

# Seamless Solutions for Any Macromolecular Analysis Needs

Agilent InfinityLab GPC/SEC Solutions



# Seamless Solutions for Any Macromolecular Analysis Needs

The Agilent InfinityLab GPC/SEC portfolio offers the most comprehensive selection of products and services for macromolecule characterization. Simplify your GPC/SEC analyses with instruments, columns, standards, and software that work seamlessly together. If challenges arise, like needing training, Agilent also offers tailored expert services.

## See what's possible with the largest GPC/SEC portfolio

### Systems

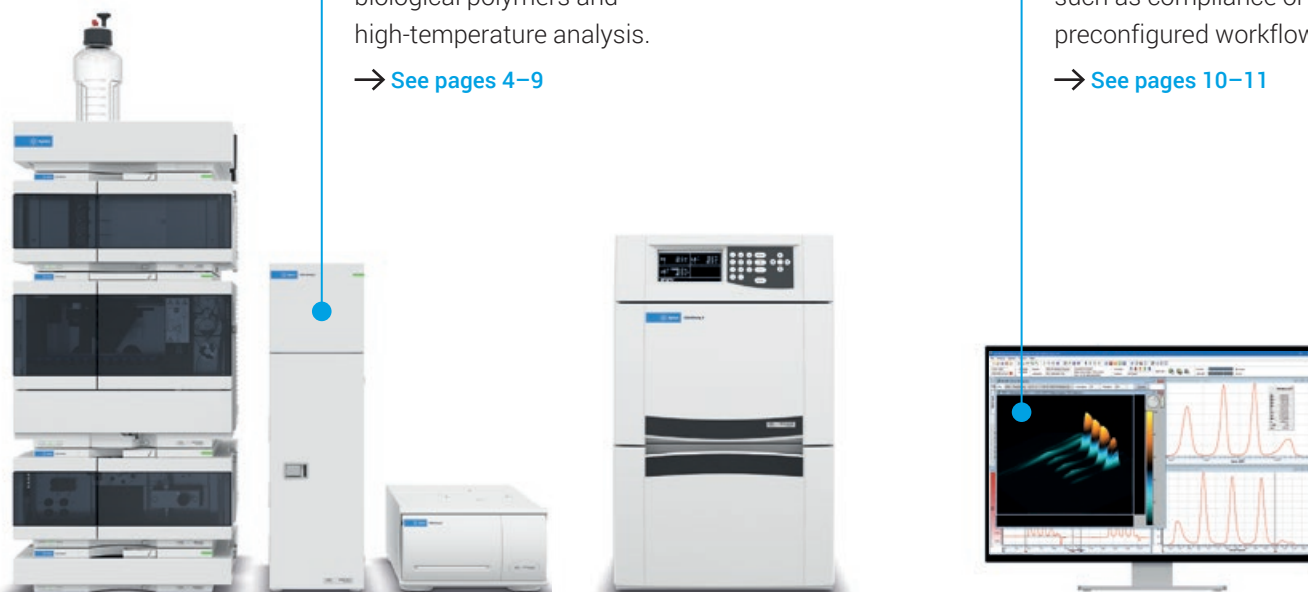
A range of robust systems is available, including for biological polymers and high-temperature analysis.

→ [See pages 4–9](#)

### Software

Specialized software offers flexibility to meet your needs, such as compliance or preconfigured workflows.

→ [See pages 10–11](#)



## Accurate results for any application

From routine analysis of polystyrene to complex engineering polymers, InfinityLab GPC/SEC Solutions offer the widest range of high-performance instruments, delivering highest sensitivity, baseline stability, and signal-to-noise ratio, even at high temperatures.



## Broadening our offerings for GPC/SEC analysis

In 2022, Agilent acquired Polymer Standard Services (PSS, Germany). The acquisition broadens and extends Agilent's product portfolio and customer offerings, particularly in the chemical and biopharmaceutical industries for the analysis of natural and synthetic polymers.

### Columns and Standards

A large selection of columns and standards enable any GPC/SEC analysis, from aqueous to organic.

→ See pages 14–17

### Services

Experts are available to offer dedicated analytical services for macromolecular characterization.

→ See page 18

### Sustainability

Instruments are verified for low environmental impact, from manufacture to use and end of life.

