

Agilent CE and CE/MS Solutions

## FLEXIBILITY AND RELIABILITY TO AMPLIFY YOUR FINDINGS



Agilent Technologies

## SOLUTIONS FOR CAPILLARY ELECTROPHORESIS

Agilent Technologies has maintained more than 20-years commitment to developing instrumentation and solutions for CE. Our experience with this technology has resulted in a constant progression of technological improvements in instrumentation and has facilitated the development of high-performance consumables and kits.

### **The Agilent 7100 CE System – a Flexible and Reliable Platform for Your Analytical Challenges**

The Agilent 7100 Capillary Electrophoresis system represents the culmination of successful engineering, merging the expectations and needs of thousands of customers seeking sophisticated separation and rugged routine analysis. Throughout its development, this instrument has been conceived for usability, ease of method development and maintenance, and the flexibility to enable any CE-type experiment. Customer support across varied applications has guided each design decision, ensuring the availability of high-quality consumables, reagents kits and methods, and a wealth of literature covering basic primers as well as specific application notes.

### **For combined CE and CE/MS analysis, Agilent provides a complete and truly integrated single-vendor solution comprising:**

- Trusted and proven Agilent instrumentation and accessories
- A single standard software package to control all instruments in the system
- A substantial portfolio of applications, kits, and consumables
- Industry-leading service and support

The Agilent 7100 CE system is completely embedded in the main Agilent software packages. This avoids added software cost and training, giving you a head start into CE and CE/MS. The widely used Agilent OpenLAB CDS (ChemStation Edition) is familiar to users of Agilent GC and HPLC systems, and Agilent MassHunter is a key part of all sophisticated Agilent MS systems.

## THE ONLY SINGLE-VENDOR SOLUTION FOR FULLY INTEGRATED CE/MS

Agilent provides valuable technologies for every facet of CE/MS, from high-sensitivity detection to interfaces that provide simplified coupling of the systems. The Agilent 7100 CE system can be connected directly to any of the Agilent 6000 Series MS systems, with full control of CE and MS from a single PC.

### Amplify Your Findings through Orthogonal High Separation Power and MS Confidences

The Agilent CE/MS interface uses a triple-tube sheath-liquid technique to provide a stable electrospray and controlled flow rate, even in unattended sequences. This technique additionally decouples chemistries required for ideal CE separation from the chemical needs for efficient MS ionization of the target compound. This interface has provided years of robust service for scientists all over the world.

Learn more: [www.agilent.com/chem/cems](http://www.agilent.com/chem/cems)

### Features of Agilent CE/MS solutions:

- Full Agilent Series 6000 MS portfolio available – Single Quad, Triple Quad, TOF, and QTOF
- Triple-tube interface to optimize separation and MS ionization – no compromises
- Range of ion sources available – standard ESI and Agilent Jet Stream thermal gradient focusing technology, as well as APPI and APCI on demand
- Flexibility on additional detectors – UV-DAD, LIF, and CCD can be used in parallel to MS
- Sensitivity for small molecules down to the ppt range – by using iFunnel-equipped instruments
- Standard Agilent MassHunter software to control the complete system – one software, one workstation
- Single-vendor solution – integrated system and single-source support



## THE ONLY SINGLE-VENDOR SOLUTION FOR FULLY INTEGRATED CE/MS

Agilent provides valuable technologies for every facet of CE/MS, from high-sensitivity detection to interfaces that provide simplified coupling of the systems. The Agilent 7100 CE system can be connected directly to any of the Agilent 6000 Series MS systems, with full control of CE and MS from a single PC.

### Industry-leading Analysis Capabilities

The 7100 CE system fits seamlessly into the portfolio of reliable Agilent analysis tools. Proven Agilent 1200 Infinity Series LC technology including fast electronics, a highly sensitive Diode Array Detector, and standard Agilent software packages such as OpenLAB CDS (ChemStation Edition) and MassHunter easily extend the capabilities of your laboratory environment.

