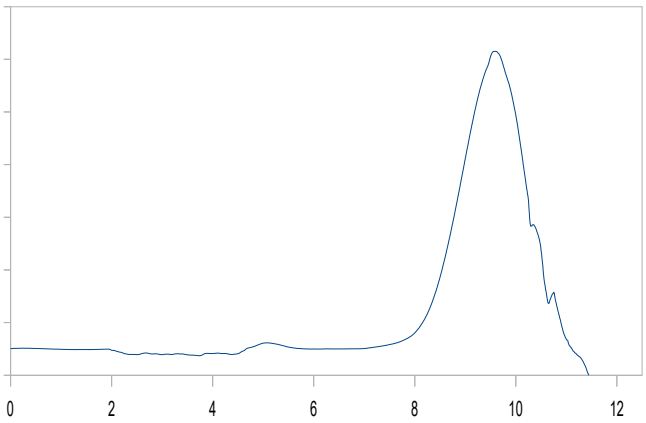
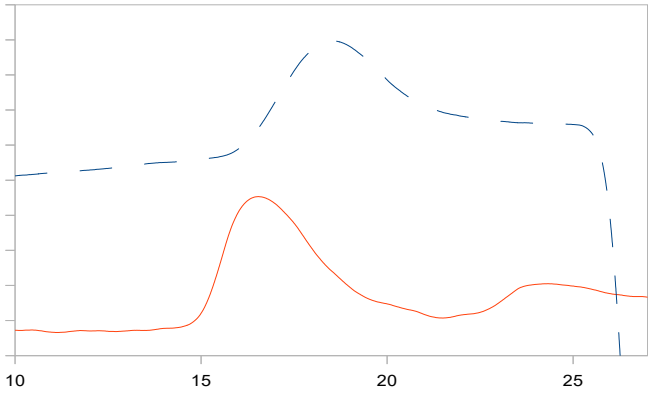


Analyte: **Poly(2-vinylpyridine)**

CAS [25014-15-7], Mw = 40 000Da

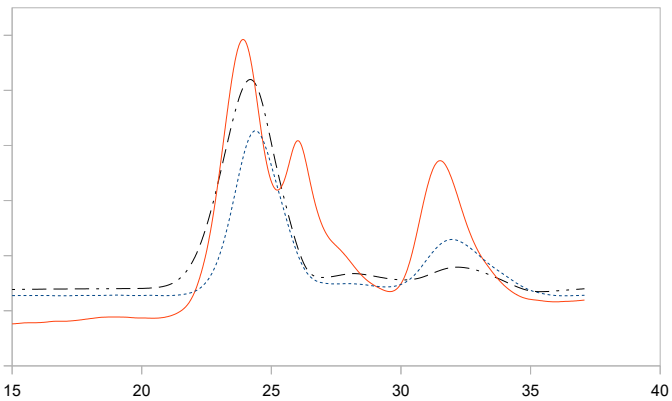
Column:	AppliChrom CatPhil-P-350-JLJ
Dimension:	300mm x 8mm
Mobil Phase:	0.1M NaCl + 0.2% TFA in H_2O,
Flow:	1.0ml/min
Temperature:	20°C
Detection:	RI
Injection:	20µl sample



Analyte: **Polyquaternium-33**

very high molecular weight, copolymer of trimethylaminoethyl acrylate salt and acrylamide, CAS [69418-26-4] (red) vs. high molecular weight polyacrylamide, CAS [9003-05-8] 15Mio Da (blue, dashed)

Column:	AppliChrom CatPhil-P-100-JLJ AppliChrom CatPhil-P-350-JLJ AppliChrom CatPhil-P-500-JLJ
Dimension:	e.a. 300mm x 8mm
Mobil Phase:	0.1M NaCl + 0.2% TFA in H_2O,
Flow:	1.0ml/min
Temperature:	40°C
Detection:	RI
Injection:	100µl sample



GPC comparison 3 samples

Analyte: **Poly DADMAC**

Polydiallyldimethylammonium chloride, polyquaternium-6

Mw = 100Da-200 000Da,
CAS [26062-79-3]

Column:	AppliChrom CatPhil-P-100-JLJ AppliChrom CatPhil-P-350-JLJ AppliChrom CatPhil-P-500-JLJ
Dimension:	e.a. 300mm x 8mm
Mobil Phase:	0.1M NaCl + 0.2% TFA in H_2O,
Flow:	1.0ml/min
Temperature:	40°C
Detection:	RI
Injection:	100µl sample

GPC/SEC of polyacrylamide, polycations, flocculants

AppliChrom CatPhil-P Columns Short Overview

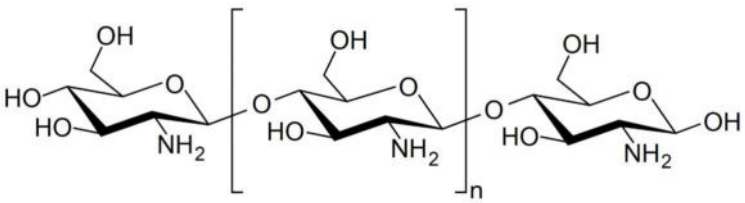
AppliChrom CatPhil-P Series

Special GPC / SEC columns for the aqueous analysis of neutral, anionic and additionally cationic polymers.
For GPC / SEC analysis of polycations, polyammonium compounds, polyamines (chitosans), polyethylenimines, PEGylated polyethyleneimines, polysaccharides, polyanions (heparins, pectins, …)

Dimensions
300 x 8mm (SACP...3008)
50 x 8mm (SACP ..508)

also available
250 x 8mm
300 x 20mm
other dimension availble on request

Type	Separation range [Da]	Max. pressure drop / column[bar]	Max. Flow [mL/min]	Particle Size [µm]	Temperature range [°C]
AppliChrom CatPhil-P-100	100 – 2.500	70	1.0	10	10 - 90
AppliChrom CatPhil-P-150	100 – 5.000	70	1.0	10	
AppliChrom CatPhil-P-200	100 – 20 000	70	1.0	10	
AppliChrom CatPhil-P-250-BPT	100 – 70.000	70	1.0	10	
AppliChrom CatPhil-P-350	2.500 – 1.000.000	60	1.0	10	pH range
AppliChrom CatPhil-P-400	10.000 – 5.000.000	30	0.7	10	2 - 11
AppliChrom CatPhil-P-450	300.000 – 10.000.000	30	0.7	10	
AppliChrom CatPhil-P-500	10.000 ~ 50.000 000	30	0.5	10	



Chitosan

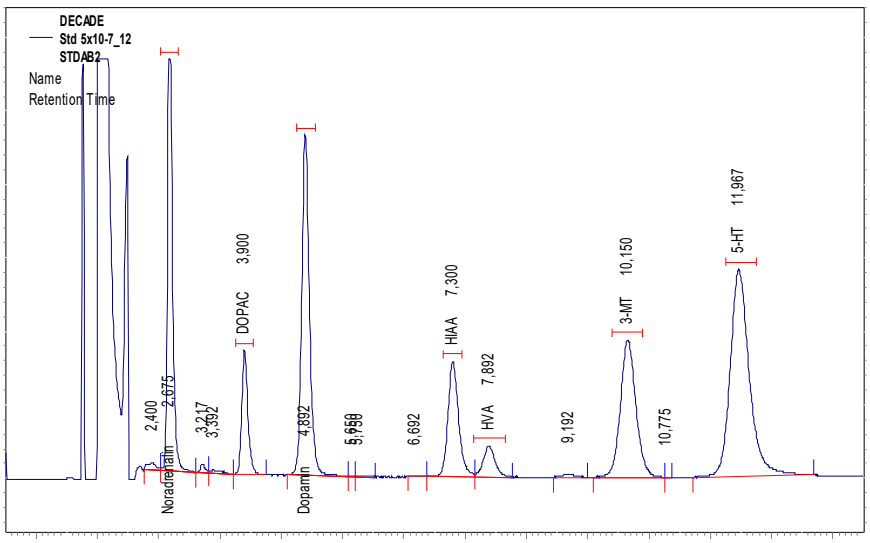
AppliChrom CatPhil-P

AppliChrom CatPhil-P Columns 300x8mm, Particle Size 5µ – 10µm – 15 µm

Description	MW Separation Range	Order Number
AppliChrom CatPhil-P-100	100Da-2 500Da	SACP1003008
AppliChrom CatPhil-P-150	100Da- 5 000Da	SACP1503008
AppliChrom CatPhil-P-200	100Da-20 000Da	SACP2003008
AppliChrom CatPhil-P-250-BPT	100Da-70 000Da	SACPB2503008
AppliChrom CatPhil-P-350	2 500Da-1 000 000Da	SACPB3503008
AppliChrom CatPhil-P-400	10 000Da-5 000 000Da	SACP4003008
AppliChrom CatPhil-P-450	300 000Da-50 000 000Da	SACP4503008
AppliChrom CatPhil-P-500	10 000Da-50 000 000Da	SACP5003008

AppliChrom CatPhil-P Guard/Pre-Columns 50x8mm

Description	MW Separation Range	Separation Range
AppliChrom CatPhil-P-100	100Da-2 500Da	SACP100508
AppliChrom CatPhil-P-150	100Da- 5 000Da	SACP150508
AppliChrom CatPhil-P-200	100Da-20 000Da	SACP200508
AppliChrom CatPhil-P-250-BPT	100Da-70 000Da	SACPB250508
AppliChrom CatPhil-P-350	2 500Da-1 000 000Da	SACPB350508
AppliChrom CatPhil-P-400	10 000Da-5 000 000Da	SACP400508
AppliChrom CatPhil-P-450	300 000Da-50 000 000Da	SACP450508
AppliChrom CatPhil-P-500	10 000Da-50 000 000Da	SACP500508



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AppliChrom HFIP-Phil-P

AppliChrom HFIP-Phil-P columns are designed for reliable performance hexafluoroisopropanol (HFIP) and related polar fluorinated solvents.
HFIP is a unique solvent that enables GPC at ambient temperature solvent-resistant polymers such as polyester, polyamides (nylon), Polyethylene terephthalate (PET) and poly(lactic-co-glycolic acid) (PLGA).

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AppliChrom HFIP-Phil-P

Special GPC / SEC columns for the GPC analysis of HFIP-soluble polymers.

For GPC / SEC analyzes from
Polyesters (polybutylene terephthalate / PBT / CAS 24968-12-5, polyethylene terephthalate /PET / CAS 25038-59-9, polylactide PLA / CAS 26100-51-6)

Polyamide 6 / PA6 / polycaprolactam / CAS 25038-54-4, polyamide 6-6 / PA6-6 / polyhexamethylene adipamide / CAS131-17-2, polyamide 6-10 / PA6-10 / poly(hexamethylene sebacamide) / PA 6-10, CAS 9011-52-3

Other (paraformaldehyde / polyoxymethylene / POM / polyacetal / CAS 30525-89-4 polyethylenimine / PEI / poly (iminoethylene / polyaziridine / CAS 9002-98-6)

Benefits AppliChrom HFIP-Phil-P GPC columns series over standard columns

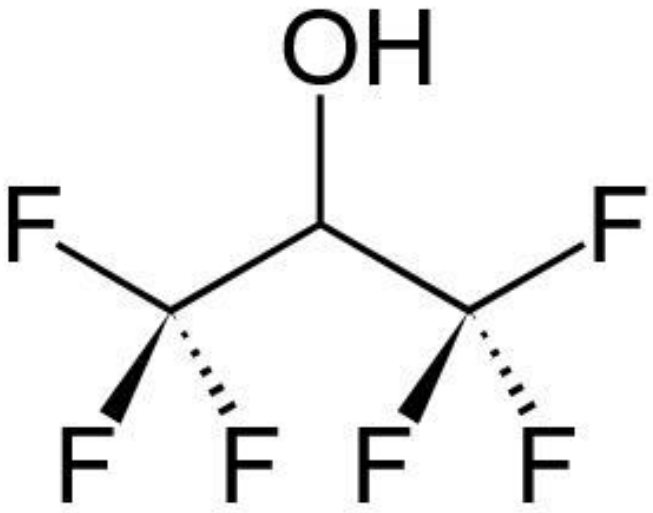
- → very large pore volume for high GPC resolution
- → high GPC resolution for oligomers / condensates of 100Da 70 000Da
- → high resolution GPC separation for the range 100Da-800 000Da
- → large areas with high linearity calibratable areas without porosity artifacts
- → low bleed
- → standard columns also used for GPC-LS and GPC viscosity

HFIP GPC / SEC calibration versus

- PMMA / polymethylmethacrylate / CAS 901-14-7

HFIP Accessories:

5mM CF_3COOK or 0.075M CF_3COONa
are added to the eluent HFIP
for the suppression of electrostatic interactions
and for artefact-free GPC.



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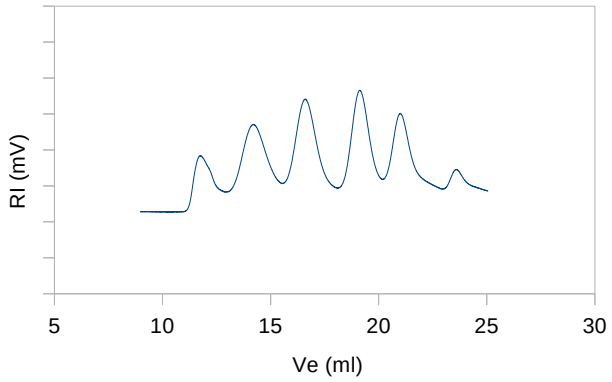
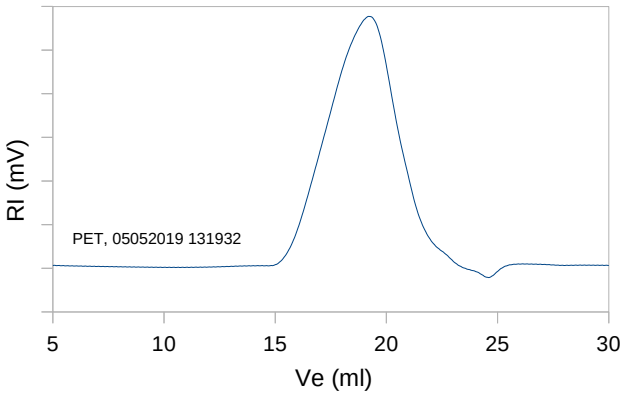


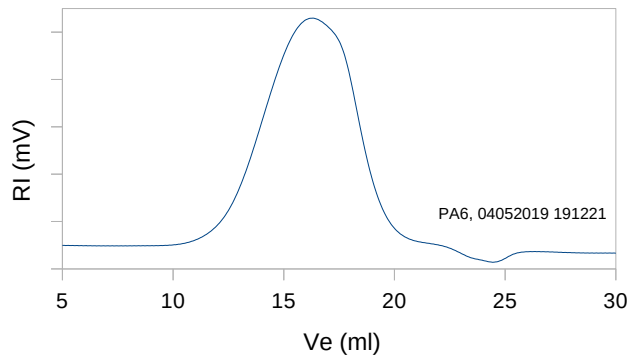
Analyte: **Polymethylmethacrylat**
(PMMA), CAS 9011-14-7, CAS131-17-2
M = 901.000, 96.760, 32.500, 3196, 540Da

Column:	AppliChrom HFIP-Phil-P-350
Dimension:	2x 300mm x 8mm
Mobil Phase:	HFIP, 5mM CF_3COONa
Flow:	0.5ml/min
Temperature:	40°C
Detection:	RI
Injection:	100µl sample