→ See page 19

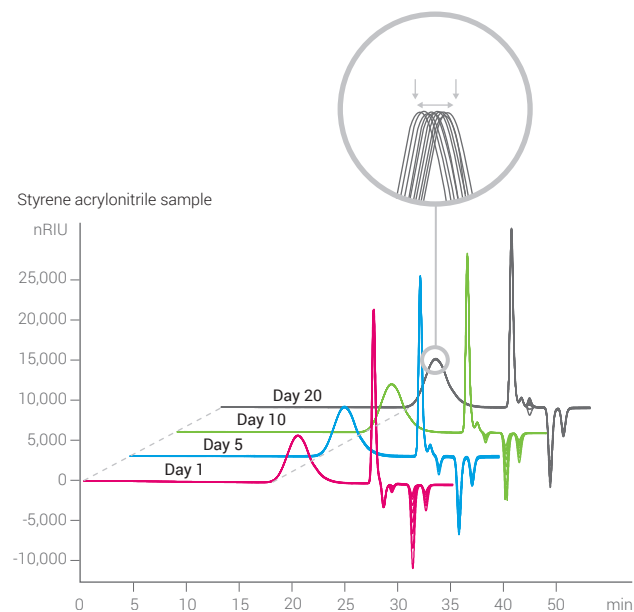


# Robust, Precise Performance for GPC/SEC Analyses

The 1260 Infinity II GPC/SEC System is ready to meet the needs of most macromolecular analyses. This versatile system combines proven Infinity II technology with specialized GPC/SEC instrumentation. The combination offers high performance with accurate results for GPC/SEC separations.

## High-precision retention times

Throughout the day and from day to day, the 1260 Infinity II GPC/SEC System provides excellent retention time reproducibility. Thermostating of the columns ensures minimal detector noise and baseline drift.



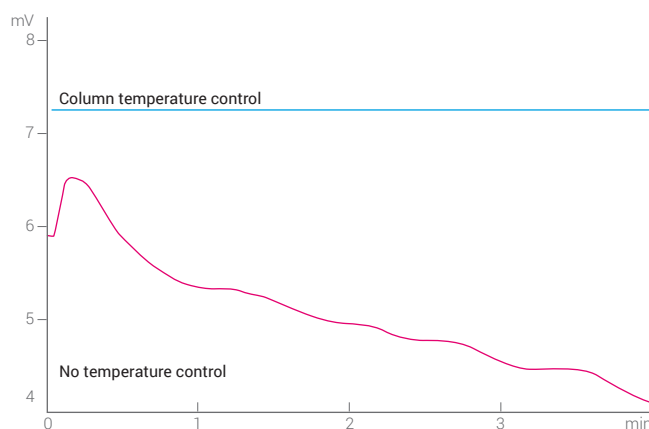
This overlay of 10 consecutive runs per day over 20 days shows the remarkable day-to-day precision of retention times.





### High-precision temperature control

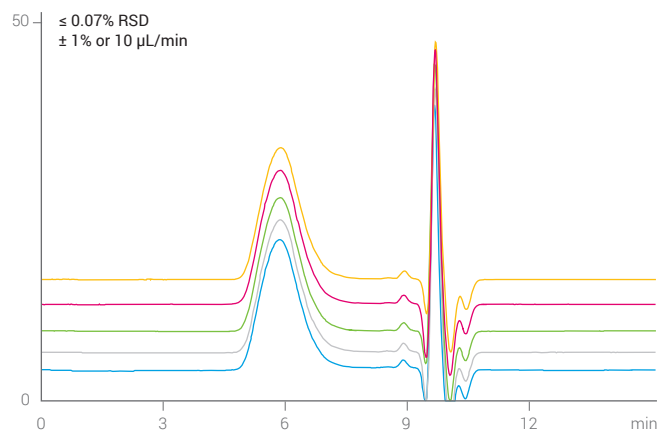
The 1260 Infinity II GPC/SEC Column Thermostat offers high capacity for 30 cm GPC/SEC columns with precise temperature control to ensure the most accurate, reproducible molecular weights. Both heating and cooling options are available to enable rapid column and detector equilibration for reliable results.



A stable baseline ensures accurate results.

### Robust precision that lasts

GPC/SEC often includes harsh additives and challenging solvents that might affect the entire flow path of the LC system. To maintain the excellent flow precision of the 1260 Infinity II Isocratic Pump, the GPC/SEC-Ready Kit offers peace of mind, ensuring accuracy in analytical and preparative GPC/SEC applications, even in the long run.



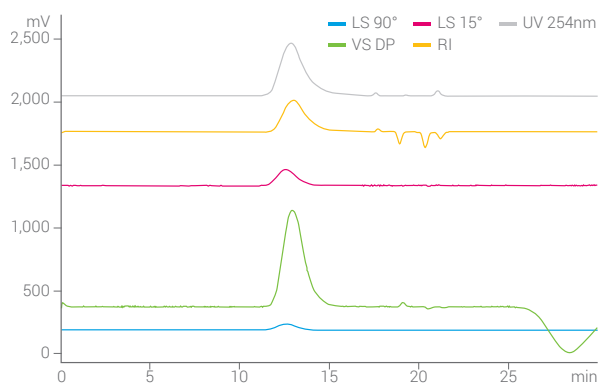
An accurate flow rate enables reproducible results. The value quoted has been calculated from analyses performed in THF at 40 °C.