Learn more: [www.agilent.com/chem/ce](http://www.agilent.com/chem/ce)

### Features of Agilent CE/MS solutions:

- Highest sensitivity for UV analysis – 1200 Infinity-type Diode Array Detector included
- Extended UV sensitivity – Agilent Extended Light Path (“bubble” cell) capillaries and high sensitivity cell options
- Easy and quick access to capillaries – Air-cooling avoids liquids and sealing
- Flexibility on external detectors – analog in/out, A/D-converter, import signals to software
- Only single-vendor solution for CE/MS – integrating CE, interface, MS and single software package
- Agilent replenishment system – high-throughput and unattended automation for highest reproducibility
- Reduced cost of ownership – long lifetime parts and consumables, quick access for maintenance



## Designed for performance and ease-of-use

Engineering excellence and rigorous industrial design principles were employed alongside scientific expertise in order to push CE performance to its limits, while maximizing usability in both routine and sophisticated analytical experiments.

## Getting the Most from Your Investment



Capillary cartridge with alignment interface for UV-DAD

### Fast and safe capillary handling

Fused silica capillaries of various lengths can be exchanged in minutes inside a convenient cassette with sliding mechanism. As no liquid cooling is required, capillaries can be exchanged easily avoiding any sealing concerns. Automatic alignment of the detector window within the correct optical slit provides reproducible data with any capillary.



Convenient access for maintenance

### Maintenance made easy

A modular design allows major parts of the machine to slide out, providing easy access for maintenance and service.



Autosampler carousel with vial sensor and inlet/outlet lifts

### Automation with seamless access

An autosampler design that is accessible even during runs. Holds and exchanges vials or samples, and empties and refills buffers in unattended mode using the Agilent replenishment system.



Direct connectors for external devices

### Connectivity

Access to external detectors is facilitated via analog in/out connections, fast electronics, and the capability to import external signals into OpenLAB software.



High sensitivity cell providing maximum path length for detection

### Enhancing UV sensitivity

Increasing path length without degrading resolution is key to CE sensitivity; Agilent's unique bubble cell capillary provides 3x or 5x greater sensitivity. For even further enhancements, a 1.2 mm path length high-sensitivity cell is also available.

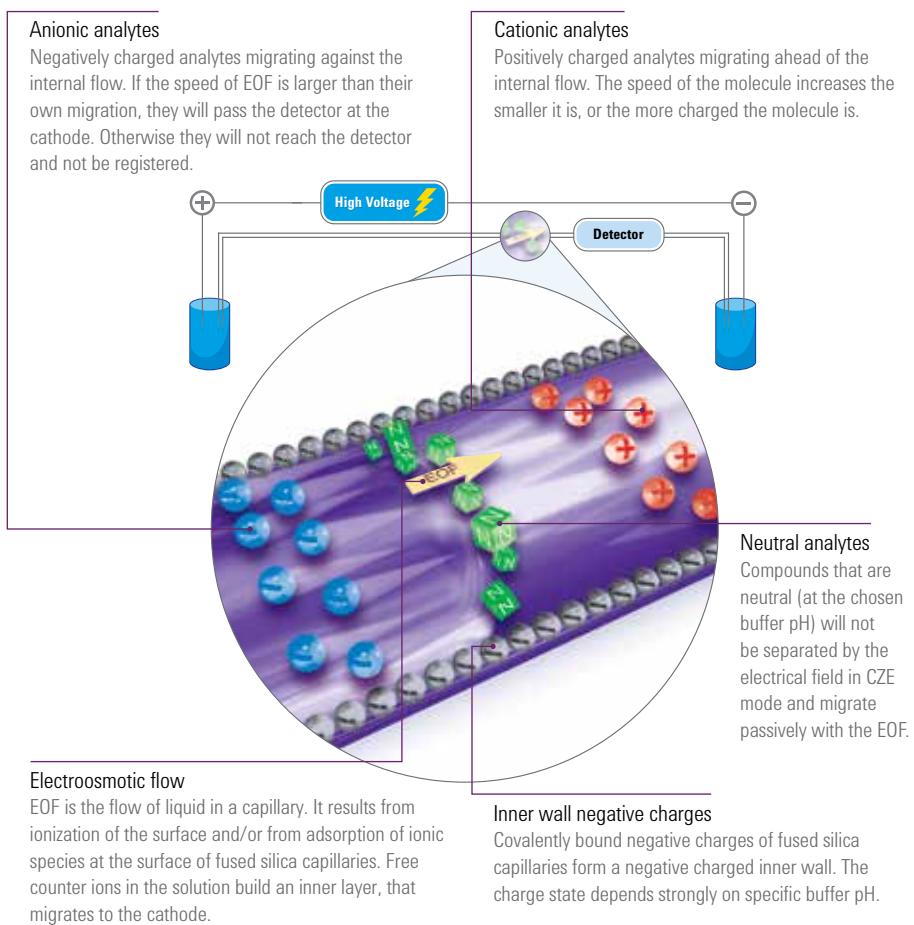
# A PERFECT TOOL FOR CHARGED COMPOUND ANALYSIS