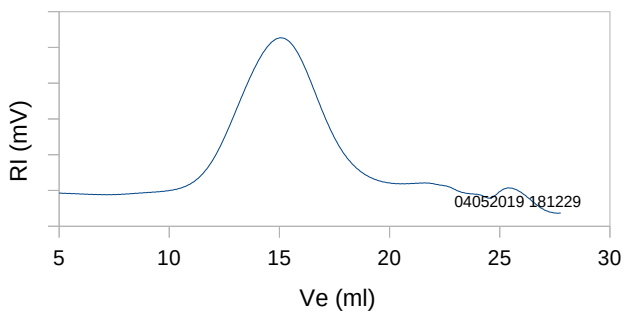
Analyte: **Polyethylenterephthalat**
(PET), CAS 25038-59-9

Column:	AppliChrom HFIP-Phil-P-350
Dimension:	2x 300mm x 8mm
Mobil Phase:	HFIP, 5mM CF_3COONa
Flow:	0.5ml/min
Temperature:	40°C
Detection:	RI
Injection:	100µl sample



Analyte: **Polyethylenterephthalat**
(PET), CAS 25038-59-9

Column:	AppliChrom HFIP-Phil-P-350
Dimension:	2x 300mm x 8mm
Mobil Phase:	HFIP, 5mM CF_3COONa
Flow:	0.5ml/min
Temperature:	40°C
Detection:	RI
Injection:	100µl sample



Analyte: **Polyamide 6,6 (PA6-6),**
CAS131-17-2

Column:	AppliChrom HFIP-Phil-P-350
Dimension:	2x 300mm x 8mm
Mobil Phase:	HFIP, 5mM CF_3COOK
Flow:	0.5ml/min
Temperature:	40°C
Detection:	RI
Injection:	100µl sample; 1g/l

Good for many HFIP soluble polymers

AppliChrom HFIP-Phil-P Columns Short Overview

AppliChrom HFIP-Phil-P Series

Special GPC / SEC columns for the GPC analysis of HFIP-soluble polymers.
For GPC / SEC analyzes from Polyesters (polybutylene terephthalate / PBT / CAS 24968-12-5, polyethylene terephthalate /PET / CAS 25038-59-9, polylactide PLA / CAS 26100-51-6), Polyamide 6 / PA6 / polycaprolactam / CAS 25038-54-4, polyamide 6-6 / PA6-6 / polyhexamethylene adipamide / CAS131-17-2, polyamide 6-10 / PA6-10 / poly(hexamethylene sebacamide) / PA 6-10, CAS 9011-52-3
Other (paraformaldehyde / polyoxymethylene / POM / polyacetal / CAS 30525-89-4 polyethylenimine / PEI / poly (iminoethylene / polyaziridine / CAS 9002-98-6)

Dimensions
300 x 8mm (SAHFIP..3008)
50 x 8mm (SAHFIP ..508)

also available
250 x 8mm
300 x 20mm
other dimension availble on request

Type	Separation range [Da]	Max. pressure drop / column [bar]	Max. Flow* [mL/min]	Particle Size [µm]	Temperature [°C]
AppliChrom HFIP-Phil-P-100	100 – 2.500	70	0.5 (at 40°C)	7	35 - 50
AppliChrom HFIP-Phil-P-350	– 1.000.000	60	0.5 (at 40°C)	7	pH range
AppliChrom HFIP-Phil-P-Multipore	100 – 1.000.000	60	0.5 (at 40°C)	7	-

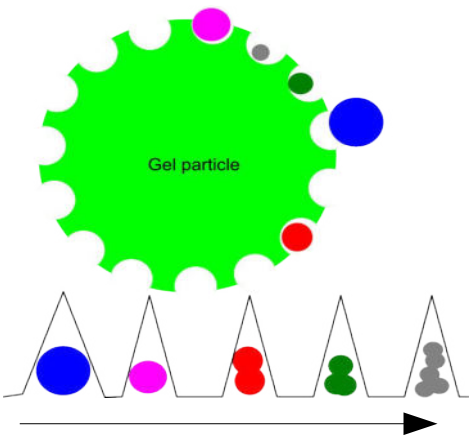
AppliChrom HFIP-Phil-P

AppliChrom HFIP-Phil-P Columns 300x8mm, Particle Size 10µm

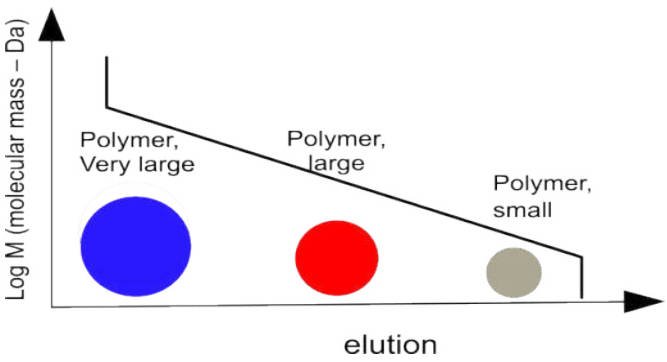
Description	MW Separation Range	Order Number
AppliChrom HFIP-Phil-P-100	100Da-2 500Da	SAHFIP1003008
AppliChrom HFIP-Phil-P-350	100Da- 5 000Da	SAHFIP3503008
AppliChrom HFIP-Phil-P-500	100Da-20 000Da	SAHFIP5003008

Principle of GPC/SEC

In detail:
Small polymers intrude to nearly all pores
Medium sized polymers intrude only to some pores
Very large polymers are totally excluded from the pores
=> separation of polymers according to molecular size



Small molecules: high retention
Large molecules: low retention



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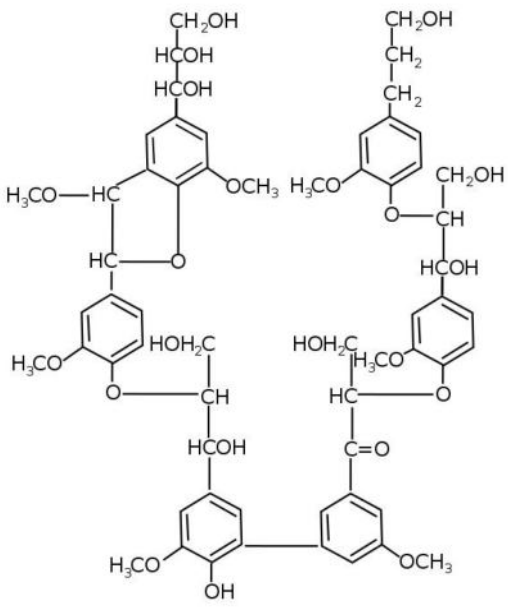
Excellent results are our aim

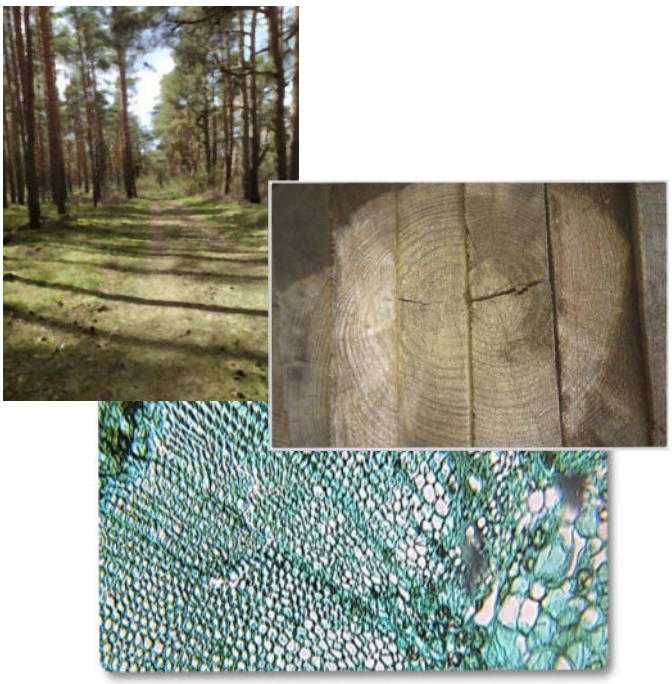
AppliChrom Aceton-Aq-Phil-P

AppliChrom Aceton-AQ-Phil-P GPC-columns for GPC analysis of organic molecules using (80%aceton, 20%water)*.
Organosolv Lignin GPC analysis are now very easy and reliable to perform (Patent pending).

- optimized for GPC analysis of organosolv lignins
- easy and reliable to handle in aceton/water/traces formic acid // 80/20/1 // v/v/v
- compatible with evaporative detection (ELSD, MS)*
- preparative GPC fractionation of organosolv lignin without salt possible
- recycling GPC respective peak recycling GPC with enormous separation efficiency possible for isolation of individual organosolv lignin substances in semipreparative scale
- molecular weight calibration vs. PEO/PEG
- spherical high porous polymeric GPC-media with no silanol activity for pure GPC
- large molecular weight range: 100 – 1 000 000Da
- high pressure stability of 100bar
- high peak and separation capacity
- AppliChrom GPC columns – innovations and quality Made in Germany.

*) ask your ELSD respective your MS-detector supplyer for compatibility or your individual detector resistance versus aceton!





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AppliChrom Aceton-Aq-Phil-P

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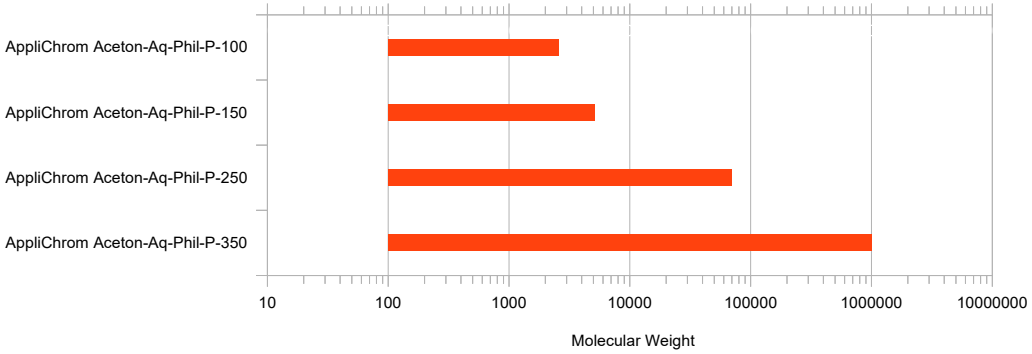
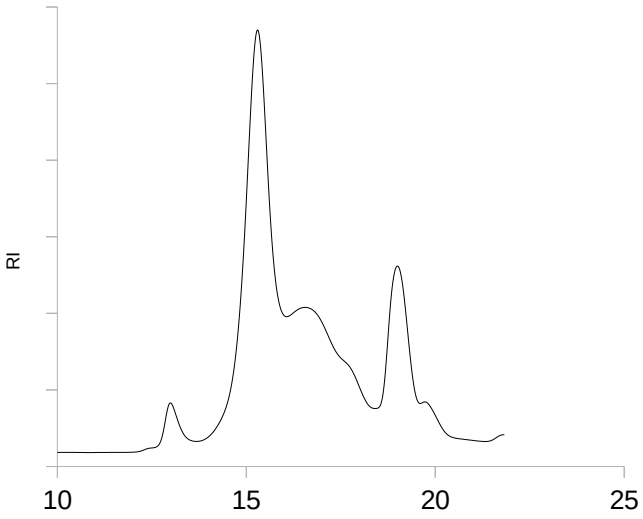
AppliChrom Aceton-AQ-Phil GPC Series:

molecular weight range and optimum range of molecular weights



AppliChrom Aceton-Aq-Phil-P-	Separation range (Da)	Optimum resolution range (Da)
100	100 - 2 500	100 – 1500
150	100 - 5 000	100 - 3000
250	100 - 70 000	100 - 10 000
350	100 -1 000 000	1 000 - 800 000

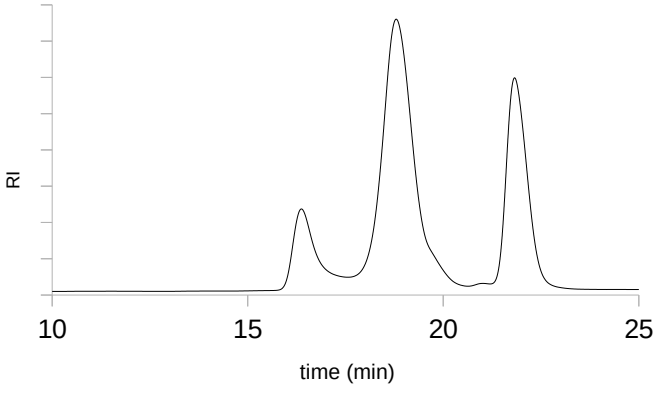


Analyte: **Organosolv Lignin GPC**

(range: 100Da-1 500 000Da)

Column: 2x AppliChrom Aceton-AQ-Phil-P-250

Dimension: ea. 300mm x 8mm
Mobil Phase: acetone/H_2O/formic acid 80/20/1 v/v/v
Flow: 1.0ml/min
Temperature: 25°C
Detection: RI



Analyte: **PEO/PEG GPC**

(8 000Da, 1 000Da, 106Da)

Column: 2x AppliChrom Aceton-AQ-Phil-P-250

Dimension: ea. 300mm x 8mm
Mobil Phase: acetone/H2O 80/20 v/v
Flow: 1.0ml/min
Temperature: 25°C
Detection: RI

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AppliChrom Aceton-Aq-Phil-P

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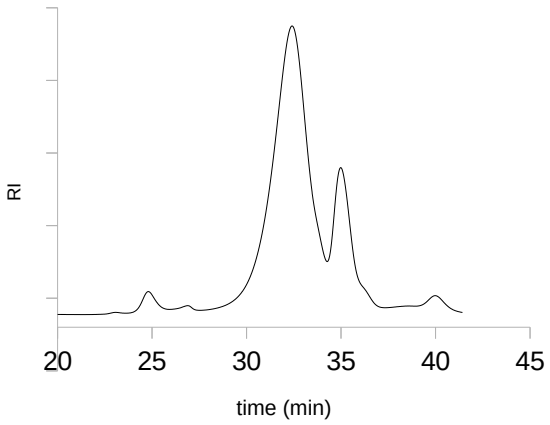

Analyte:	**Organosolv Lignin GPC**
Column:	3x AppliChrom Aceton-AQ-Phil-P-350
Dimension:	ea. 300mm x 8mm
Mobil Phase:	acetone/H2O/formic acid 80/20 /1 v/v/v
Flow:	1.0ml/min
Temperature:	25°C
Detection:	RI

AppliChrom Aceton-AQ-Phil-P Columns Short Overview

AppliChrom Aceton-Aq-Phil-P Series

AppliChrom Aceton-AQ-Phil-P GPC-columns for GPC analysis of organic molecules using (80%aceton, 20%water)*.
Organosolv Lignin GPC analysis are now very easy and reliable to perform.O
Optimized for GPC analysis of organosolv lignins. Easy and reliable to handle in aceton/water/traces formic acid // 80/20/1 // v/v/v . Compatible with evaporative detection (ELSD, MS). Preparative GPC fractionation of organosolv lignin without salt possible

- recycling GPC respective peak recycling GPC with enormous separation efficiency possible for isolation of individual organosolv lignin substances in semipreparative scale
- molecular weight calibration vs. PEO/PEG
- spherical high porous polymeric GPC-media with no silanol activity for pure GPC
- large molecular weight range: 100 – 1 000 000Da
- high pressure stability of 100bar
- high peak and separation capacity

Dimensions
300 x 8mm (SAAPP..3008)
50 x 8mm (SAAPP ..508)

also available
250 x 8mm
300 x 20mm
other dimension availble on request

Type	Separation range [Da]	Max. pressure drop / column [bar]	Max. Flow [mL/min]	Particle Size [µm]	Temperature range [°C]
AppliChrom Aceton-Aq-Phil-P-100	100 – 2.500	70	1.0	10	40 -50
AppliChrom Aceton-Aq-Phil-P-150	100 – 5.000	70	1.0	10	pH range
AppliChrom Aceton-Aq-Phil-P-250	100 – 70.000	70	1.0	10	-
AppliChrom Aceton-Aq-Phil-P-350	100 – 1.000.000	60	1.0	10	