# Improved Performance with Advanced Detection Techniques

To cover an array of macromolecular analytes, including biological polymers like proteins, Agilent offers a range of detection possibilities in the 1260 Infinity II Multidetector GPC/SEC System. Choose from refractive index, light scattering, and viscometry. The 1260 Infinity II Bio-SEC System additionally features a bio-inert flow path, which is ideal for the analysis of biological polymers when combined with the 1260 Infinity II Multi-Angle Light Scattering Detector.

## Advanced detection possibilities

The triple-detection in the 1260 Infinity II Multidetector GPC/SEC System delivers stable baselines and high signal-to-noise performance and enables determination of polymer properties that cannot be measured by conventional concentration-based detection techniques.



A low-dispersion setup and a 10  $\mu$ L cell for light scattering detection result in excellent peak shapes for all signals.



**BIO**

**BIO  
INERT**

For bioanalysis  
and beyond

InfinityLab LC Solutions can be adapted to meet all your bioanalysis needs and more. Biocompatible systems contain iron-free sample flow paths, while bio-inert systems feature sample flow paths that are free of metal.

### Multi-angle light scattering

Multi-angle light scattering is a powerful technique to gain insights about absolute molecular weight, size, and conformation of macromolecules in solution. With larger molecules, the scattered light is not independent of the detection angle. Adding the 1260 Infinity II Multi-Angle Light Scattering Detector to the 1260 Infinity II Bio-SEC System or 1260 Infinity II GPC/SEC System offers the possibility to measure the intensity of the scattered light at multiple angles to gain more precise and reliable data.

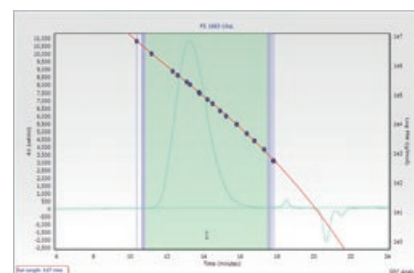
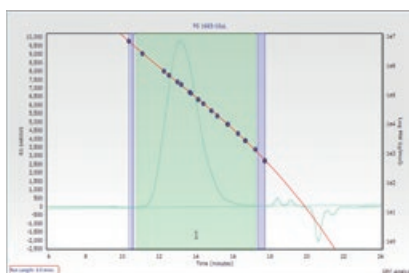


# Highest Resolution for Microscale to Analytical GPC/SEC Analyses

The Agilent 1290 Infinity II GPC/SEC System is capable of both analytical and microscale operation. The high-performance pump can operate at pressures up to 1,300 bar. Coupling with a 2  $\mu$ L low-volume refractive index detector (RID) and 0.075 mm tubing enables microscale operation. Key benefits include shorter run times for higher sample throughput, ultralow dispersion for improved resolution, and lower solvent consumption for reduced running costs.



## Accurate molecular weight



**Sample:** polystyrene 2  $\times$  mixed B,  
7.5  $\times$  300 mm  
**Flow rate:** 1 mL/min

**Column temperature:** 30  $^{\circ}$ C  
**RID temperature:** 35  $^{\circ}$ C  
**RI frequency:** 18.5 Hz

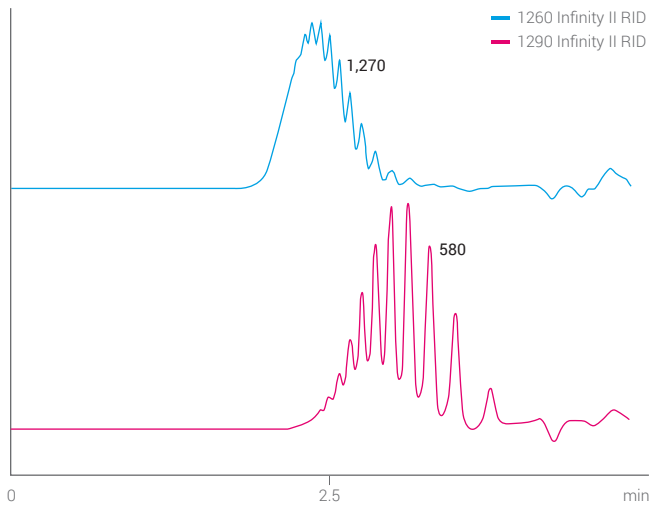
|                  | Mp      | Mn     | Mw      | PD   |
|------------------|---------|--------|---------|------|
| Micro RID        | 227,000 | 96,000 | 274,000 | 2.85 |
| Conventional RID | 224,000 | 97,000 | 270,000 | 2.77 |
| Ratio values     | 1.01    | 0.99   | 1.01    | 1.03 |