Capillary electrophoresis (CE) offers fast separations with exceptional efficiency and resolution for charged substances ranging from inorganic ions to large polymers or proteins. Separations that are often difficult to achieve with liquid chromatography can be done easily – while using a different separation principle provides an additional orthogonal data set based on compound mobility (mass/charge) in an electrical field. CE also excels where sample amounts are very limited and requires much less solvent than liquid or ion chromatography.

## Features of Capillary Electrophoresis:

Typically performed in narrow 25-100 µm ID capillaries (mostly fused silica) under high electrical fields (up to 30 kV), CE enables efficient separation reducing Joule heating.

- High resolution separations of charged or polar molecules – up to  $N > 10^5$  to  $10^6$
- Various electrophoretic techniques – separate based on mobility, pI value, size, or hydrophobicity
- Smallest sample volumes – only a few µL total, with injection of nL volumes
- Minimal sample preparation required – no stationary phase means less risk of adsorption
- Low consumption of sample and buffer – only few mL of (usually) aqueous buffers



Mobility-based separation of charged compounds in an electrical field. A superimposed electroosmotic flow inside a fused silica capillary also moves neutral compounds to the cathode and point of detection.

## CE SEPARATION MODES

# ONE INSTRUMENT FOR A WIDE RANGE OF USES

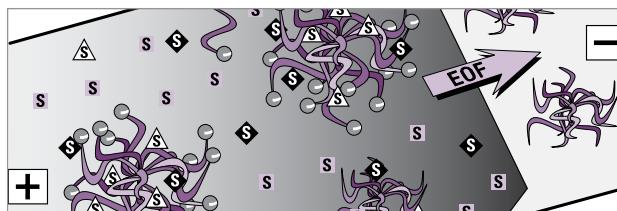
The versatility of capillary electrophoresis is derived from its unique underlying principles and numerous modes of operation. The Agilent 7100 CE system was built as an analytical platform to provide easy access to all possible capillary electrophoresis modes and applications.

### The Versatility of CE – from Inorganic Ions to Protein Analysis



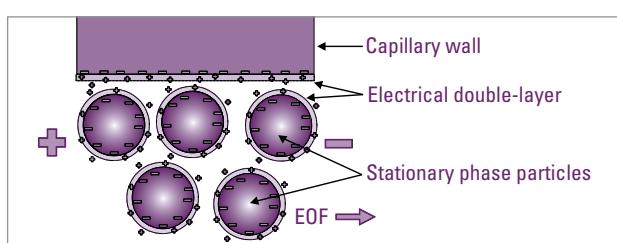
Capillary zone electrophoresis (CZE)

CZE is the simplest form of CE. In CZE, a capillary is filled with an electrolyte (run buffer), the sample is introduced at the inlet, and the electrical field is applied.



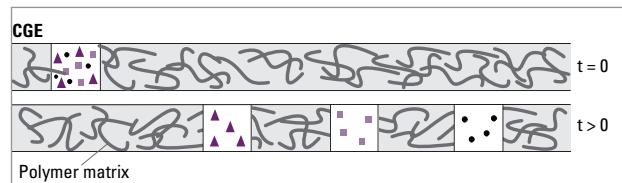
Micellar electrokinetic chromatography (MEKC)

MEKC – a hybrid of electrophoresis and chromatography – is a widely practiced CE mode in bio-pharmaceutical analysis and also in small molecule analysis. It is the only electrophoretic technique that can be used for the separation of neutral solutes as well as charged ones.