AppliChrom Aceton-Aq-Phil-P

AppliChrom Aceton-Aq-Phil-P Columns 300x8mm, Particle Size 10µm

Description	MW Separation Range	Order Number
AppliChrom Aceton-Aq-Phil-P-100	100 - 2 500Da	SAAPP1003008
AppliChrom Aceton-Aq-Phil-P-150	100 - 5 000Da	SAAPP1503008
AppliChrom Aceton-Aq-Phil-P-250	100 - 70 000Da	SAAPP2503008
AppliChrom Aceton-Aq-Phil-P-350	100 -1 000 000Da	SAAPP3503008

AppliChromAceton-Aq-Phil-P Guard/Pre-Columns 50x8mm

Description	MW Separation Range	Order Number
AppliChrom Aceton-Aq-Phil-P-100	100 - 2 500Da	SAAPP100508
AppliChrom Aceton-Aq-Phil-P-150	100 - 5 000Da	SAAPP150508
AppliChrom Aceton-Aq-Phil-P-250	100 - 70 000Da	SAAPP250508
AppliChrom Aceton-Aq-Phil-P-350	100 -1 000 000Da	SAAPP350508

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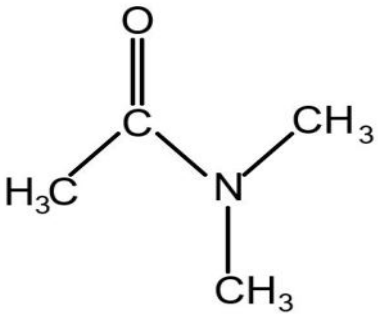
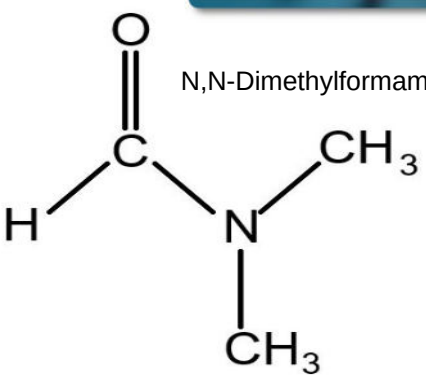
AppliChrom DMAC-Phil-P

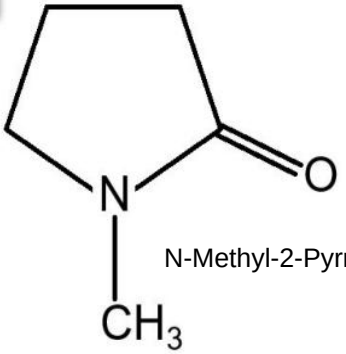
AppliChrom DMAC GPC/SEC columns are specifically designed for the analysis of polymers and other macromolecular compounds in DMAC, DMF or NMP.
These columns offer outstanding performance and reliability in gel permeation chromatography (GPC) and size exclusion chromatography (SEC).
Thanks to their unique material composition, AppliChrom DMAC-Phil-P columns enable precise separation of solvent-resistant polymers, including polyethylene, polypropylene and other engineering plastics. They are ideal for applications where high resolution and reproducibility are required.
The DMAC-Phil-P GPC/SEC columns are characterized by their high chemical stability and temperature resistance, making them an excellent choice for demanding analytical procedures. They offer a wide range of pore sizes to ensure optimal separation for different molecular weights.

N,N-Dimethylacetamid (DMAC)



N,N-Dimethylformamid (DMF)





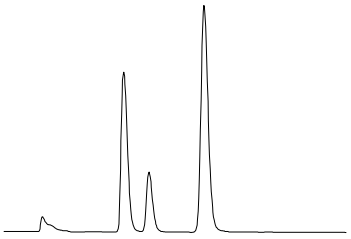
N-Methyl-2-Pyrrolidon (NMP)

AppliChrom DMAc-Phil-P

AppliChrom GPC columns for GPC analyzes organic (DMAc, DMF and NMP)

Spherical porous polymeric GPC chromatography phases

- → wide range of pore and particle sizes
- → optimal for 0.5ml / min flow rate with 8mm ID columns (40-50°C)
- → Pressure stability 50-150bar, depending on the porosity
- → high resolution due to high pore volume
- → long service life
- → high reproducibility
- → high purity of the GPC column for good interaction-free GPC
- → Please avoid: drying out
- → Molar mass range: 100Da-1 000 000Da
- → Examples: PMMA, PAN, cellulose, DMF and DMAc soluble polymers

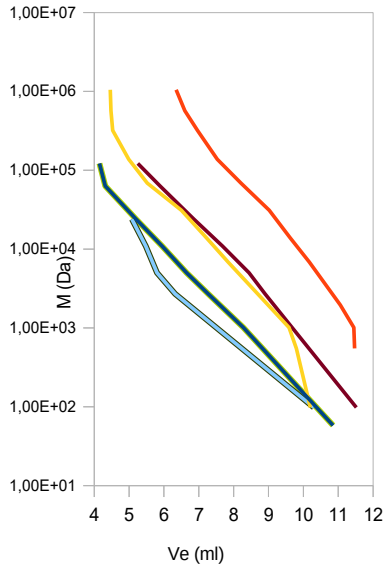


AppliChrom DMAc-Phil-P molar mass range:

P-100	100 -2 500Da
P150	100 – 5 000
P-200	100 - 20 000Da
P-250	100 -70 000Da
P-300	1 000 - 300 000Da
P-350	1 000 - 1 000 000Da
P-400	10 000 - 5 000 000Da
P-450	100 000 - >10 000 000Da
10E5-BPT	100 – 1 000 000Da

To cover a very wide range of molecular sizes, GPC columns of appropriate porosity can be combined.

GPC Calibration Curves AppliChrom DMAc-Phil



Analyte:	**PMMA Standards**
Column:	AppliChrom DMAcPhil-P-100 AppliChrom DMAcPhil-P-200 AppliChrom DMAcPhil-P-250 AppliChrom DMAcPhil-P-300 AppliChrom DMAcPhil-P-350
Dimension:	e.a. 300mm x 8mm
Mobil Phase:	H_2O
Flow:	0.5ml/min
Temperature:	45°C
Detection:	RI
Injection:	20µl sample

Long linear calbration range

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AppliChrom DMAc-Phil-P Columns Short Overview

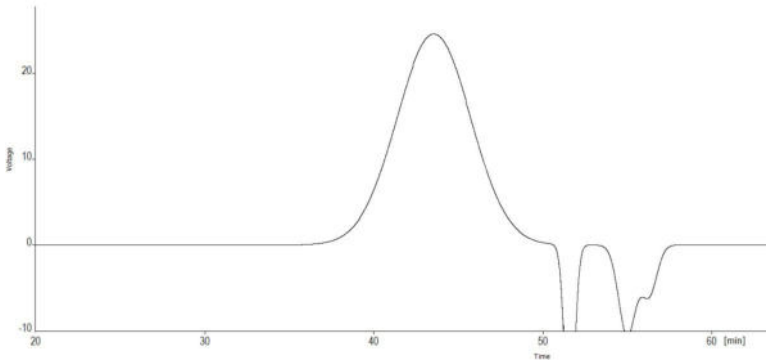
AppliChrom DMAc-Phil-P Series

AppliChrom GPC columns for GPC analyzes organic (DMAc, DMF and NMP)
Spherical porous polymeric GPC chromatography phases
→ wide range of pore and particle sizes
→ optimal for 0.5ml / min flow rate with 8mm ID columns (40-50°C)
→ Pressure stability 50-150bar, depending on the porosity
→ high resolution due to high pore volume
→ long service life
→ high reproducibility
→ high purity of the GPC column for good interaction-free GPC
→ Please avoid: drying out
→ Molar mass range: 100-1,000,000Da
→ Examples: PMMA, PAN, cellulose, DMF and DMAc soluble polymers
AppliChrom

Dimensions
300 x 8mm (SADCP...3008)
50 x 8mm (VADCP...508)

also available
250 x 8mm
300 x 20mm
other dimension availble on request

Type	Separation range [Da]	Max. pressure drop / column [bar]	Max. Flow* [mL/min]	Particle Size [µm]	Temperature range [°C]
AppliChrom DMAC-PHIL-P-100	100 – 2.500	70	0.7	10	20 - 50
AppliChrom DMAC-PHIL-P-150	100 – 5.000	70	0.7	10	pH range
AppliChrom DMAC-PHIL-P-200	100 – 20.000	70	0.7	10	-
AppliChrom DMAC-PHIL-P-250	100 – 70.000	70	0.7	10	
AppliChrom DMAC-PHIL-P-300	1.000 – 300.000	60	0.7	10	
AppliChrom DMAC-PHIL-P-350	1.000 – 1.000.000	60	0.7	10	
AppliChrom DMAC-PHIL-P-400	10.000 – 5.000.000	30	0.4	10	
AppliChrom DMAC-PHIL-P-450	100.000 - > 10.000 000	30	0.4	10	
AppliChrom DMSO-PHIL-P-10E5-BPT	100 – 1.000.000	60	0.7	10	



Analyte: **Polyvinyl pyrrolidone**

Column: 2x AppliChrom DMAc-Phil-P-350

Dimension: ea. 300mm x 8mm
Mobil Phase: DMF, 5g/L LiBr
Flow: 0.5ml/min
Temperature: 60°C
Detection: RI

AppliChrom DMAc-Phil-P

AppliChrom DMAc-Phil-P Columns 300x8mm, Particle Size 5µ – 10µm – 15 µm

Description	MW Separation Range	Order Number
AppliChrom DMAC-Phil-P-100	100 -2 500Da	SADCP1003008
AppliChrom DMAC-Phil-P-150	100 - 5 000Da	SADCP1503008
AppliChrom DMAC-Phil-P-200	100 -20 000Da	SADCP2003008
AppliChrom DMAC-Phil-P-250	100 -70 000Da	SADCP2503008
AppliChrom DMAC-Phil-P-300	1 000 - 300 000Da	SADCPB3003008
AppliChrom DMAC-Phil-P-350	1 000 - 100 000Da	SADCP3503008
AppliChrom DMAC-Phil-P-400	10 000 - 5 000 000Da	SACDP4003008
AppliChrom DMAC-Phil-P-450	100 000 - >10 000 000Da	SACP4503008
AppliChrom DMAC-Phil-P-10E5-BPT	100 – 1 000 000Da	SADCPBE5X3008

AppliChrom DMAc-Phil-P Guard/Pre-Columns 50x8mm

Description	MW Separation Range	Separation Range
AppliChrom DMAC-Phil-P-100	100 -2 500Da	VADCP100508
AppliChrom DMAC-Phil-P-150	100 - 5 000Da	VADCP150508
AppliChrom DMAC-Phil-P-200	100 -20 000Da	VADCP200508
AppliChrom DMAC-Phil-P-250	100 -70 000Da	VADCP250508
AppliChrom DMAC-Phil-P-300	1 000 - 300 000Da	VADCPB300508
AppliChrom DMAC-Phil-P-350	1 000 - 100 000Da	VADCP350508
AppliChrom DMAC-Phil-P-400	10 000 - 5 000 000Da	VACDP400508
AppliChrom DMAC-Phil-P-450	100 000 - >10 000 000Da	VACP450508
AppliChrom DMAC-Phil-P-10E5-BPT	100 – 1 000 000Da	VADCPBE5X508

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AppliChrom Peak-Recycling-GPC

Peak Recycling GPC is an innovative method for the efficient separation and recycling of polymer samples. This technique makes it possible to identify the peaks in chromatographic analyzes and to specifically recycle them, allowing valuable materials to be recovered.

By using AppliChrom Peak-Recycling GPC columns, companies can not only reduce their material costs, but also improve their environmental footprint by reducing waste and conserving resources. This method is particularly advantageous in the plastics industry, where the recycling of polymers plays a central role.

With the AppliChrom Peak-Recycling GPC columns, you benefit from a sustainable solution that offers both economic and ecological advantages.

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AppliChrom Peak-Recycling-GPC

Excellent results are our aim

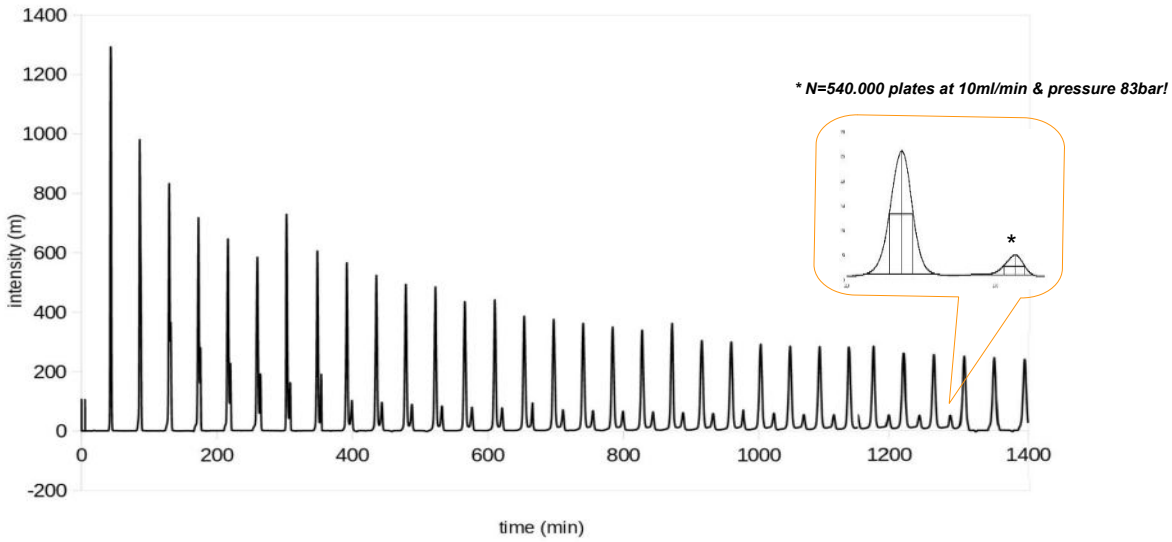
- Up to 540 000 plates/separation in liquid chromatography for highest level purity products.