To use the same system for both analytical and microscale work, it is important that the two different scales deliver consistent results in terms of molecular weight. A comparison of results illustrates how, even at microscale, you can be sure that molecular weights are correct and consistent.\*

\*Data courtesy of H. Eghbali et al., Analytical Science, The Dow Chemical Company

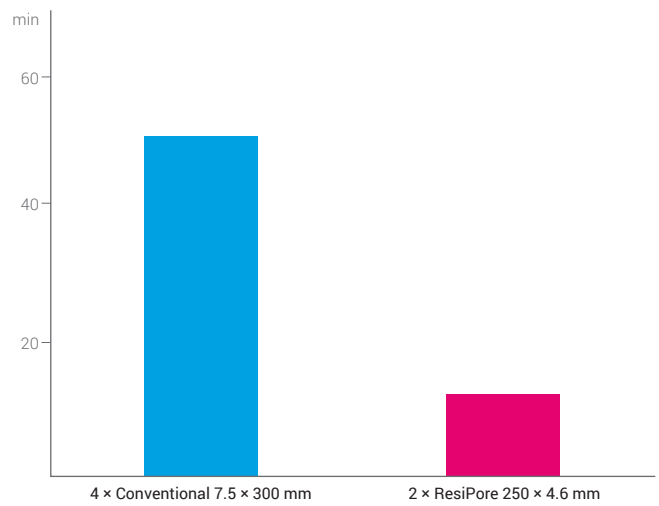


## Increase resolution



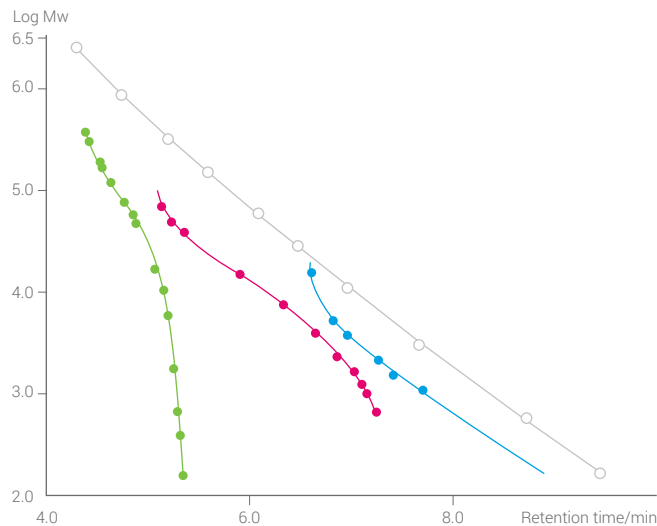
Used at microscale, the 1290 Infinity II RID has a low-volume detector cell and a reduced system delay volume relative to the 1260 Infinity II RID. This ultralow dispersion gives improved resolution, with the advantages of shorter run times and increased sample throughput.

## Reduce solvent consumption and run times



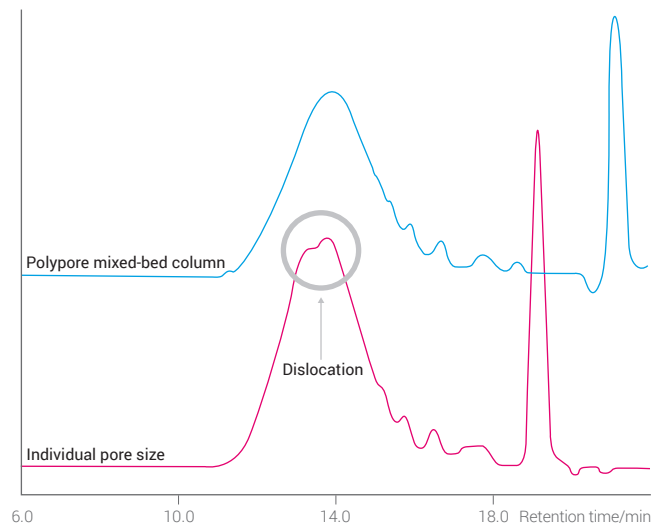
Flow rates can be increased for higher sample throughput. Using shorter, smaller internal diameter InfinityLab GPC/SEC columns with the 1290 Infinity II GPC/SEC System can reduce run times by up to 70%.

## Improve calibration



InfinityLab PlusPore columns feature mixed, multiporous stationary phases. These columns enable extremely linear calibrations. When coupled with the micro RID, it is possible to achieve excellent peak shapes and very high resolution.