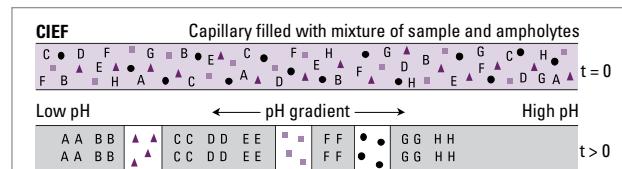
Capillary electrochromatography (CEC)

CEC is a form of miniaturized liquid chromatography that uses an electric field to pump liquid through a packed chromatography column by EOF, providing very high plate numbers.



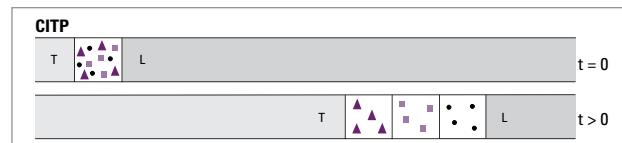
Capillary gel electrophoresis (CGE)

CGE is ideal for size-based separation of macromolecules such as proteins and nucleic acids. As charged solutes migrate through the polymer network they become hindered, larger solutes more than smaller ones. Macromolecules such as DNA and SDS-saturated proteins cannot be separated without a gel, since they have invariable mass-to-charge ratios.



Capillary isoelectric focusing (CIEF)

CIEF is a “high resolution” electrophoretic technique used to separate peptides and proteins on the basis of their isoelectric point (pI). CIEF can be used to separate proteins that differ by  $\approx 0.005$  pI units.



Capillary isotachophoresis (CITP)

CITP is a “moving boundary” electrophoretic technique where a combination of two buffer systems is used to create a state in which the solutes all move as separate but connected bands and at the same velocity. The zones remain sandwiched between so-called leading and terminating electrolytes. In a single CITP experiment, either cations or anions can be analyzed. Stacking effects by ITP can be used to enhance analytical sensitivity.

Download CE primer from

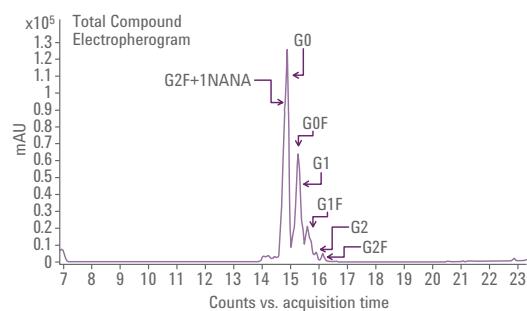
[www.agilent.com/chem/library](http://www.agilent.com/chem/library)

Search for publication number 5990-3777EN

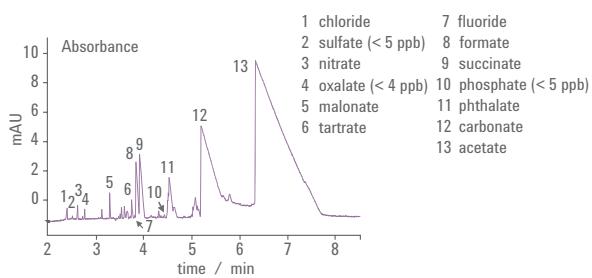
# A WEALTH OF APPLICATION OPTIONS

Flexible access to instrumental parameters allows users to easily reproduce any application or optimize their own methods as needed. The open-platform approach allows flexible integration with Agilent MS or 3rd-party detectors, extending usability for enhanced analytical sensitivity and specificity.

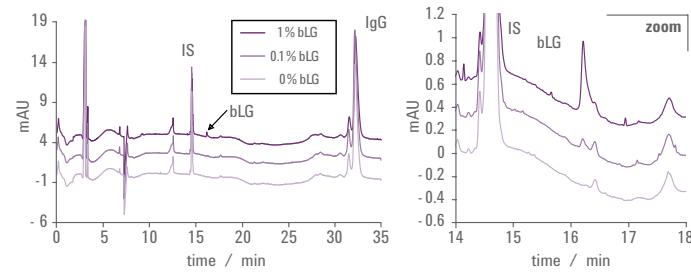
## CE Covers a Huge Range of Chemistries – the Agilent 7100 CE System Can Do It All