- Semipreparative and preparative scale

- Low solvent consumption and savings in workforce time

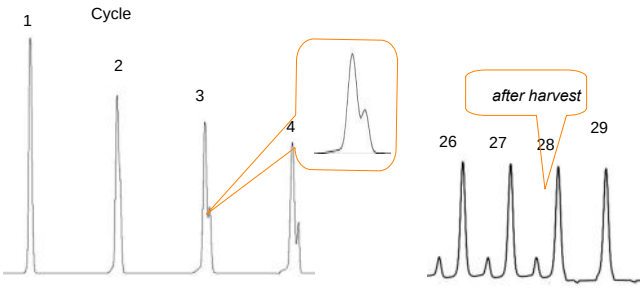
- Easy and efficient to handle including service hotline and suited Peak-Recycling-GPC system

- Large range of solvent polarity



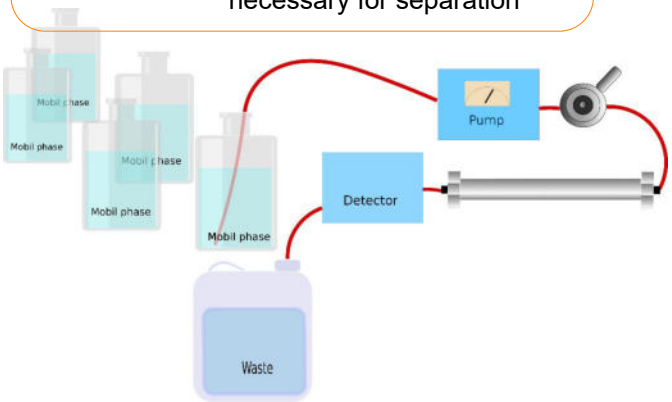
AppliChrom
Peak-Recycling-GPC Series

-efficiency
- effectiveness
- maximum purity
- time savings
- low solvent consumption



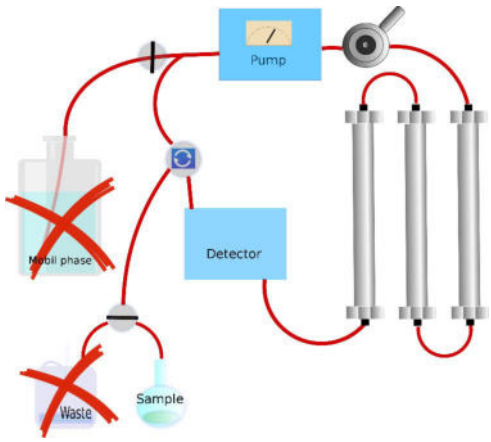
Classical manual reinjected semiprep GPC

Colum lenght:	1x 600mm x 20mm
Separation:	~ 30 000plates / separation
Mobile phase:	1 310min x 10ml/min => 13 100ml = 13.1l necessary for separation



AppliChrom Peak-Recycling-GPC

Colum lenght:	3x 600mm x 20mm
Separation:	~ 540 000plates / separation
Mobile phase:	approx 50min x 10ml = approx 500ml necessary for separation



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AppliChrom Peak-Recycling-GPC

Excellent results are our aim

AppliChrom-Columns are easy to handle
You connect the columns with the suited Peak-Recycling-GPC system and laboratory operator let system work until needed purification result is monitored to be sufficient. In case of questions Applichrom customers are assisted by the AppliChrom team members with more than 20 years hands on experience in liquid chromatography and GPC techniques (ask info@applichrom.de for assistance).

Solvent polarity

Polar — **Non-polar**

DMF/DMAc/NMP > 90/10 $CHCl_3$/MeOH > THF > Acetic acid ethylester > $CHCl_3$ > CH_2Cl_2 > Toluene*)

*) In case of using polar and viscous DMF/NMP/DMAc – reduction of flowrate, heating of column and in many cases some salt in solvent is necessary got get separation. Please ask for columns prepacked with final solvent that should be used.

Solvent polarity:

A big variation of solvent polarities can be used for AppliChrom Peak-Recycling-GPC columns (polystyrene based series)

Column Dimension here: 600mm x 20mm and 50mm x 20mm

Product	Exclusion Limit	Preparative Column performance*)			Precolumns*)
AppliChrom Peak-Recycling-GPC Column	[Da]	20mm ID x	32mm ID x	40mm ID x	For 20, 32 and 40mm ID columns: 50mm x 20mm
35A	2 500	> 42 000	> 42 000	> 42 000	> 35 000
100A	5 000	> 42 000	> 42 000	> 42 000	> 35 000
500A	20 000	> 42 000	> 42 000	> 42 000	> 35 000
1 000A	70 000	> 42 000	> 42 000	> 42 000	> 35 000

*) Guaranteed performance in plates/meter, typical performance > 50 000/m. In recycling. More than 1 000 000 plates /separation possible!

Column ID	Regular Flow rate [ml/min] *)	Max. Flow rate [ml/min] *)
20mm	10	15
32mm	20	30
40mm	30-40	40

*) In case of using polar and viscous solvents like DMF/NMP/DMAc – reduction of flowrate, heating of column and in many cases some salt in solvent is necessary for a good separation. Please ask for columns prepacked with final solvent that should be used.

AppliChrom Peak-Recycling-GPC Columns

Catalog #	Description	Dimension	
CRC3560020 PCRC355020	Column AppliChrom Peak-Recycling-GPC, 35A Precolumn AppliChrom Peak-Recycling-GPC, 35A	600mmx20mm 50mm x 20mm	Other dimensions available.
CRC10060020 PCRC1005020	Column AppliChrom Peak-Recycling-GPC, 100A Precolumn AppliChrom Peak-Recycling-GPC, 100A	600mmx20mm 50mm x 20mm	Other dimensions available.
CRC50060020 PCRC5005020	Column AppliChrom Peak-Recycling-GPC, 500A Precolumn AppliChrom Peak-Recycling-GPC, 500A	600mmx20mm 50mm x 20mm	Other dimensions available.
CRC100060020 PCRC10005020	Column AppliChrom Peak-Recycling-GPC, 35A Precolumn AppliChrom Peak-Recycling-GPC, 35A	600mmx20mm 50mm x 20mm	Other dimensions available.

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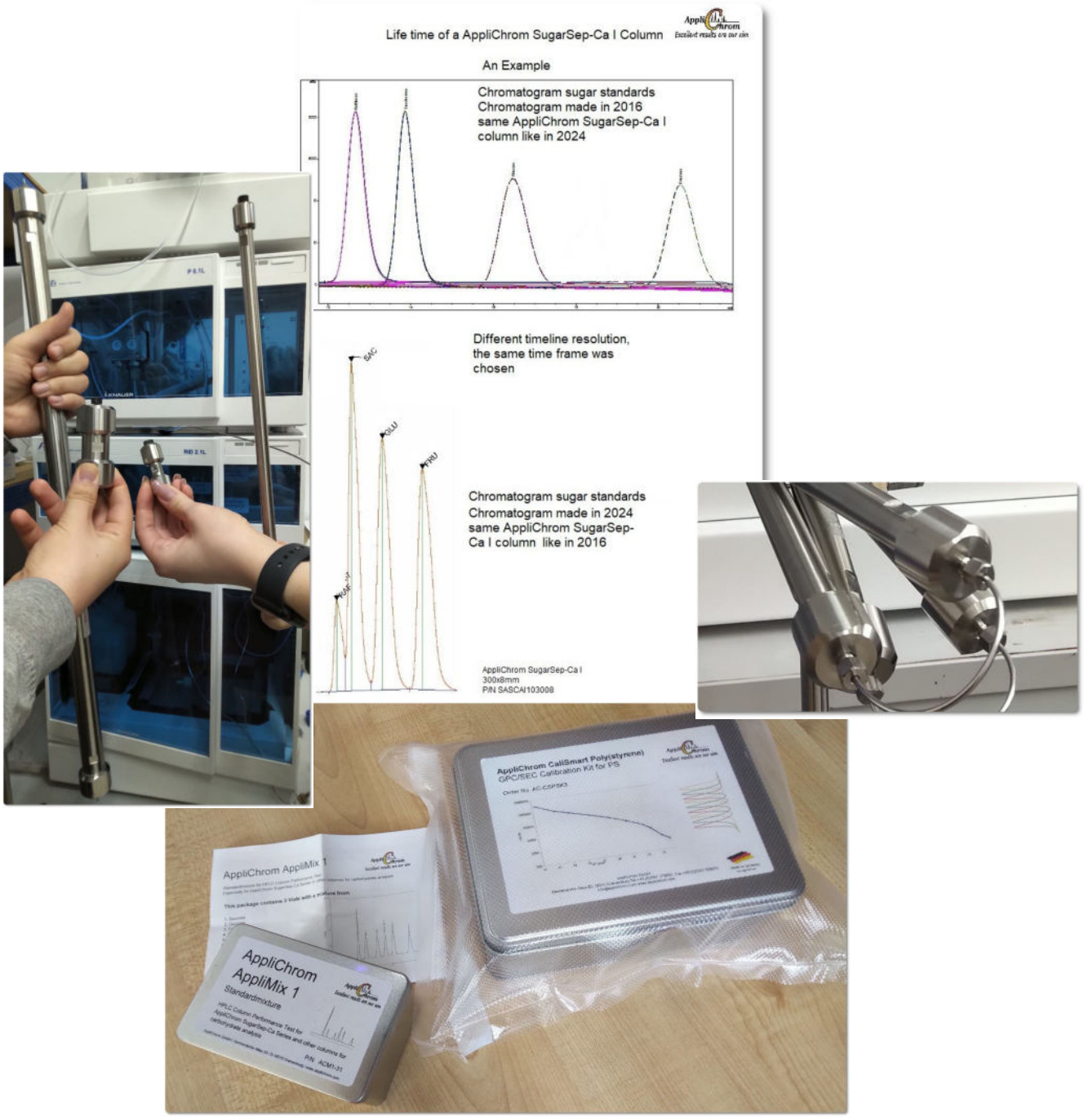
AppliChrom Series
GPC/SEC Column Guide

The Good to know Chapter

How to handle AppliChrom columns and which AppliChrom material/column corresponds to which USP list number.



AppliChrom GPC/SEC Series:

AppliChrom GPC columns are designed for high performance GPC separations. These columns contain high crosslinked polymeric particles of high reproducibility, good selectivity and high stability. Before shipment, each AppliChrom GPC column is tested and supplied with its individual test chromatogram and specifications. For long live time of AppliChrom GPC columns and for long term satisfaction it is important for customers to take care about some points that will be given in the following text. Due to several different specific applications of customers, the text can not be absolute – therefore, if you have any question, please do not hesitate asking the AppliChrom service at sales@applichrom.de and inform your local distributor.

After receiving of column:

- Control if there is any obvious physical damage from shipping
- Check if the column you got is the column you ordered
- All columns are shipped in the solvent that is documented in the column test certificate
- Verify the column quality

Please take into account that performance of column also depends on the chromatographic system at customers site.

Following parameters can have an influence the verification of column performance:

- Loop size, degree of loop filling, concentration of sample
- Capillary diameters and length in chromatographic system
- Temperature of column
- Effective detector cell volume
- Data acquisition rate
- Fitting connections

AppliChrom GPC column series connectors:

- In case a set of columns of different porosities plus eventual precolumn is ordered, customer will be also supplied with the suited column connectors, of 1/16´´ OD. The fittings have the 10-32 type thread and ferrules that are pre-fixed to ensure tightening without voidvolume

Tubing and fittings:

- 8mm ID AppliChrom GPC column series are designed to be connected with 1/16´´ OD capillary via 10-32er threading with HPLC-System
- If connecting chromatographic system with columns, please take care about the depth of capillary coming from system - connected by ferrule and fitting to columns. If distance between capillary end and ferrule is to low you get extra void volumes and loss of peak performance, if distance between capillary and ferrule is to long, system can leak or column inlet can be destroyed
- **See also: AppliChrom HPLC / GPC column user guide**

Installation of column

- Rinse chromatographic system (without column) with degassed and filtered eluent (here: DMSO eluent) with a moderate flowrate, check if there is no leak in the system, there is no blockade in the system and please make sure that detector will not be blocked or getting a to high pressure! Maybe laboratory must be continous good temperated (warm enough) to be sure DMSO is still fluid and viscosity is low enough! Please ensure this temperature also at weekends and/or holidays. Please documentat system pressure for the later used flowrate, at e.g. 0.4ml/min. If salts are added to the eluent, please take care to avoid precipitation of salt in system – as a result of this irreversible damages can occure
- Connect column respective columns with capillary from injector. Take care columns are connected in flow direction. The outlet of column (of the final column if there is a set of column) sould be connected direct with waste, bypassing the detector system
- If using more than 1 column (series of columns); take the columns in the following order: inlet => precolumn, maincolumn of smallest porosity, maincolumn of medium porosity, maincolumn of largest porosity => outlet
- Heat the columns at least to 50-60°C or to about 80°C for at least 1h
- Start pumping with 0.1ml/min, check if connections are tight, observe the outlet of columns to make sure a clear eluent flows out. Pump at least 5min / column at this flowrate, document the observed pressure.
- Increase stepvise to the final flowrate, e.g. 0.4ml/min, document the backpressure
- If backpressure is constant and eluent leaving the outlet pipe is clear, connect with detector (please make sure that connector is warm enough for ensuring fluidity of DMSO)
- After a total approx 5-10 column volumns baseline should be stable and measurements can start.
- If system is not needed for some time (over night, weekends,...), please lower flowrate e.g. to 0.05 or 0.1ml min, but do not change the column temperature. Every cooling and heating process of column means stress for column
- Please make sure that there is not a column pressure drop of more than 80bar per column or 30bar per Precolumn
- Avoid fast pressure increase or fast pressure lowering of columns
- If you inject sample, please take care sample is clear and free of particles (e.g. by filtration) and please take the lowest concentration that is necessary to get the results you need. Especially if using / analysing reactive samples, column livetime can be increased significantly by using low concentrations of sample. Samples should be diluted with eluent to avoid eventual extra-peaks

Important:

If you have any question, please do not hesitate contacting the AppliChrom servcie, e.g. at sales@applichrom.de

We want to get you as satisied customer with good products plus good service.

Installation:

a) Rinse first your HPLC / GPC system (suction tube, pump, injector incl. injection loop as well as capillary connections up to the column entrance) with the mobile phase, e.g., with 1ml / min,
note the originating counterpressure.

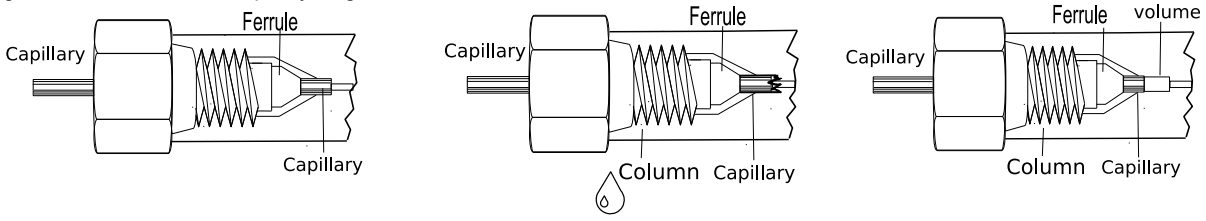
b) Connect the capillary to the column entrance with the HPLC / GPC column. Provide for the fact that the capillary is optimally connected with the column entrance. Between the capillary end and the column should be

- no dead volume originate (by to short capillary piece) – leads to line widening

- the capillary end also not longer as the admission within the HPLC / GPC-Column– can lead to leakage in the column head.

Please follow,
the space of the capillary ends can vary between different HPLC / GPC suppliers. To make sure that the correct space of the capillary end are reached, the adaptation of the ferrule is recommended in respective HPLC / GPC hardware.

Charting of the influence of the capillary length



Capillary suitably

Capillary to long
(Column damage possibly)

Capillary to short

c) **Pump** the eluent by the HPLC / GPC system consisting of pump, injector, capillary between column and injector, column, e.g., with 1ml / min with 4.6 mm of columns ID. Let go the first eluent 2-4ml them the column leave directly in the waste - under avoidance of the detectors (is valid for columns to max. 4.6 mm ID and you let go lengths from 50-250mm), with 8 mm of columns ID and lengths from 250-300mm please 15-20ml eluent directly in the waste – under avoidance of the detectors. If you control and document, besides, please pressure, rinse the column in this manner so long to the measured pressure is steady and the eluent clearly of the column flows out.

d) **Connect** the column end from that of the eluent resigned with the detector system. Guarantee that yourselves, besides, no significantly raised system counterpressure compared with the before measured value from c) puts (tip to blockage of the detector system, e.g., from dried up eluent, tough or crystallised solvens, mature test, blocked, narrowed or broken off capillaries...) - blockage of the detector system can lead to the destruction with pressure excess – use please only accordingly trained, attentive staff!

e) **Use** the fitting and ferrule connection between column and detector system in the manner that a) **no dead volume** (line widening) and b) no excess end of the inside-recumbent capillary originates (can lead to the destruction of the column exit). Ideally is the new touch-down of a connection from ferrule and fitting or, e.g., the use of PEEK-screw connections at the column exit.

f) **Document** at regular intervals the system pressure.