## Retain peak shape

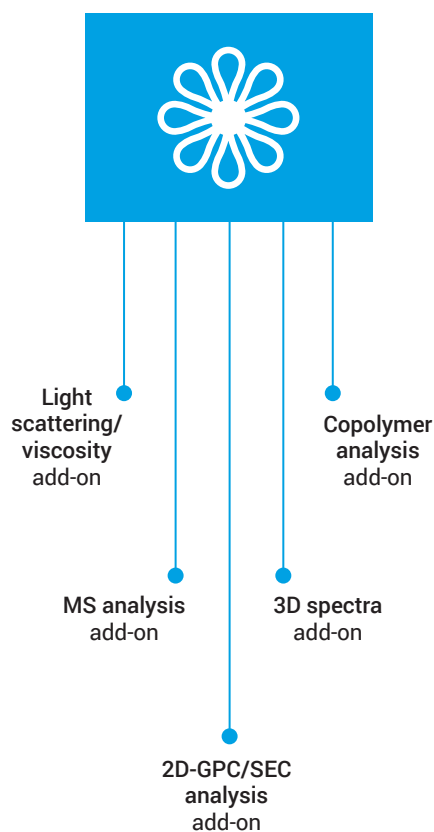


Serial connection of individual pore size columns, shear degradation, and adsorption to packing material can cause peak dislocations, peak tailing, and inaccurate results varying by as much as 10–20% from the true value. InfinityLab PlusPore columns can eliminate these issues.

# Tailored GPC/SEC Software for Your Workflows

Agilent offers the software for GPC/SEC analyses that fits your lab environment. WinGPC Software and the GPC/SEC Software for OpenLab CDS provide the functionality required for conventional and advanced GPC/SEC.

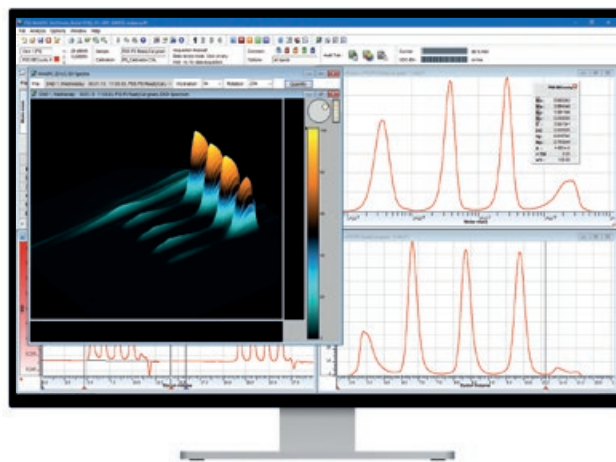
**WinGPC Software: most comprehensive software for macromolecular analysis**



**WinGPC: the one-stop solution for GPC/SEC**

WinGPC is developed by experts to cover all GPC/SEC workflows in a versatile, future-proof, and easy to use software. WinGPC Software is a complete software package that can include compliance and/or client/server capabilities. Whichever edition you choose, optional add-ons are available to suit your specific analysis and laboratory requirements.

Get precise and accurate results for your polymers and the data in the right format with WinGPC unique reporting and data display options. Identify potential for improvements in your workflows by integrating system and analyte run information.



Screenshot of the WinGPC Software showing a 3D contour plot of consecutive GPC/SEC runs.



### GPC/SEC Software for OpenLab CDS

OpenLab CDS features a compliant, versatile software package for both HPLC and GPC/SEC. Including all the functionality of OpenLab CDS for HPLC, it is combined with an add-on to process the collected data using GPC/SEC calculations.

This software has been designed to support two configurations. You can use it in a standalone workstation setup, or you can support multiple GPC/SEC systems within a client/server solution.

- Perform calculations on signals from concentration detectors (for example, refractive index and UV).
- Generate GPC column calibrations using narrow distribution standards or broad Hamielec and integral methods.
- Overlay data from samples, molecular weights, and distributions for comparison.
- Design your own reports to fit your individual needs, or simply use one of the predefined reports from the comprehensive range.



Screenshot of the GPC/SEC software for OpenLab CDS showing the chromatogram and molecular weight distribution for a polystyrene sample.

Agilent  
**OpenLab**

# The Industry Standard for Routine, High-Temperature Analysis of Engineering Polymers

The 1260 Infinity II High-Temperature GPC System with the 1260 Infinity II High-Temperature Sample Prep System gives you full confidence in data integrity and operator safety. Together, with a choice of optional detectors including light scattering, viscosity, and ELS detection, the system can provide comprehensive characterization of the polymer to be analyzed.



1260 Infinity II High-Temperature Sample Prep System

## Everything you need for sample preparation

A wide range of accessories, such as sample vials and filters, are available for the 1260 Infinity II High-Temperature Sample Prep System. Correct filtering of samples prior to analysis is vital to ensure high-quality results. This sample prep system includes a custom-built pipettor unit that allows for the filtration of samples at high temperature through either stainless steel or glass fiber filters with minimal user interaction.