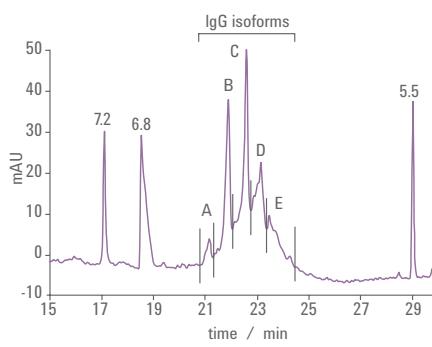
**Figure 1.** CE/MS of APTS labeled N-glycans released from mAb.  
Download application note from [www.agilent.com/chem/library](http://www.agilent.com/chem/library)  
Search for publication number 5991-1020EN



**Figure 2.** Trace anion determination in semiconductor-grade H2O2.  
Download application note from [www.agilent.com/chem/library](http://www.agilent.com/chem/library)  
Search for publication number 5990-3392EN



**Figure 3.** Low-level impurity detection with IgG samples.  
Download application note from [www.agilent.com/chem/library](http://www.agilent.com/chem/library)  
Search for publication number 5990-7976EN



**Figure 4.** Monoclonal antibody isoform quantitation.  
Download application note from [www.agilent.com/chem/library](http://www.agilent.com/chem/library)  
Search for publication number 5991-1142EN

# NANOFLOW PROTEOMICS

When ultimate analytical sensitivity is required, nanoflow LC/MS using very small bore columns and nanoelectrospray (nanoES) provides the best results. Agilent offers a flexible nanoESI source and the Nanodaptor kit to enable nanoflow chromatography using an Agilent 1290 Infinity system.

## Standard Software Packages Integrate CE into Your Laboratory

Agilent OpenLAB CDS (ChemStation Edition) provides the standard software that is familiar in thousands of LC, GC, and CE labs. Whether you are using CE with UV-DAD or CE with an Agilent Single Quadrupole MS system, this software provides a convenient, complete package for qualitative and quantitative work.

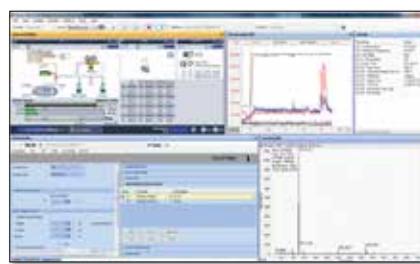
Agilent Lab Advisor expands this software with valuable diagnostic tools for checking and ensuring performance and data quality.

Agilent MassHunter software supports all Agilent 6000 Series TOF, QTOF and QQQ MS instruments and is required for integration with CE. Since MassHunter covers both LC and CE, switching between LC/MS and CE/MS is easily achieved, as both applications are controlled through the same workstation and software.



## OpenLAB CDS (ChemStation Edition)

Standard 7100 CE system instrument control and data analysis software can be extended to control Agilent 6000 Series Single Quadrupole MS system.



## Lab Advisor

Instrument diagnostics package for 7100 CE system providing additional features and tools over the basic diagnostic toolset.

## MassHunter Data Acquisition

Version B.05.01 and higher includes 7100 CE system instrument control in addition to standard 1200 Infinity Series HPLC instrument control for all Agilent 6000 Series TOF, QTOF and QQQ MS instruments.

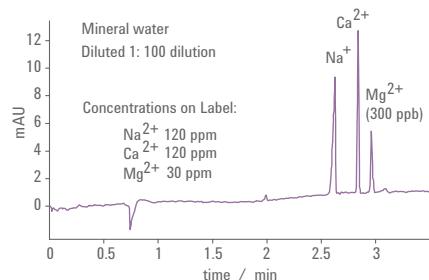
## A QUICK START TO RELIABLE DATA

Agilent offers a wide range of high-quality consumables for CE. This method places stringent requirements on purity and precision as regards factors such as buffer concentration and pH; nanoliter injection volumes require perfectly cut capillaries, while sensitive UV detection relies on reproducible bubble-cell capillaries. Agilent provides all these and more within their comprehensive CE consumables portfolio.