Please, use for AppliChrom-precolumn cartridges only the AppliChrom-precolumn cartridge holder fitting for it!
All information on these sides are put together with the biggest care, has been worked on and been checked. No liability or guarantee can be still assumed for content and objective correctness as well as actuality and completeness. All information without guarantee.

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AppliChrom Series USP L## Column List

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USP L## Column Listing

Description	USP L##	AppliChrom Series
Strong cation-exchange resin consisting of sulfonated cross-linked styrenedivinylbenzene copolymer in the hydrogen form, 6 to 12 µm in diameter .	L17	SugarSep-H-Series
Strong cation-exchange resin consisting of sulfonated cross-linked styrenedivinylbenzene copolymer in the calcium form, about 9 µm in diameter.	L19	SugarSep-Ca-Series
A rigid, spherical styrenedivinylbenzene copolymer, 3 to 30 µm in diameter.	L21	StyDiViBe-P-Series
A cation-exchange resin made of porous polystyrene gel with sulfonic acid groups, about 10 µm in size	L22	SugarSep-H-Series
Packing having the capacity to separate compounds with a molecular weight range from 100-5000 (as determined by polyethylene oxide), applied to neutral, anionic, and cationic water-soluble polymers. A polymethacrylate resin base, cross-linked with polyhydroxylated ether (surface contained some residual carboxyl functional groups) was found suitable.	L25	SuperOH-P-Series
Strong cation-exchange resin consisting of sulfonated cross-linked styrenedivinylbenzene copolymer in the lead form, 7 to 9 µm in diameter	L34	SugarSep-Pb-Series
Packing having the capacity to separate proteins by molecular size over a range of 2,000 to 40,000 Da. It is a polymethacrylate gel.	L37	SuperOH-P-Series
A methacrylate-base size-exclusion packing for water-soluble samples.	L38	SuperOH-P-Series
A hydrophilic-polyhydroxymethacrylate gel of totally porous spherical resin.	L39	SuperOH-P-Series
Strong cation-exchange resin consisting of sulfonated cross-linked styrenedivinylbenzene copolymer in the sodium form, about 6 to 30 µm diameter	L58	SugarSep-Na SugarSep-Oligo-Na
Strong cation-exchange resin consisting of sulfonated cross-linked styrene-divinylbenzene copolymer in the silver form, average 25 µm in diameter.	L##	SugarSep-Oligo-Ag

AppliChrom SuperOH-P

	Particle size (µm)	Type	USP
AppliChrom SuperOH-P-100 Separation Range 100Da-2 500 Da	10	spheric	L25, L38, L39
AppliChrom SuperOH-P-150 Separation Range 100Da-5 000 Da	10	spheric	L25, L38, L39
AppliChrom SuperOH-P-200 Separation Range 100Da-20 000 Da	10	spheric	L25, L38, L39
AppliChrom SuperOH-P-250 Separation Range 100Da-70 000 Da	10	spheric	L37, L38, L39
AppliChrom SuperOH-P-300 Separation Range 1 000Da-300 000Da	10	spheric	L37, L38, L39
AppliChrom SuperOH-P-350 Separation Range 2 500Da-1 000 000Da	10	spheric	L38, L39
AppliChrom SuperOH-P-400 Separation Range 10 000Da -5 000 000Da	10	spheric	L38, L39
AppliChrom SuperOH-P-450 Separation Range 50 000Da →10 000 000Da	10	spheric	L38, L39
AppliChrom SuperOH-P-Multipore Separation Range 100Da →1 000 000Da	10	spheric	L38, L39

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USP L## Column Listing

AppliChrom StyDiViBe-P			
	Particle size (µm)	**Type**	**USP**
AppliChrom StyDiViBe-P-35A Separation Range 100Da-2 500Da	5, (10)	spheric	L21
AppliChrom StyDiViBe-P-50A Separation Range 100Da-5 000Da	5, (10)	spheric	L21
AppliChrom StyDiViBe-P-100A Separation Range 100Da-10 000Da	5, (10)	spheric	L21
AppliChrom StyDiViBe-P-500A Separation Range 100Da-30 000Da	5, (10)	spheric	L21
AppliChrom StyDiViBe-P-1.000A Separation Range 100Da-70 000Da	5, (10)	spheric	L21
AppliChrom StyDiViBe-P-1.500A Separation Range 100Da-120 000Da	5, (10)	spheric	L21
AppliChrom StyDiViBe-P-10E4A-BPT Separation Range 100Da-400 000Da	5, (10)	spheric	L21
AppliChrom StyDiViBe-P-10E5A-BPT Separation Range 500Da-1 500 000Da	5, (10)	spheric	L21
AppliChrom StyDiViBe-P-10E6A-BPT Separation Range 10 000Da-4 000 000Da	10	spheric	L21
AppliChrom StyDiViBe-P-10E6.5A-BPT Separation Range 500Da-7 000 000Da	10	spheric	L21
AppliChrom StyDiViBe-P-10E7A-BPT Separation Range 100 000Da-10 000 000Da	10	spheric	L21

AppliChrom SugarSep ***Detailed application data base www.sugar-hplc.com***			
	Particle size (µm)	**Type**	**USP**
AppliChrom SugarSep-H I / II / III / IV / V For anaylsis of sugars, sugar alcohols, alcohols, carboxylic acids	10	spheric	L17
AppliChrom SugarSep-Ca I / II / III / IV / V For anaylsis of sugars, sugar alcohols, alcohols	10	spheric	L19
AppliChrom SugarSep-Pb I / II / III / IV / V For anaylsis of sugars, sugar alcohols, alcohols	10	spheric	L34
AppliChrom SugarSep-Na / Li For anaylsis of sugars, sugar alcohols, alcohols	10	spheric	L58
AppliChrom SugarSep-Oligo-Na For anaylsis of sugars, sugar alcohols, alcohols	10, 25	spheric	L58
AppliChrom SugarSep-K I / II / III / IV / V For anaylsis of sugars, sugar alcohols, alcohols	10	spheric	L##
AppliChrom SugarSep-Oligo-Ag For anaylsis of sugars, sugar alcohols, alcohols	10, 25	spheric	L##

AppliChrom RPeptide			
	Particle size (µm)	**Type**	**USP**
AppliChrom Rpeptide 100A	5	spheric	L21

Further AppliChrom columns without USP L## Number

AppliChrom VivoSep SEC

	Particle size (µm)	Type	For GPC/SEC analysis of
AppliChrom VivoSep SEC 150 Separation Range 100Da - 5 000Da	7	spheric	For analysis of proteins, humic acids,... Special multistage hydrophilically modified Polymeric SEC with high resolution. Pressure stability of 50-200 bar (depending on pore size) Compared to cross-linked Dextran SEC columns, which are only stable in the range of 5 bar or less. Good for easy, fast and reliable quality controll of bio-molecules purified by SEC from crosslinked dextrans Calibration: protein standards, PEO/PEG, dextran, pullulan
AppliChrom VivoSep SEC 200 Separation Range 100Da - 20 000Da	7	spheric	
AppliChrom VivoSep SEC 250 Separation Range 100Da-70 000Da	7	spheric	
AppliChrom VivoSep SEC 250 XL Separation Range 100Da - 100 000Da	7	spheric	
AppliChrom VivoSep SEC 300 Separation Range 1 000Da - 300 000Da	7	spheric	
AppliChrom VivoSep SEC 350 Separation Range 2 500Da - 1 000 000Da	7	spheric	
AppliChrom VivoSep SEC 400 Separation Range 10 000Da - 5 000 000Da	7	spheric	
AppliChrom VivoSep SEC Multipore Separation Range 100Da - 1 000 000Da	7	spheric	

AppliChrom DMSO-Phil-P

	Particle size (µm)	Type	For GPC/SEC analysis of
AppliChrom DMSO-PHIL-P-100 Separation Range 100Da-2 500Da	12	spheric	For analysis in DMSO amylose, amylopectin, starch urea-formaldehyd resins (UF-resins) melamin-urea-formaldehyd resins (MUF-resins) lignins, humic substances, humic acids, coniferous wood bark essences polysaccharide, polysaccharid Derivatives poly(N-isopropylacrylamid) PNIPA Poly-vinylpyridin calibration: pullulan, dextran, polyvinylpyridin et al.
AppliChrom DMSO-PHIL-P-150 Separation Range 100Da-5 000Da	12	spheric	
AppliChrom DMSO-PHIL-P-200 Separation Range 100Da-20 000Da	12	spheric	
AppliChrom DMSO-PHIL-P-250 Separation Range 100Da-70 000Da	12	spheric	
AppliChrom DMSO-PHIL-P-300 Separation Range 1 000Da-500 000Da	12	spheric	
AppliChrom DMSO-PHIL-P-350 Separation Range 5 000Da-1 500 000Da	12	spheric	
AppliChrom DMSO-PHIL-P-400 Separation Range 10 000Da-5 000 000Da	12	spheric	
AppliChrom DMSO-PHIL-P-450 Separation Range 50 000Da-10 000 000Da	12	spheric	
AppliChrom DMSO-PHIL-P-500 Separation Range →20 000 000Da	12	spheric	
AppliChrom DMSO-PHIL-P-M Separation Range 100Da-1 000 000Da	12	spheric	

Further AppliChrom columns without USP L## Number

AppliChrom CatPhil-P			
	Particle size (µm)	**Type**	**For GPC/SEC analysis of**
AppliChrom CatPhil-P-100 Separation Range 100Da-2 500Da	10	spheric	Special designed for aqueous GPC/SEC: polycations polyamines (chitosanes) polyethylenoxides Polysaccarides polyanions (heparins, pectins)
AppliChrom CatPhil-P-150 Separation Range 100Da- 5 000Da	10	spheric	
AppliChrom CatPhil-P-250-BPT Separation Range 100Da - 70 000Da	10	spheric	
AppliChrom CatPhil-P-350 Separation Range 2 500Da-1 000 000Da	10	spheric	
AppliChrom CatPhil-P-400 Separation Range 10 000Da-5 000 000Da	10	spheric	
AppliChrom CatPhil-P-450 Separation Range 300 000Da-10 000 000Da	10	spheric	
AppliChrom CatPhil-P-500 Separation Range 10 000Da- ~50 000 000Da	10	spheric	

AppliChrom HFIP-Phil-P			
	Particle size (µm)	**Type**	**For GPC/SEC analysis of**
AppliChrom HFIP-Phil-P-100 Separation Range 100Da-2 500Da	7, (10)	spheric	For GPC analyis in HFIP Polyesters (polybutylene terephthalate / PBTpolyethylene terephthalate /PET, polylactide PLA/ Polyamide 6 / PA6/ polyamide 6-6 PA6-6 / polyhexamethylene adipamide / polyamide 6-10 / PA6-10 / poly(hexamethylene sebacamide) / PA 6-10 Other (paraformaldehyde /polyoxymethylene POM / polyacetal / polyethylenimine / PEI / poly (iminoethylene / polyaziridine **calibration: molecular weight vs. PEO**
AppliChrom HFIP-Phil-P-350 Separation Range up to 1 000 000 Da	7, (10)	spheric	
AppliChrom HFIP-Phil-P-Multipore Separation Range 100Da- 1 000 000Da	7, (10)	spheric	

AppliChrom Aceton-Aq-Phil-P			
	Particle size (µm)	**Type**	**For GPC/SEC analysis of**
AppliChrom Aceton-Aq-Phil-P-100 Separation Range 100Da– 2 500Da	10		For GPC analyis in 80/20 aceton/water organosolv lignins **calibration: molecular weight vs. PEO/PEG**
AppliChrom Aceton-Aq-Phil-P-150 Separation Range 100Da– 5 000Da	10		
AppliChrom Aceton-Aq-Phil-P-250 Separation Range 100Da– 70 000Da	10	spheric	
AppliChrom Aceton-Aq-Phil-P-350 Separation Range 100Da–1 000 000Da	10	spheric	

Further AppliChrom columns without USP L## Number

AppliChrom DMAC-Phil-P			
	Particle size (µm)	**Type**	**For GPC/SEC analysis of**
AppliChrom DMAC-Phil-P-100 Separation Range 100Da-2 500Da	10	spheric	PMMA PAN cellulose soluble polymers for use in DMF, DMAc and NMP
AppliChrom DMAC-Phil-P-150 Separation Range 100Da-5 000Da	10	spheric	
AppliChrom DMAC-Phil-P-200 Separation Range 100Da-20 000Da	10	spheric	
AppliChrom DMAC-Phil-P-250 Separation Range 100Da-70 000Da	10	spheric	
AppliChrom DMAC-Phil-P-300 Separation Range 1 000Da-300 000Da	10	spheric	
AppliChrom DMAC-Phil-P-350 Separation Range 1 000Da-1 000 000Da	10	spheric	
AppliChrom DMAC-Phil-P-400 Separation range 10 000Da-5 000 000Da	10	spheric	
AppliChrom DMAC-Phil-P-450 Separation range 100 000Da→10 000 000Da	10	spheric	
AppliChrom DMAC-Phil-P-10E5-BPT Separation range 100Da - 1 000 000Da	10	spheric	

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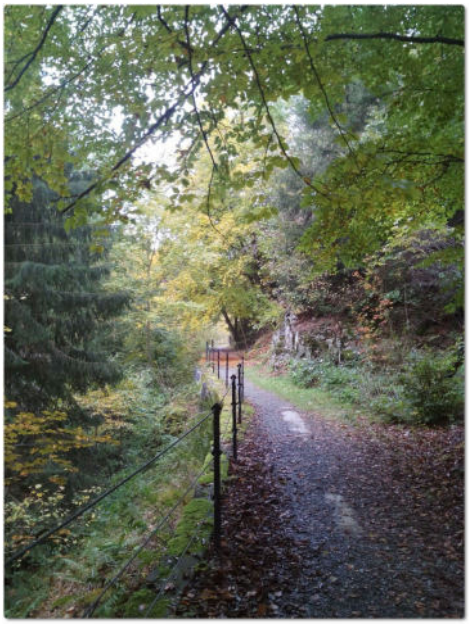
Your reliable partner on your chromatographic journey
Let's go the path together



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AppliChrom List of Applications with Chromatograms

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* Mixture 1
1. Sucrose
2. Glucose
3. Fructose
4. Glycerin
5. Mannitol
6. Sorbitol