1260 Infinity II High-Temperature (HT) GPC System

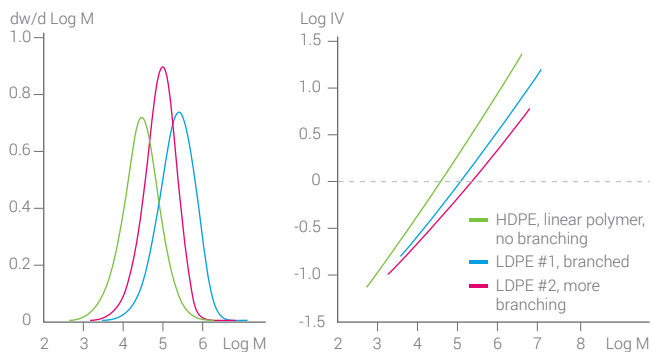
## Ultimate flexibility for high-quality HT GPC results

The 1260 Infinity II HT GPC System is a fully integrated solution. The dual-zone autosampler ensures your polymers are protected against degradation. When ready for analysis, the sample vial is transported to the oven for equilibration, ensuring stable baselines and reproducible results. The entire sample flow path can be heated up to 220 °C to maintain sample solubility, eliminating sample precipitation and costly downtime. Also, dual-angle light scattering or viscometry detectors give you flexibility to use the system in a wide range of GPC/SEC applications, especially polyolefin analysis.

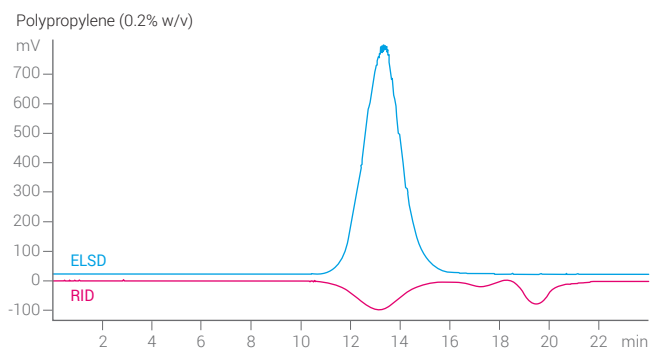
## Sensitive high-temperature evaporative light scattering detection

The 1260 Infinity II High-Temperature ELSD brings a new dimension to polyolefin molecular weight determination, detecting low concentrations of polyolefins (polyethylene and polypropylene) at elevated temperatures in high-boiling solvents.

Typically, an order of magnitude more sensitive than RID, high-temperature ELSD is ideal for polymers that require lower column loading to reduce the risks of degradation (such as ultrahigh-molecular-weight polyethylene, UHMWPE). Rapid equilibration times and excellent signal stability make selection of baselines and integration limits straightforward, improving accuracy and reproducibility of results.



Molecular weight distributions (left) and Mark-Houwink plots (right) for three different grades of polyethylene.



High-temperature ELSD can be significantly more sensitive than RID.



1260 Infinity II HT GPC System with 1260 Infinity II HT ELSD

# Complete Analytical Solutions from the Polymer/Macromolecule Analysis Experts

If you're seeking to improve your GPC/SEC analysis of macromolecules—or develop new applications for challenging polar or charged macromolecules—Agilent can help. Our GPC/SEC portfolio has expanded to include new columns and chemical standards for macromolecule applications. And, they're all backed by decades of characterization knowledge and expertise.



## High-quality columns

Agilent offers a comprehensive range of GPC/SEC columns that cover diverse applications and can be used with organic, aqueous, and polar solvents. These columns include high-quality PLgel, PL aquagel-OH, PolarGel, SUPREMA, NOVEMA Max, and GRAM, along with specialty columns for specific applications.



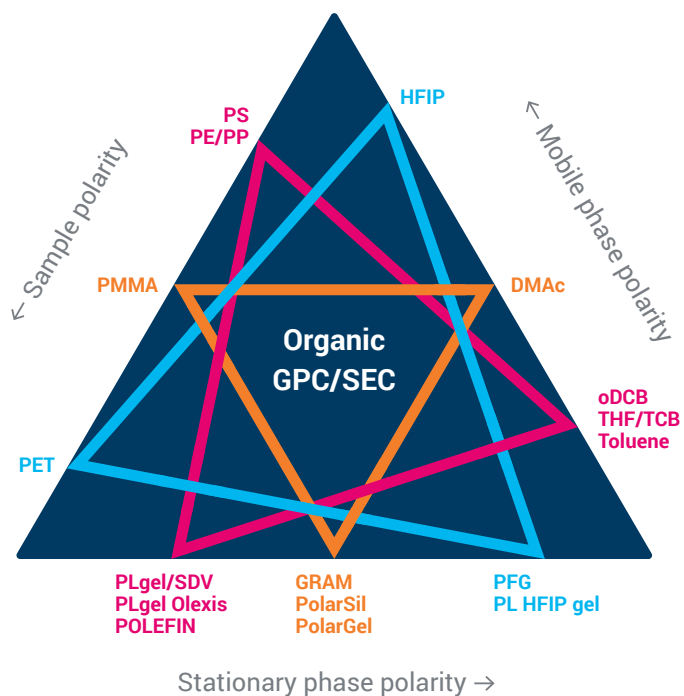
## Quality standards for successful calibration

Our standards are manufactured using ISO 9001 certification and are traceable with a unique batch number and a certificate of analysis, detailing the method and characterization results.