### Agilent Proven Kits Include Reagents and Methods Optimized for Success

Solution kits for CE are complete sets providing ready-to-use methods and reagents. These kits provide a perfect entry into CE technology, ensuring immediate success with specific applications without the need for method development. Bring high reproducibility, speed, and confidence to day-to-day routine ion analysis with these Agilent kit solutions:

- Cation Solutions Kit
- Inorganic Anion Solutions Kit
- Forensic Anion Solutions Kit
- Organic Acids Solutions Kit



**Figure 5.** Inorganic cation analysis by CE is fast and simple using predefined kits.



Download consumables catalogue  
[www.agilent.com/chem/library](http://www.agilent.com/chem/library)  
 Search for publication number  
 5990-3822EN

## MAXIMUM VALUE FROM YOUR INVESTMENT

To ensure the ongoing performance of your analytical laboratory and to maximize the value of your investment, Agilent provides a comprehensive range of service plans. With coverage for both Agilent and non-Agilent equipment, our service agreements can help you control costs, increase productivity, and benefit from our global network of expert service professionals to meet your strategic objectives.

### Choose the Plan That's Right for You

	Agilent Advantage			Repair Service
	GOLD	SILVER	BRONZE	
<b>Services Included in All Advantage Agreements</b>				
Agilent Service Guarantee	✓	✓	✓	✓
Contract-level Preferred Response vs. T&M	Priority	Standard	Standard	✓
Hardware Telephone Support	✓	✓	✓	✓
Software Telephone Support	✓	✓	✓	✓
<b>On-site Repair Services</b>				
Unlimited On-site Repair Visits (travel & labor)	✓	✓	✓	✓
Parts Required for Repair	✓	✓	✓	✓
Consumables/Supplies Required for Repair* including liners, seals, tubing, assemblies, lamps and multipliers	✓	✓	✓	✓
<b>Maintenance Services</b>				
Annual On-site Preventive Maintenance	✓	✓		
<b>Advanced Diagnostics and Reporting</b>				
Agilent Remote Advisor-Assist**	✓	✓	✓	
Agilent Remote Advisor-Report**†	✓	✓	✓†	
Agilent Remote Advisor-Alert**	✓	✓		
<b>High Availability Services</b>				
Extended Coverage Hours Discount	✓			
<b>Compliance Services (Optional)</b>				
Discount when Bundling Operational Qualification (OQ)	✓	✓		
Guaranteed Pass OQ	✓	✓		
Discount when Bundling Re-qualification (RQ)	✓	✓		

### Agilent Advantage Gold

#### When your lab simply can't afford downtime.

Priority response coverage for high throughput labs that need mission-critical systems up and running at all times.

### Agilent Advantage Silver

#### If optimizing lab productivity matters to you.

Ideal if you do not require the priority response of Gold, but want complete annual coverage to keep your system and lab operating at the highest levels.

### Agilent Advantage Bronze

#### For keeping costs under tight control.

A convenient way to protect your budget from surprise repair costs by covering unlimited telephone and on-site support plus all parts and consumables required to get your system back online.

\* Per local parts replacement policy.

\*\* Where available. Installation required. Installation fees waived when connecting minimum number of systems.

† Selected reports available.

Learn more

**[www.agilent.com/chem/ce](http://www.agilent.com/chem/ce)**

**[www.agilent.com/chem/cems](http://www.agilent.com/chem/cems)**

Buy online

**[www.agilent.com/chem/store](http://www.agilent.com/chem/store)**

Find a local Agilent customer center

in your country

**[www.agilent.com/chem/contactus](http://www.agilent.com/chem/contactus)**

USA and Canada

**1-800-227-9770**

**[agilent\\_inquiries@agilent.com](mailto:agilent_inquiries@agilent.com)**

Europe

**[info\\_agilent@agilent.com](mailto:info_agilent@agilent.com)**

Asia Pacific

**[inquiry\\_lsca@agilent.com](mailto:inquiry_lsca@agilent.com)**

For Research Use Only. Not for use in diagnostic procedures.

This information is subject to change without notice.

© Agilent Technologies, Inc. 2017

Printed in the USA May 31, 2017

5991-1511EN



**Agilent Technologies**