Mixture 2
1. Sucrose
2. Glucose
3. Fructose
4. Glycerin

Mixture 3
1. Sucrose
2. Glucose
3. Fructose
4. Glycerin
5.Ethanol

Mixture 4
1. Dp 3
2. Dp 2
3. Glucose
4. Fructose

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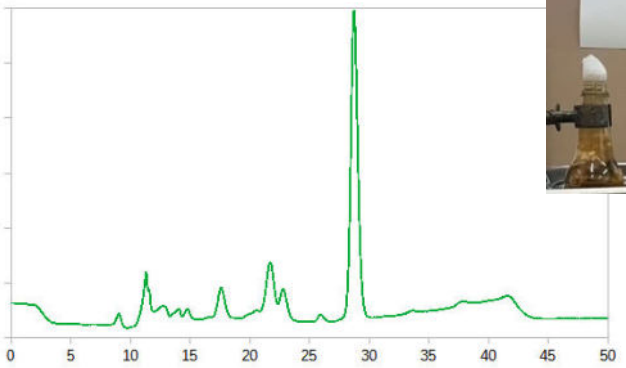
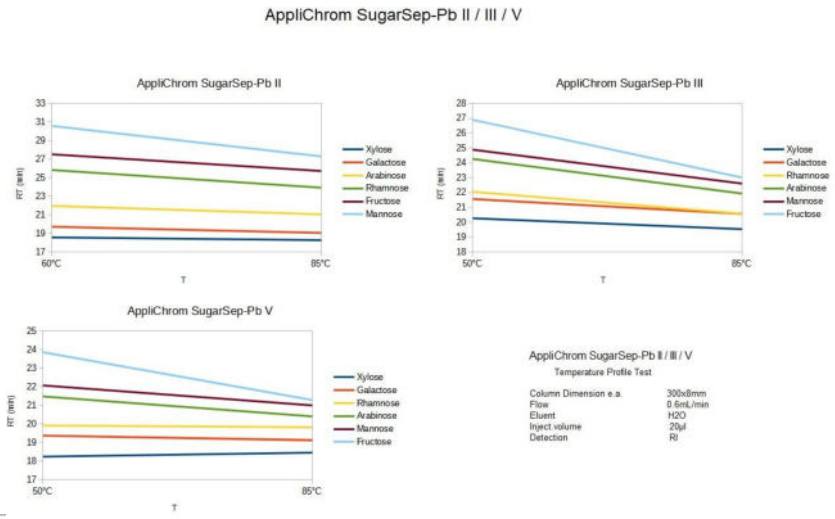
The AppliChrom Application Collection

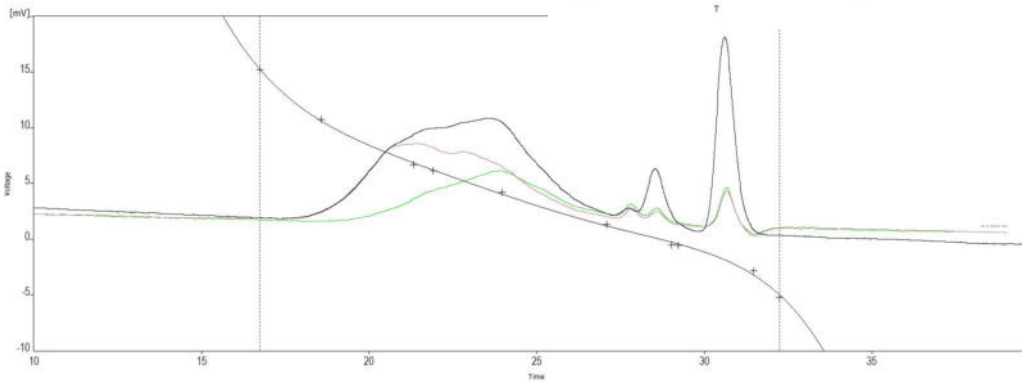
A short overview about the AppliChrom columns and applications

and

The AppliChrom Toolbox







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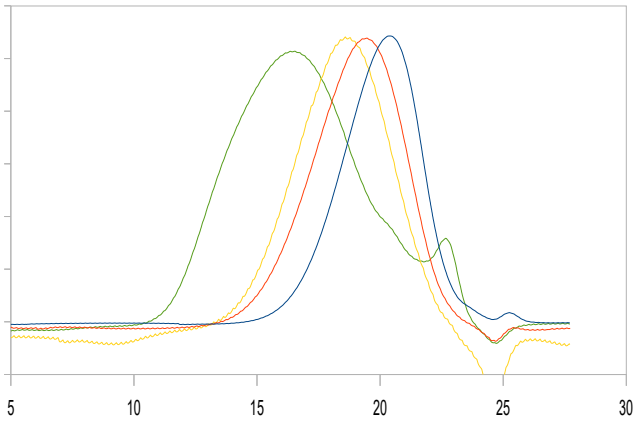
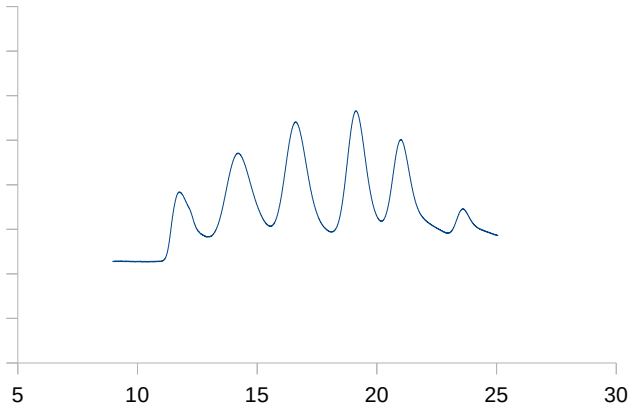
Content

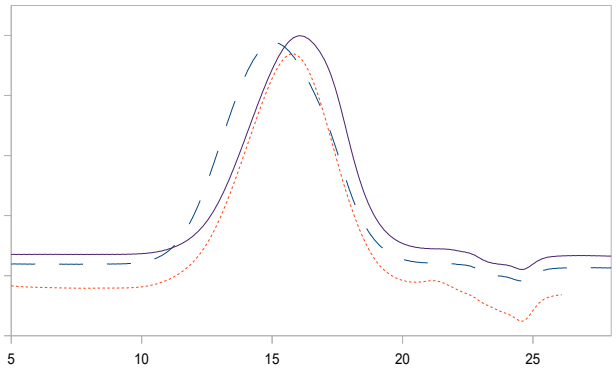
The AppliChrom Application Collection

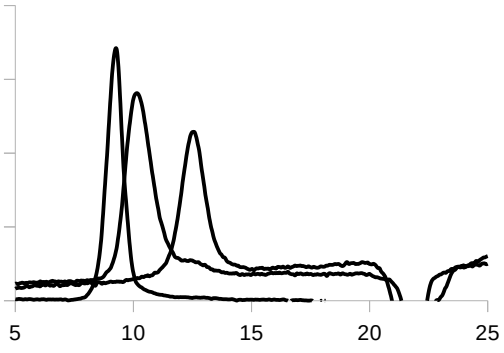
A short overview about the AppliChrom columns and applications

AppliChrom applications in alphabetic order









To order please contact AppliChrom, or your local AppliChrom distributor

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A short overview about the AppliChrom columns and applications

AppliChrom Applications in alphabetic order

Analyt	Eluent	AppliChrom Column	Temperature
Acetic acid, formic acid, lactic acid	H_2O + 0.1% H_2SO_4	SugarSep-H II	40°C
Acrylate dispersion (water based)	H_2O + 1M $NaNO_3$	SuperOH-P series	ambient
Alginat-Na	H_2O + 5g/l $Na_2HPO4x7H_2O$ + 0.075M $NaNO_3$	SuperOH-P series	ambient
Amylopectin	DMSO + 0,075M $NaNO_3$	DMSO-Phil-P series	80°C
Amylose	DMSO + 0,075M $NaNO_3$	DMSO-Phil-P series	80°C
Arabinose	H_2O	SugarSep series	80°C
Ascorbic acid	H_2O + 0.1% H_2SO_4	VitaC	40°C
Bisphenol-A-epichlorhydrin resin	THF	StyDiViBe-P series	ambient
Bitumen	THF	StyDiViBe-P series	ambient
Butyric acid	H_2O + 0.1% H_2SO_4	SugarSep-H series	40°C
Carboxymethyl cellulose	H_2O + 0.05M Na_2HPO_4 + 0.02M $NaNO_3$	SuperOH-P series	ambient
Carboxymethyl starch	H2O + 0,05M Na_2HPO_4 + 0,02M $NaNO_3$	SuperOH -P series	ambient
Carragenan	H_2O + 0.075M $LiNO_3$	SuperOH-P series	ambient
Capric acid	H_2O + 0.1% H_2SO_4	SugarSep-H series	40°C
Caramel color	DMSO + 0.075M $NaNO_3$	DMSO-Phil-P series	80°C
Casein (water soluble fraction)	H_2O + 0.01M $Na_{1.5}H_{1.5}PO_4$ + 0.3M NaCl	SuperOH-P series	ambient

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The AppliChrom Application Collection

AppliChrom
Excellent results are our aim

Analyt	Eluent	AppliChrom Column	Temperature
Cellulose (water soluble fraction)	H_2O + 0.075M $NaNO_3$	SuperOH-P series	ambient
Cellulose(tri)acetate	DMAc + 5g/l LiBr	DMAc-Phil-P series	60°C
Cellulose nitrate	THF	StyDiViBe-P series	ambient
Chitosan (Poliglusam, Polyglucosamin)	H_2O + 0.1M $NaNO_3$ + 0.2% formic acid	CatPhil-P series	ambient
Collagen	H_2O + 0.075M $NaNO_3$	SuperOH-P series	ambient
Corn Syrup	H_2O	SuperOH-P series	ambient
Corn Syrup	H_2O (free from salts)	SugarSep-Oligo-Na	80°C
Corn Syrup	H_2O (free from salts)	SugarSep-Oligo-Ag	80°C
Dextran	H_2O, ≥ 0,02% salts	SuperOH-P series	ambient
Dextran	H_2O, ≥ 0,02% salts	CatPhil-P series	ambient
Dextran	H_2O + 0.075M $NaNO_3$	DMSO-Phil-P series	80°C
Dextran-Iron komplex	H_2O + 0.075M $NaNO_3$	SuperOH-P series	ambient
Dextransulfat	H_2O + 5g/l $Na_2HPO_4x7H_2O$ + 0.075M $NaNO_3$	SuperOH-P series	ambient
Dextrin	H_2O	SuperOH-P series	ambient
Dextrin	H_2O	SugarSep-Oligo-Ag	80°C
Ethyl starch	H_2O + 0.075M $NaNO_3$	DMSO-Phil-P series	80°C
Fish protein hydrolysate	H_2O + 0.07M $Na_{1.5}H_{1.5}PO_4$ + 0.05M $NaNO_3$	SuperOH-P series	ambient
Flavonoids	Acetone / H_2O	Aceton-Aq-Phil-P series	ambient
Gelatin (from collagen)	H_2O + 0.01M $Na_{1.5}H_{1.5}PO4$ + 0.3M NaCl	SuperOH-P series	ambient

Analyt	Eluent	AppliChrom Column	Temperature
Gelatin (from gelly bear)	H_2O + 0.01M $Na_{1.5}H_{1.5}PO_4$ + 0.3M NaCl	SuperOH-P series	30°C
Gelatin (from pig)	H_2O + 0.2M $Na_{1.5}H_{1.5}PO_4$	SuperOH-P series	ambient
Glycogen	H_2O + 0.075M $NaNO_3$	SuperOH-P series	ambient
Gum arabic (Gummi Arabicum)	H_2O + 0.075M $NaNO_3$	SuperOH-P series	ambient
Heparin	H_2O + 5g/l $Na_2HPO_4x7H_2O$ + 0.075M $NaNO_3$	SuperOH-P series	ambient
Honey (oligo-sugar spectrum)	H_2O	SugarSep-Ca	80°C
Honey (oligo-sugar spectrum)	H_2O	SugarSep-Oligo-Na	80°C
Humic acid, humic substances	DMSO + 0.075M $NaNO_3$	DMSO-Phil-P series	80°C
Hyaluronic acid	H_2O + 5g/l $Na_2HPO_4x7H_2O$ + 0.075M $NaNO_3$	SuperOH-P series	ambient
Hydroxyethyl cellulose	H_2O + 0.075M NaCl	SuperOH-P series	ambient
Hydroxyethyl starch	H_2O + 0.075M NaCl	SuperOH-P series	ambient
Jelly bean	0.01M $Na_{1.5}H_{1.5}PO_4$ + 0.3M NaCl in H_2O	SuperOH-P series	ambient
Inulin	H_2O + 5g/l $Na_2HPO_4x7H_2O$ + 0.075M $NaNO_3$	SuperOH-P series	ambient
Iron dextran complex	H_2O + 0.075M $NaNO_3$	SuperOH-P series	ambient
Lignin (steam explosion, milled wood, organosoly, craft, ligninsulfonates)	DMSO + 0.075M $NaNO_3$	DMSO-Phil-P series	80°C

Analyt	Eluent	AppliChrom Column	Temperature
Lignin (Steam explosion, organosolv, sulfonates)	DMAc + 5g/l LiBr	DMAc-Phil-P series	60°C
Lignin (Milled wood, Organosolv, Craft), derivatisation: trimethylsilyation or acetylation	THF	StyDiViBe-P series	ambient
Lignin (Organosolv)	Acetone/H_2O	Aceton-Aq-Phil-P series	ambient
Lignin sulfonate	H_2O + 0.1M $NaNO_3$ (80%), ACN (20%)	SuperOH-P series	ambient
Malt beer (Oligosugar spectrum)	H_2O	SugarSep-Oligo-Na	80°C
Maltodextrin	H_2O (no salt!)	SugarSep-Oligo-Na	80°C
Maltodextrin	H_2O (no salt!)	SugarSep-Oligo-Ag	80°C
Maltodextrin	H_2O	SuperOH P series	ambient
Manuka honey (protein spectrum)	DMSO + 0.075M $NaNO_3$	DMSO-Phil series	80°C
Manuka honey (sugar spectrum)	H_2O	SugarSep-Ca	80°C
Melamin	DMSO + 0.075M $NaNO_3$	DMSO-Phil-P series	80°C
Melamin formaldehyde resin (MF)	DMSO + 0.075M $NaNO_3$	DMSO-Phil-P series	80°C
Melamin Urea Formaldehyd resin (MUF resin)	DMSO + 0.075M $NaNO_3$	DMSO-Phil-P series	80°C
Methylcellulose	DMSO + 0.075M $NaNO_3$	DMSO-Phil-P series	80°C
Motor oil (lubricant)	THF	StyDiViBe-P	ambient
Oligosaccharid spectrum	H_2O	SugarSep-Oligo-Ag	80°C
Pectin	H_2O + 0.07M $Na_{1.5}H_{1.5}PO_4$ + 50mM NaCl	SuperOH-P series	ambient

Analyt	Eluent	AppliChrom Column	Temperature
Paraffin	$CHCl_3$	StyDiViBe-P series	ambient
Plant oil/fat (sunflower oil, olive oil, palm oil,...)	THF	StyDiViBe-P series	ambient
Phosphate, phosphoric acid	H_2O + 0.1% $HClO_4$	SugarSep-H series	40°C
Polyacrylamide	H_2O + 0.075M $NaNO_3$	SuperOH-P series	ambient
Polyacrylamide	H_2O + 0.1M NaCl + 0.2% TFA	CatPhil-P series	ambient
Polyacrylic acid	H_2O + 0.075M $NaNO_3$	SuperOH-P series	ambient
Polyamid 6 (PA6) resp. Polycaprolactam	HFIP + 25mM CF_3COONa	HFIP-Phil-P series	40°C
Polyamid 6.6 (PA6-6)	HFIP + 25mM CF_3COONa	HFIP-Phil-P series	40°C
Polyacrylic acid	H_2O + 0.07M $Na_{1.5}H_{1.5}PO_4$ + 0.075M $NaNO_3$	SuperOH-P series	ambient
Polyacrylnitril	DMF 0.5% LiBr	DMAc-Phil-P series	60°C
Poly butadiens	THF	StyDiViBe-P series	ambient
Poly carboxylatether	H_2O + 0.05M Na1.5H1,5PO4 + 0.1M $NaNO_3$	SuperOH-P series	ambient
Poly DADMAC (Polydiallyldimethylammoniumchlorid, Polyquaternium-6)	H_2O + 0.1M $NaNO_3$ + 0.2% formic acid	CatPhil-P series	ambient
Poly DADMAC (Polydiallyldimethylammoniumchlorid, Polyquaternium-6)	H_2O + 0.1M NaCl + 0.2M TFA	CatPhil-P series	ambient
Poly dimethylsiloxan	Toluene	StyDiViBe-P series	ambient
Polyester (Polybutylenterephthalat (PBT)	HFIP + 25mM CF_3COONa	HFIP-Phil-P series	40°C
Poly[2-(butenyl)2-oxazoline-co-ethylenimine]	DMSO + 0.075M $NaNO_3$	DMSO-Phil-P series	80°C