Options include:

- Individual molecular weight polymer standards in powder form
- Time-saving, prepared InfinityLab EasiVial and EasiCal standards as well as the ReadyCal and EasyValid validation kits
- Ultranarrow molecular weight standards, available in 1, 5, and 10 g quantities

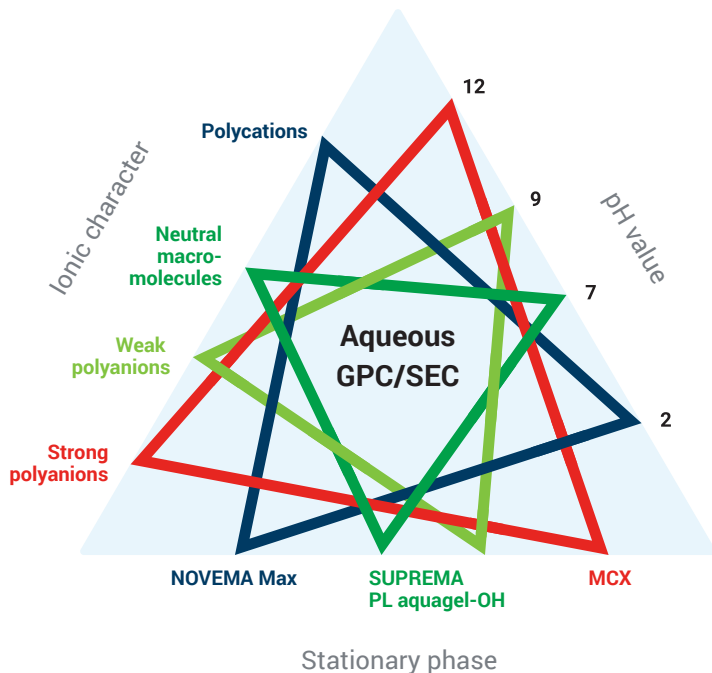
## Columns selection tips



### Organic-soluble polymers

- △ **Pink triangle:** Compounds only soluble in strong solvents, like THF
- △ **Orange triangle:** Compounds soluble in medium-polar solvents, like DMAc
- △ **Blue triangle:** Compounds soluble in higher-polar fluorinated solvents, like HFIP

**Note:** For organic applications, a system of balanced polarities is recommended.



To learn more and to access ordering information for the GPC/SEC columns and standards, go to:  
[www.agilent.com/chem/gpc-sec-columns](http://www.agilent.com/chem/gpc-sec-columns)

# Easy Reference Guide: Expanded Portfolio of Agilent GPC/SEC Columns and Standards

The expanded Agilent portfolio for polymer analysis delivers a complete solution that supports your unique analytical needs and ensures robust, reliable outcomes.

## Organic solvent-soluble polymers



Neutral Polymers,  
Polycarbonate,  
PVC

PL Rapide  
PLgel  
SDV  
PLgel MIXED  
SDV Linear  
SDV Lux  
PLgel MIXED-LS\*

– Individual pore sizes and mixed-bed or linear columns



Polycarbonates,  
Polyurethanes,  
Epoxy Resins,  
Polyester Resins,  
Siloxanes,  
Silicone Fluids

InfinityLab PolyPore  
InfinityLab ResiPore  
InfinityLab OligoPore  
InfinityLab MesoPore

– Next generation of InfinityLab GPC/SEC columns, available in smaller ids  
– New high-efficiency media with improved pore volumes  
– Maximizes overall separation performance in shorter run times with less solvent consumption



Nylons,  
Polylactides,  
Polyesters, PET

PL HFIPgel  
PFG  
PFG Lux\*

– Compatible with fluorinated solvents  
– Available in 5 µm particles for higher efficiency



Food Films,  
PE, PP,  
Polymers

InfinityLab PLgel Olexis  
POLEFIN

– High-temperature GPC  
– Particle and pore sizes optimized for analysis of large molecules in viscous eluents under demanding analysis conditions



Epoxy,  
Polyurethanes,  
Polysulfones,  
Celluloses

PolarGel  
PolarSil  
GRAM  
GRAM Lux\*

– Medium-polar organic solvents  
– PolarSil available in 3 µm particle sizes for higher efficiency



## Water-soluble polymers



Dextran, Saccharides,  
Hyaluronic Acid,  
Acrylates, Acrylamides,  
Heparin, Gum

PL aquagel-OH  
PL Multisolvant  
PL Rapide Aqua  
SUPREMA  
SUPREMA Lux\*

- Individual pore sizes and mixed-bed columns
- SUPREMA compatible with 100% organic modifiers



Sulfonated  
Polyanions,  
Lignins

MCX

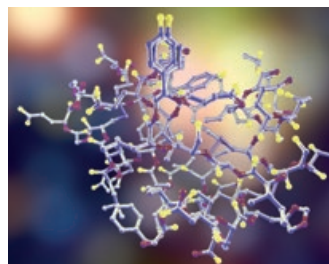
- Charged anionic polymers
- Robust at high pH
- Compatible with organic modifiers
- Available in 5 µm particle sizes



Chitosan,  
Food Ingredients,  
Cationic Polymers

NOVEMA Max  
NOVEMA Max Lux\*

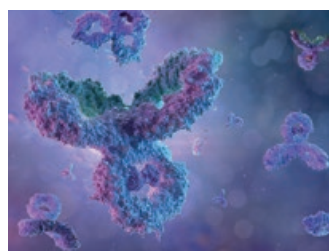
- Charged cationic polymers
- Robust at low pH
- Compatible with organic modifiers
- Available in 5 µm particle sizes



Proteins, Peptides,  
Enzymes

AdvanceBio SEC\*  
Bio SEC-3  
Bio SEC-5  
PROTEEMA  
PROTEEMA Lux\*

- Pore size options from 100 to 2,000 Å
- Options for UV, light scattering, and MS detection
- AdvanceBio SEC has a hydrophilic coating for low secondary interactions
- PROTEEMA Lux is a diol SEC phase available in bio-inert hardware



Monoclonal  
Antibodies  
(mAbs)

AdvanceBio SEC\*  
Bio SEC-3  
Bio SEC-5  
MAB\*

- Options for UV, light scattering, and MS detection
- AdvanceBio SEC has a hydrophilic coating for low secondary interactions
- MAB is a mixed-bed, diol SEC phase available in bio-inert hardware

\* Light scattering ready: low-noise columns suitable for immediate use with light scattering detection

## Focus On What You Do Best

At Agilent, we look for ways to optimize your lab's performance. That is why you can rely on us to provide the tools you need and protect your investment with a broad portfolio of services, backed by a global network of experienced Agilent-certified service professionals dedicated to the productivity of your lab.



### Service plans

The CrossLab services provide laboratories with comprehensive maintenance coverage to suit their specific needs and budget. We offer a range of service plans so that you can choose the level of coverage desired.



### Virtual tech support

Get live technical help via the latest video communication tools. Our Virtual Assist application uses a secure connection and supports digital annotations, enabling clear instructions for remote problem solving to reduce your downtime.



### The Agilent Service Guarantee

If we cannot fix an instrument covered by a CrossLab service plan, regardless of manufacturer, our escalation process will resolve the issue up to and including replacing your instrument for free.\*

\* Conditions apply.



### Compliance service

Agilent offers a comprehensive set of laboratory compliance services, including instrument operational qualification based on USP <1058>, analytical instrument qualification (AIQ), and custom validation services.



### Flexible payment plans

Considering flexible payment plans? Agilent can help you acquire your next instrument without the capital expenditure. We can design a payment plan that conserves cash and reduces the risk of instrument obsolescence.

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Greener GPC/SEC

## Get Your Results the Sustainable Way

Solvent consumption in GPC/SEC is substantial and may also involve environmentally harmful substances and additives in large volumes. To lower the environmental impact of your lab operations, smart instrument, column, and software choices are needed. Smaller dimension columns and smart injection methods, combined with InfinityLab LC instruments, can significantly reduce solvent consumption for your GPC/SEC analyses.



### Verified sustainability

The InfinityLab LC portfolio has received My Green Lab ACT (Accountability, Consistency, Transparency) labels after independent audits to verify environmental impact throughout the product life cycle.



### Ecofriendly software

By smart injection modes available in WinGPC Software, it is possible to save up to 30% of the solvent in your GPC/SEC analyses.



### Greener GPC methods

With micro-GPC methods, it is possible to achieve faster run times and lower solvent consumption at the same, or even better, polymer separation performance.

Learn more at:

[www.agilent.com/chem/my-green-lab](http://www.agilent.com/chem/my-green-lab)

## Reliable, efficient, always innovating for your best result

You can rely on Agilent InfinityLab LC instruments, columns, and supplies to deliver rugged quality and robust analytical results. But our promise to you does not stop there. Every component of the Agilent InfinityLab family is designed to work together to help you improve your workflow, increasing efficiency and reducing operational costs.

Learn more about InfinityLab: [www.agilent.com/chem/infinitylab](http://www.agilent.com/chem/infinitylab)

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