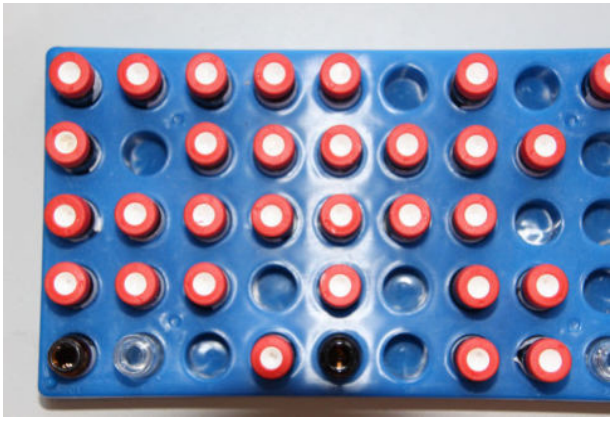
Analyt	Eluent	AppliChrom Column	Temperature
Polybutyl methacrylate-co-poly (dimethylamino ethylmethacrylate)	DMSO + 0.075M $NaNO_3$	DMSO-Phil-P series	80°C
Polyester: polylactid (PLA)	HFIP + 0.25mM CF_3COONa	HFIP-Phil-P series	40°C
Polyester (aromatic polyol ester)	THF	StyDiViBe-P series	ambient
Polyester (aliphatic polyester, adipate polyester)	THF	StyDiViBe-P series	ambient
Polyether polyol	THF	StyDiViBe-P series	ambient
Polyethylen	Trichlorbenzene	StyDiViBe-P series	150°C
Polyethylenglycol (PEG)	H_2O, ≥ 0,02% salts	CatPhil-P series	ambient
Polyethylenglycol (PEG)	H_2O, ≥ 0,02% salts	SuperOH-P series	ambient
Polyethylenimin (PEI) linear	H_2O + 0,1M NaCl + 0,1% TFA	CatPhil-P series	ambient
Polyethylenglycol (PEG) and Polyethylenoxid (PEO)	H_2O + 0,05% $NaNO_3$	CatPhil-P series	ambient
Polyethylenglycol (PEG), Polyethylenoxid (PEO)	H_2O + 0,05% $NaNO_3$	SuperOH-P series	ambient
Polyethylenoxid (PEO)	THF	StyDiViBe-P series	ambient
Polyethylenoxid-co-polypropylenoxid (PEO-Co-PPO)	THF	StyDiViBe-P series	ambient
Polyethylenterephthalat (PET)	HFIP + 25mM CF_3COONa	HFIP-Phil series	40°C
Poly ethylmethacrylat	THF	StyDiViBe-P series	ambient
Poly isopropylmethacrylat	THF	StyDiViBe series	ambient
Polylatcid (PLA)	HFIP + 25M CF_3COONa	HFIP-Phil series	40°C
Polymethylmethacrylate (PMMA)	HFTP + 25mM CF_3COONa	HFIP-Phil series	40°C
Polymethylmethacrylate (PMMA)	THF	StyDiViBe-P series	ambient

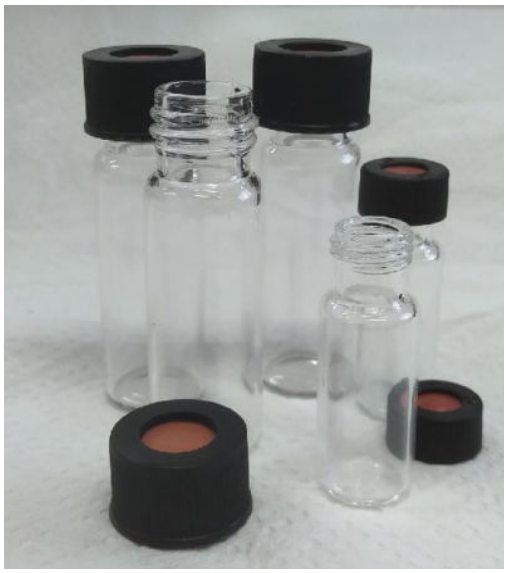
Analyt	Eluent	AppliChrom Column	Temperature
Polymethylmethacrylate (PMMA)	DMAc + 5g/l LiBr	DMAc-Phil-P series	60°C
Poly (methyl phenyl siloxane)	Toluene	StyDiViBe-P series	ambient
Poly (methyl phenyl siloxane)	Toluene	StyDiViBe-P series	ambient
Poly(N-isopropylacrylamide), (PNIPA, PNIPAAm, NIPA, PNIPAA PNIPAm)	DMSO + 0,075M $NaNO_3$	DMSO-Phil-P series	80°C
Polyethylenoxid-Co-Polypropylenoxid	THF	StyDiViBe-P series	ambient
Polyolefin	Trichlorobenzene	StyDiViBe-P series	150°C
Polyol hard foam	THF	StyDiViBe-P series	ambient
Polyol soft foam	THF	StyDiViBe-P series	ambient
Polyoxazolin	HFIP + 25mM CF_3COONa	HFIP-Phil series	40°C
Polyoxazolin (Poly[2-(butenyl)2-oxazolineco-ethylenimine])	DMSO + 0,075M $NaNO_3$	DMSO-Phil-P series	80°C
Polyoxymethylen (POM)	HFIP + 25mM CF_3COONa	HFIP-Phil series	40°C
Polyvinylchloride (PVC)	THF	StyDiViBe-P series	ambient
Polystyrenesulfonate	H_2O + 0,1M $NaNO_3$ (80%), ACN (20%)	SuperOH-P series	ambient
Polystyrene	THF	StyDiViBe-P series	ambient
Polyvinylalcohol (PVA) 88% hydrolysed	H_2O + 0.1M $NaNO_3$ (80%), ACN (20%)	SuperOH-P series	ambient
Polyvinylalcohol (PVA)	DMSO + 0,075M $NaNO_3$	DMSO-Phil-P series	80°C
Polyvinylimidazol	H_2O + 0,1M NaCl + 0,2% TFA	CatPhil-P series	ambient
Polyvinylpyridin	H_2O + 0,1M NaCl + 0,2% TFA	CatPhil-P series (calibration vs. Pullulan, dextran and PEG/PEO possible)	ambient
Polyvinyl-2-pyridin	DMSO + 0,075M $NaNO_3$	DMSO-Phil-P series	80°C

Analyt	Eluent	AppliChrom Column	Temperature
Polyvinylpyrolidon (PVP)	H_2O + 0,075M $NaNO_3$ (80%), ACN (20%)	SuperOH-P series	ambient
Polyvinylpyrolidon (PVP)	DMF + 5g/l LiBr	DMAc-Phil-P series	60°C
Polyquaternium-33 respective copolymer of trimethylaminoethylacrylate salt and acrylamide	H_2O + 0.1M NaCl + 0.2% TFA	CatPhil-P series	ambient
Protein	H_2O + PBS Buffer	VivoSep SEC	ambient
Protein (PEGylated)	H_2O + 0.05% NaN_3	SuperOH-P series	ambient
Protein (soy, pea, non processed)	DMSO + 0.075M $NaNO_3$	DMSO-Phil-P series	80°C
Proteinspectrum (manuka honey)	DMSO + 0,075M $NaNO_3$	DMSO-Phil-P series	80°C
Pullulan	H_2O, ≥ 0.02% salts	SuperOH-P series	ambient
Pullulan	H_2O, ≥ 0.02% salts	CatPhil-P series	ambient
Pullulan	DMSO, 0.075M $NaNO_3$	DMSO-Phil-P series	80°C
Spruce bark extract	DMSO + 0.075M $NaNO_3$	DMSO-Phil-P series	80°C
Sugar	H_2O	SugarSep-Ca series	85°C
Sugar acids	H_2O + 0.1% H_2SO_4	SugarSep-H series	40°C
Sugar alcohols	H_2O	SugarSep-Ca series	85°C
Starch (pea, potato, soy)	DMSO + 0.075M $NaNO_3$	DMSO-Phil-P series	80°C
Starch hydrolysate	H_2O + 0.2M $NaNO_3$	SuperOH-P series	ambient
Starch hydrolysate	DMSO + 0.075M $NaNO_3$	DMSO-Phil-P series	80°C

Analyt	Eluent	AppliChrom Column	Temperature
Tall Oil	THF	StyDiViBe-P series	ambient
Triglycerides from fatty acids	THF	StyDiViBe-P series	ambient
Urea Formaldehyd Resin (UF resin)	DMSO + 0.075M $NaNO_3$	DMSO-Phil-P series	80°C
Virus	H_2O + 0.1M $Na_{1.5}H_{1.5}PO_4$	SuperOH-P series	ambient
Xanthan	H_2O + 0.1M Na_2HPO_4	SuperOH-P series	ambient

to be continued...





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The AppliChrom Toolbox

Tips, tricks and much more about GPC analysis
Collected from decades of experience

The AppliChrom Toolbox:

Do you need analytical solutions for

- different molecules or special ranges of molecular size?

- special demands in respect to solvent or in respect of lowering salt concentration for keeping bioactivity?

- increasing resolution power to more than 500.000 plates/meter?

- preparative scale separations?

- silica free reversed phase separations?

- ion exchange separations?

- HIC-separations?

- … ?

AppliChrom customers get the advantage of an enormous materials toolbox plus individual support for solving their (often challenging) task in analysing and/or purification of sample.

You get acess to more than 30 years of hands on experience in liquid chromatography in GPC/SEC plus in HPLC from analytical scale to process scale. Polymers, biopolymers, biomolecules, degradation products and many more substance classes are covered.

What are you looking for?

Write your message to: info@applichrom.com

Content

For tailoring/detailed information in respect to your substance, please contact us direct info@applichrom.com or via the AppliChrom homepage
www.applichrom.com.

What is your demand, what is your request, the missing part you need to make you more success- respective powerful. Really glad to hear you. Please do not hesitate!

You also find us on LinkedIn

1. Sample pretreatment

1.1 Sample dissolution / sample concentration

Enrichment of the sample:

Dissolve your analyte in the eluent used in your GPC/SEC separation.
The preferred concentrations of the analyte depend on the molecular weight or size of the sample.
Avoid high concentrations in a range where the dissolved sample appears sticky and viscous.
Please stay below this point.

Dissolving the sample:

Dissolution may take as little as 1 hour, but for molecular weights > 40 million Daltons it may take several days.
Please avoid mechanical stress or ultrasonic for acceleration of dissolution.
This could destroy the higher weight fractions of the sample.

1.2 Syringe filter

Use syringe filter before injecting sample into GPC/SEC column.
Easily PTFE filters can be used.
There are two kinds PTFE-filters:
PTFE hydrophobic and PTFE hydrophilic.
PTFE hydrophobic filters can used for hydrophobic substances in hydrophobic eluents (like Polystyrene in THF/Toluene/$CHCl_3$).
PTFE hydrophilic filters can be used for hydrophilic substances in hydrophilic/strong polar eluents like dextran in water or DMSO.
Poresizes of 0.22 or 0.45µm are available. Poresizes of 0.22µm can be used for analysis of small molecules/polymers. Poresizes of 0.45µm are preferred if molecules up to about 2-5Mio Dalton are analysed.

1.2 Syringe filter (continuation)

If macromolecular molecules up to 10-70Mio Dalton are analysed special large pore filters are needed. Syringe filters with poresizes of about 1µm are available. Care has to be taken that sample is not adsorbed on the filter material. Furthermore filter material should not be dissolved by solvent of analyte.

Please check at least 2 different kinds of chemistry of membrane filter to show the analytical GPC signal area (mV * sec) is not reduced by using membrane filter. In general polar membrane filters should be used for polar analytes in polar eluents. Non polar membrane filters should be used for non polar analytes in non polar eluents for sample pretreatment. AppliChrom customers are of course welcomed to take consultation regarding yours (analytical) sample filtration process for GPC/SEC analysis.

Please do not hesitate asking your chromatography specialists at info@applichrom.com.

Info Box

Syringe filters are available in various diameters, pore sizes and filter materials. You can also obtain the syringe filters suitable for your application directly from AppliChrom. We will be glad to advise you.

2. Consideration of eluents/solvents

GPC/SEC is performed in a large range of different solvents.
Solvents range from very hydrophobic trichlorobenzene to hydrophilic water with many sub-steps.
GPC/SEC separations/analysis only allow the separation according of (hydrodynamic) sizes of an analyte (small molecules or poylmer) in a given solvent.

The fundamental base for pure molecular size separation of analyte (GPC/SEC) is the only solution of analyte in the solvent respective eluent that is used – but no (even not partial) reversible adsorption to GPC/SEC column packing is allowed.
Additional: No exclusion/repulsion of analyte to GPC/SEC column packing should occure!
Furthermore: Each molecule of analyte shall be non influenced by other molecules of analyte what e.g. could happen at higher concentrations for very high molecular analytes or by non sufficient solvatisation of eluent in respect to analytes.

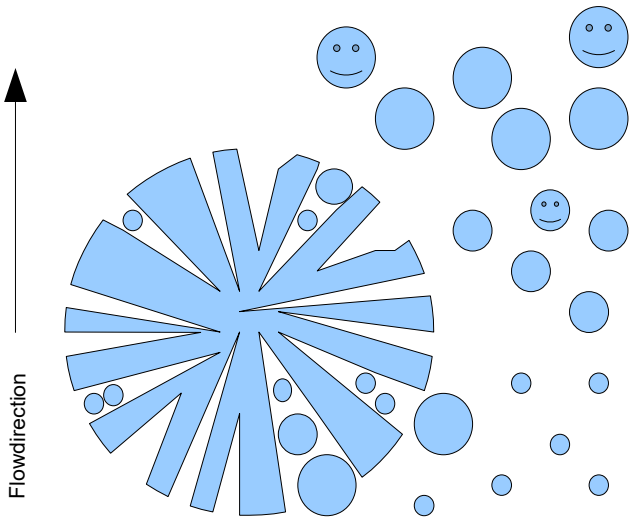
That means:
- perfect solvent
- perfect stationary phase
- strong consideration of analyte concentration
- many very different analyte groups often need many different analyte group specific solutions.

2.1 Influence of the eluent

When using porous GPC/SEC column packings in well-dissolving eluents with small molecules, the small molecules can reach all pores of the GPC/SEC packing.
These small molecules then have a long retention time. Under the above conditions, large molecules will only fit into a few pores that are large enough.

Smaller pores and smaller pore volumes are non reached by large molecules. As a result, retention volume of larger molecules is lower. The consequence of this pure size separation at GPC/SEC column packing is – large molecules are eluted with small elution volume. Small molecules are eluted with larger elution volumes. This is called pure Size Exclusion Chromatography (SEC) separation. The same principle is behind the so called Gel Permetation Chromatography (GPC). This GPC/SEC technology allows the analysis of sizes of molecules, size distribution analysis, with special detection also absolute the molecular weight determination and the preparative fractionation of molecules according to size.
After the smallest molecule left in GPC/SEC mode the HPLC mode starts.
HPLC will not be described here.

To make sure that only size of the analyte is the only separation parameter, chromatographer must take much attention to fit the analyte to properties of GPC/SEC column packing and the suited eluent. This can be more complex than in classical HPLC method development.



Info Box

AppliChrom BPT Technology: a combination of small, medium and large pores in each particle ensures an increase of calibration range. No matching porosities effects – respecive artifical shoulders in chromatogrammes known from many column combinations are significant reduced – for improving your GPC Chromatography.

2.2 GPC/SEC solvents (examples):

The following substance groups, eluents and column combinations are useful in GPC/SEC e.g. for

- **Highly hydrophobic substances** like many technical hydrophobic polymers (polystyrenes, silicones, pmma,...):
  THF, toluene, $CHCl_3$, trichlorobenzene,…
  Calibration vs. polystyrenes.
  GPC columns: AppliChrom StyDiViBe

- **Highly crystalline polymers** (polyamides, polyesters,.. plus: polyoxazolins...):
  HFIP.
  Salts like 25mM CF_3COONa are useful to surpress polar interaction between molecules.
  Calibration vs. PMMA.
  GPC columns: AppliChrom HFIP-Phil

GPC/SEC solvents (examples):

- **Medium polar polymers** (MUF-resins, polymethacrylates, lignins,.., polar polymers with strong internal structural H-bridges (cellulose))
  DMF, NMP, DMAc. Salts like 5g/l LiBr or LiCl are useful to surpress polar interactions between molecules. Absence of water in eluent is important for most of these applications. Calibration vs. PMMA.
  GPC columns: AppliChrom DMAc-Phil.

- **Polar polymers** (UF-resins, MUF-resins, lignins, starch, proteins, polyoxazolines,…)
  DMSO. Salts like 0,075M $NaNO_3$ are taken to surpress ionic and H-bridges between analyte and molecules and sometimes stationary phase. Classical applications were using very corrosive LiCl or LiBr additive. AppliChrom DMSO-Phil-P GPC columns are designed to work perfect for all tested applications in GPC mode using only non corrosive $NaNO_3$ in DMSO. Calibration vs. dextran, pullulan.
  GPC columns: AppliChrom DMSO-Phil-P.

- **High hydrophilic polymers anionic or neutral** (pectins, dextrans, chitosans, lower molecular weight, starch, many cellulose derivatives, polyvinylalcohol, PVP,...)
  Water (anionic or neutral) (sometimes with salts). Calibration vs. PEO/PEG, dextran or pullulan.
  Perfect suited GPC columns: AppliChrom SuperOH-P.

- **Less hydrophilic polymers, anionic or neutral** (low sulfonated lignin sulfonate, styrene sulfonate, …). Water with low concentration of salts (80%) + ACN or MeOH (20%). Calibration vs. PEO/PEG.
  GPC columns: AppliChrom SuperOH-P.

- **Highly hydrophilic polymers of aminic or cationic character** (chitosan, pDADMAc, p-2-vinylpyridin pDADMAc-co-p-acrylamide,…): Water with salts (NaCl or $NaNO_3$) plus acids (formic acid or trifluoroacetic acid). Calibration vs. PEO/PEG, dextrans or pullulans.
  AppliChrom CatPhil-P-JLJ SEC columns work perfect for polycationic SEC. Absence of charges on column surface mean no selective adsorption of polyanionic structure. This makes it possible even to make pure SEC.
  GPC columns: AppliChrom CatPhil-P-JLJ SEC
  -analysis of pDADMAc-co-p-acrylamide copolymers with residues of carboxylate sub-structures.

GPC/SEC solvents (examples):

- **Special field: Organosolv lignins, non glycolized flavonoids**,…
  Water/Aceton (no salts).
  GPC columns: AppliChrom Aceton-AQ-Phil-P

- **Special field: Sugars (identity of sugars or oligomeric spectrum):**
  Water (no salts).
  Chromatography columns: AppliChrom SugarSep series (Ion exchange, ion exclusion and size exclusion mechanisms are used for highest resolution).
  GPC columns: AppliChrom SugarSep.

Info Box

Solvent polarity

Polar — Non-polar

DMF/DMAc/NMP > 90/10 $CHCl_3$/MeOH > THF > Acetic acid ethylester > $CHCl_3$ > CH_2Cl_2 > Toluene*)

*) In case of using polar and viscous DMF/NMP/DMAc – reduction of flowrate, heating of column and in many cases some salt in solvent is necessary got get separation. Please ask for columns prepacked with final solvent that should be used.

3. Sample concentration and sample amount

For GPC column combination of 2-3x(300x8mm) columns there are following recommendations:

Molecular weight	Approx. sample concentration (mg sample /ml eluent)	Sample volume [µl]
> 5 000 000 Da	0.2	100 - 200
1 000 000-5 000 000 Da	0.5	50 - 200
100 – 1 000 000 Da	1	20 - 50
100 - 100 000Da	2	20

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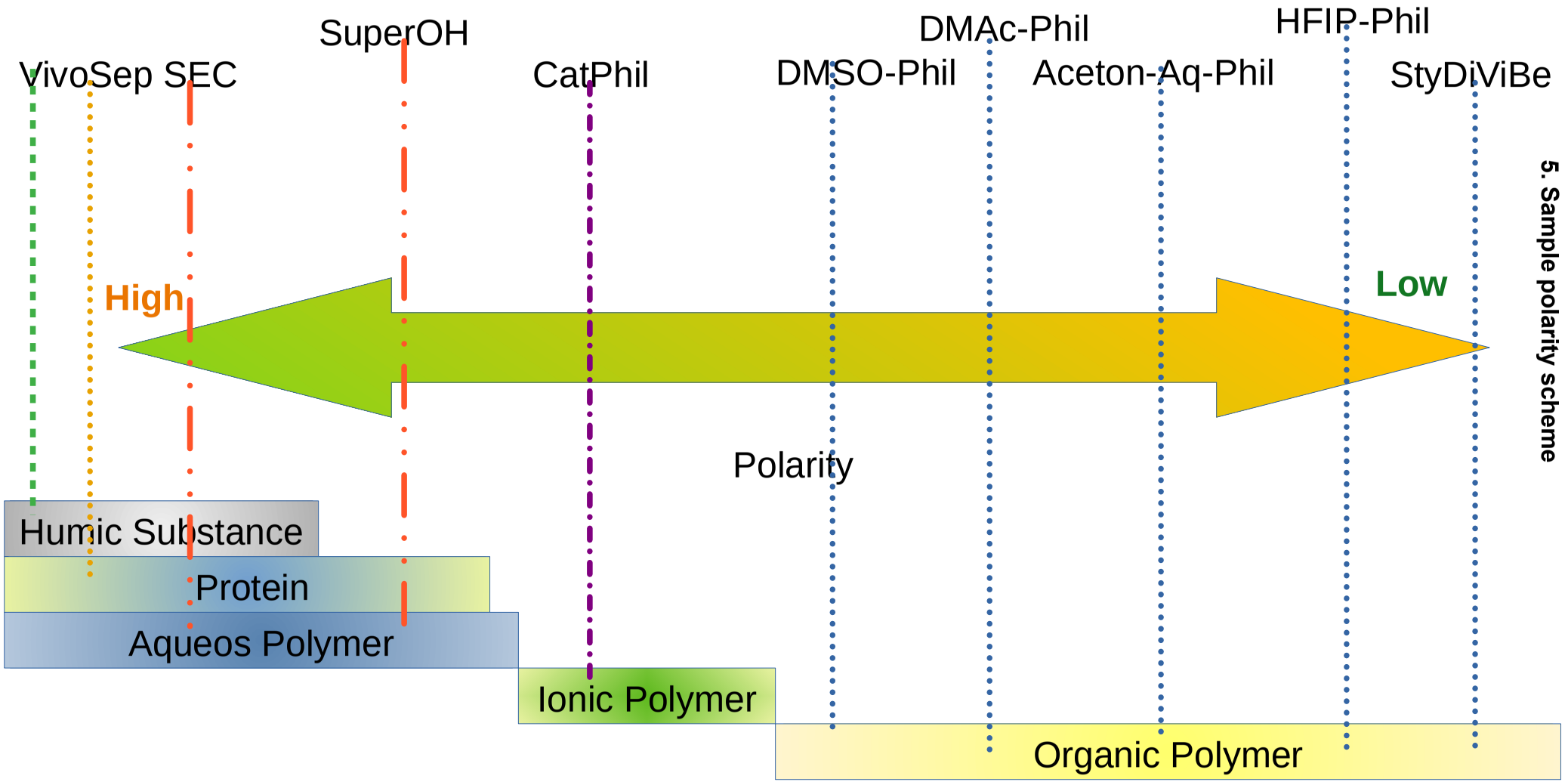
AppliChrom GPC/SEC Sample Polarity Scheme

Excellent results are our aim

AppliChrom Column Series according to the polarity of the samples



5. Things you should pay attention to
(even if they seem self-evident)

AppliChrom GPC columns are designed for high performance GPC separations. These columns contain high crosslinked polymeric particles of high reproducibility, good selectivity and high stability. Before shipment, each AppliChrom GPC column is tested and supplied with its individual test chromatogram and specifications. For long live time of AppliChrom GPC columns and for long term satisfaction it is important for customers to take care about some points that will be given in the following text.

After receiving of column:

- Control if there is any obvious physical damage from shipping
- Check if the column you got is the column you ordered
- All columns are shipped in the solvent that is documented in the column test certificate
- Verify the column quality

Please take into account that performance of column also depends on the chromatographic system at customers site.

Following parameters can have an influence the verification of column performance:

- Loop size, degree of loop filling, concentration of sample
- Capillary diameters and length in chromatographic system
- Temperature of column
- Effective detector cell volume
- Data acquisition rate
- Fitting connections

AppliChrom GPC column series connectors:

- In case a set of columns of different porosities plus eventual precolumn is ordered, customer will be also supplied with the suited column connectors, of 1/16´´ OD. The fittings have the 10-32 type thread and ferrules that are pre-fixed to ensure tightening without voidvolume

Tubing and fittings:

- 8mm ID AppliChrom GPC column series are designed to be connected with 1/16´´ OD capillary via 10-32er threading with HPLC-System.

- If connecting chromatographic system with columns, please take care about the depth of capillary coming from system - connected by ferrule and fitting to columns. If distance between capillary end and ferrule is to low you get extra void volumes and loss of peak performance, if distance between capillary and ferrule is to long, system can leak or column inlet can be destroyed.

6. More questions?

You are welcomed to ask the AppliChrom Chromatographists for supporting you in your individual chromatography project.
AppliChrom supports the following modules to serve chromatographists:

- General chromatography (Reversed Phase, HILIC, GPC, SEC, Ion Exchange, Ion Exclusion)
- Parameters in chromatography
- Trouble shooting & SST (System suitability tests)
- GPC/SEC and HPLC seminars
- Individual seminars adapted to your individual requirements

6.1 The AppliChrom Programme

Rent a Chromatographist programme – supporting your sucess in your individual chromatography project.

7. Outside the toolbox, about AppliChrom GmbH

Your polymer, biopolymer and degradation product analysis and purification tools by AppliChrom GmbH:
- Founded 2006 as AppliChrom, Application & Chromatography
- In market since 2009, since than continous growing together with the sucess of our customers
- Own production facilities for polymeric based chromatography media, columns and customer specific method developments
- Seminars, training in liquid chromatography method development, handling chromatographic separations/analysis, analytical and preparative chromatography, silica free separation methods, increase of pH-ranges in chromatography – including RP-HPLC, gel permeation chromatography, size exclusion chromatography, ligand exchange chromatography, ion exclusion chromatography, peak recycling chromatography, separation methods that fit to your demands.
- Staff members with more than 25 years hands-on experience in media production, applications, knowledge transfer, developments from analytical via preparative up to process scale chromatography.
- The only ambition of AppliChrom was, is and will be surpassing customers needs with chromatography tools, application fields, performance, service and highest level of reproducibility, day for day, year for year, decade for decade.

Inquiry Form For Forwarding to AppliChrom GmbH

To place an order please fill in this form and send it by mail or fax to:

AppliChrom GmbH
Germendorfer Allee 20
D-16515 Oranienburg
Germany

Telephone: **+49 (0)3301 579293**
Fax: **+49 (0)3301 209879**
Email: **info@applichrom.co**
Web: **www.applichrom.com**

Catalog Number	Description	Dimension

bulk quantities on request

Adress

Name	
Company / institute	
Adress	
Country	
Phone number	
E-mail adress	
VAT-number	
Comment	

AppliChrom GmbH
+49 (0)3301 579293
info@applichrom.com

AppliChrom General Terms and Conditions

Excellent results are our aim

General terms and conditions

The prices are free, in EURO, without VAT, this is calculated separately.
The listed prices are valid in the Federal Republic of Germany, deviations may result from changes in the manufacturers' prices.

Our offer is a business-to-business (B2B) offer and also addressed to selected traders and freelancers as well as universities and other public clients but not to private customers.

Delivery terms:
Federal Republic of Germany: Delivery is not free (EXW Oranienburg, INCOTERMS 2010). We charge a shipping and packaging fee depending on the size and weight of the goods or by arrangement.
(EU and third countries): Delivery is carried out DDU / EXW Oranienburg, INCOTERMS 2010. If no specification of the buyer is made, we determine the freight carrier and charge the buyer the shipping costs as well as all additionally incurred costs.

Payment:
From invoice date within 15 days net or by appointment.

Complaints:
Are possible within 8 business days after receipt of the goods.
In any case, they must be notified in writing.
The return of the goods is only permitted with our consent.
In case of justified defects, we have the choice between exchange of the goods, rework or reimbursement of the purchase price.
Complaints do not entitle the buyer to suspend his payment.
Any further damages claims of the buyer are excluded, as long as they are not caused by gross negligence or intentional. In case of gross negligence or intentional breach of our contractual or statutory obligations, our liability is limited to the foreseeable damage; we do not assume any liability for any defects.
Claims under the Product Liability Act are not affected by the above regulation.
If the price offer is obviously based on an incorrect price due to transmission errors or error, we are entitled to make a subsequent price correction. If the customer rejects this correction or if no agreement can be reached between the parties to the contract, we are entitled to a right of withdrawal at any time, as far as legally permissible.

Warranty:
Corresponds to legal requirements.
However, the guarantee / warranty of the manufacturer applies to commercial products.
The guarantee for the properties of the columns is limited to the conditions of the original test chromatogram.
AppliChrom ensures the quality of the AppliChrom HPLC / GPC columns under the following conditions:
- If a column does not function properly, AppliChrom will re-install the column or replace it without incurring any costs for the customer.
- In the case of return of columns, AppliChrom must first issue a return authorization. Defective products must be accompanied by a written declaration of the defect. A redemption only takes place under the following conditions: All columns must be checked upon receipt and AppliChrom must have all defects within 14 days after receipt of the column.
- Unless otherwise agreed, the warranty period is limited to a maximum of 90 days after delivery date.
- The guarantee for the properties of the columns is limited to the conditions of the original test chromatogram.

To void the warranty / guarantee:
- Removing or unscrewing the end fittings of the HPLC/GPC columns automatically voids column warranty.
- Physical damage to the column due to misuse or mishandling, including mechanical shocks.
- Damage to the stationary phase or the base material due to handling in the case of incorrect chemical conditions, unsuited solvent, temperatures or pressure conditions.
- Failure due to high backpressures caused by improper solvent and/or sample filtration practices causing particulate build-up or precipitation in the column or end-fitting.
- Incorrect selection of packing material made by customer for their particular use or incompatibility of equipment, etc.

Use restriction
Only for R & D as well as laboratory, not tested for pharmacy or medical diagnostics.
Buyer will not use AppliChrom's name in any publicity or advertising without AppliChrom's prior written approval.

Proprietary right of reservation exists until full payment of the goods.
Only place of performance and jurisdiction is Oranienburg/Germany.
We reserve the right to make technical changes.
Our company does not participate in a consignment procedure.

A general guarantee for the functionality with all analytes can not be given. In individual cases it is always advisable to discuss the issue with our product specialists. An application laboratory in Oranienburg is also available for your service. Please contact us.

Errors and changes excepted. Products for research and development. Not tested for clinical, diagnostic or food applications.

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