

Guide to Capillaries, Reagents, and Supplies for **CE** and **CEC**

Maximize your CE and CEC System and
experience greater laboratory uptime



Agilent Technologies

Your Link to Success – Agilent Technologies Capillary Electrophoresis Capillaries, Reagents, Solutions Kits, and Supplies

Agilent Technologies, a world leader in capillary electrophoresis (CE) technology, is committed to helping you improve the quality of analyses by offering application solutions, simplifying the use of software and instrumentation, an offering unsurpassed technical support. Agilent recognizes that CE solutions may begin with the equipment, but Agilent doesn't stop there.

Agilent provides everything you need for successful separations in CE and CEC including solutions kits, uncoated, coated and packed capillaries, reagents and buffers, supplies and spare parts. The new 2002-2003 Agilent Chromatography and Spectroscopy Supplies Reference Guide provides a complete list of all supplies to keep your lab operating at maximum efficiency.

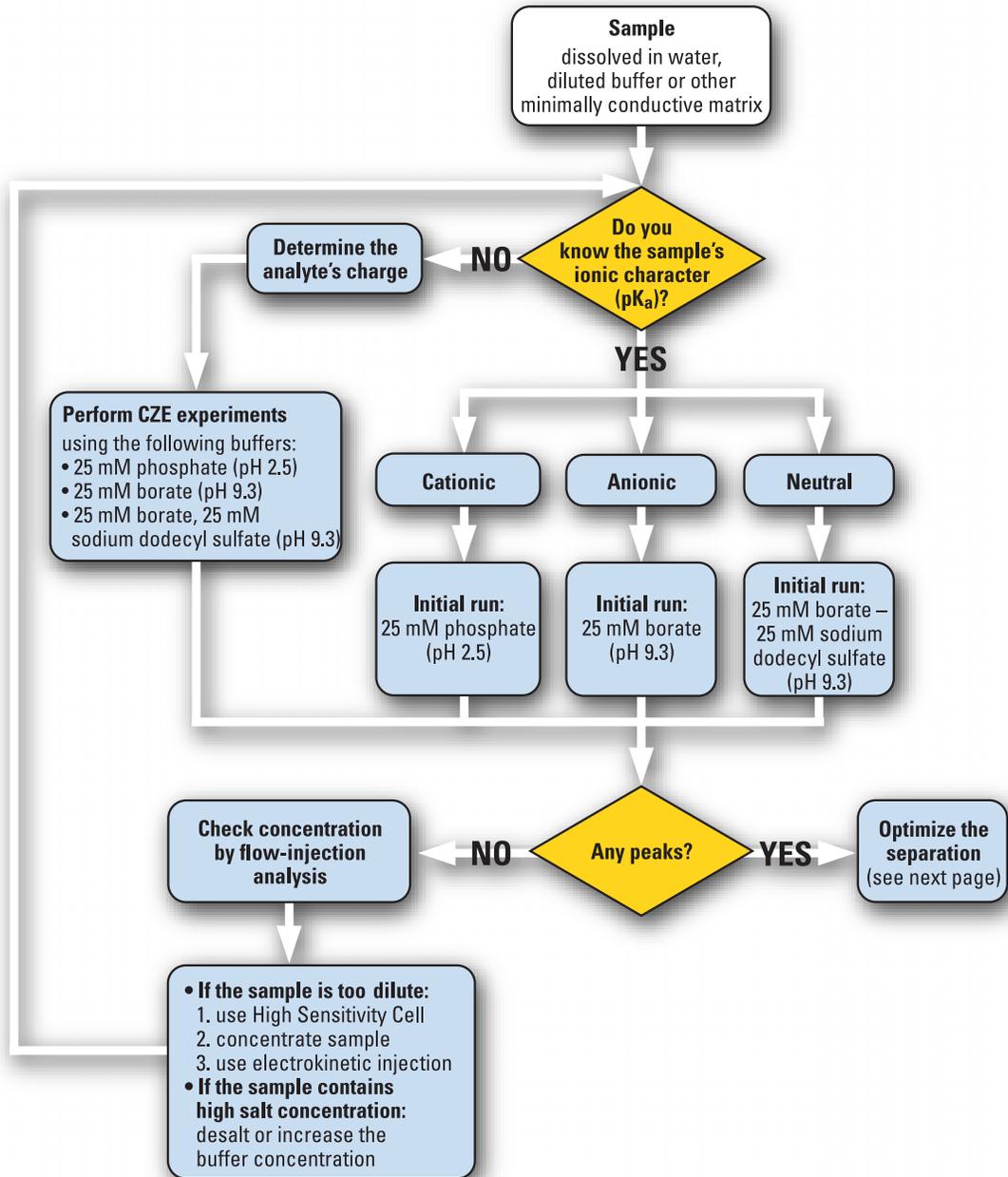


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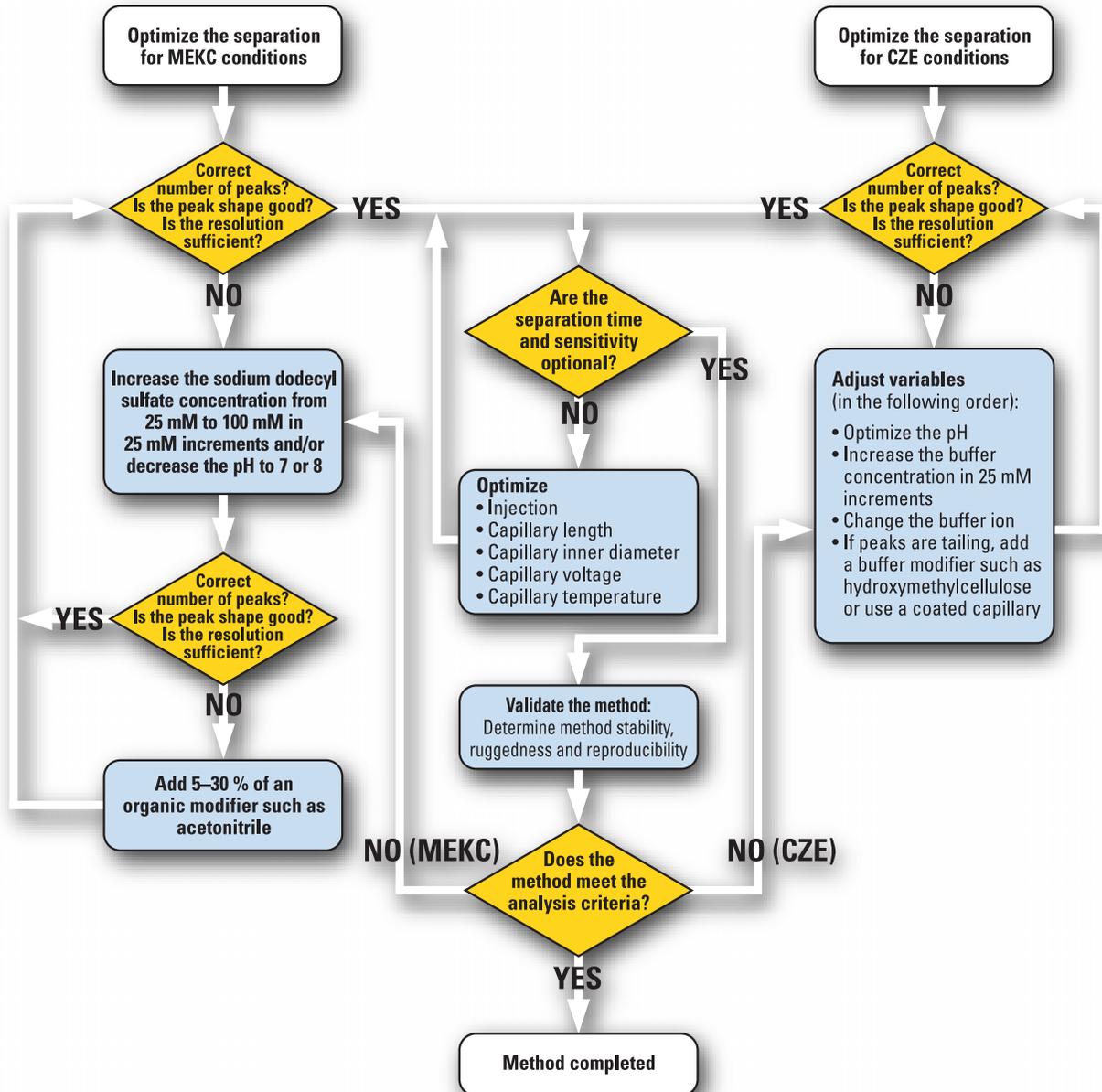
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CE Method Development



CE Method Optimization



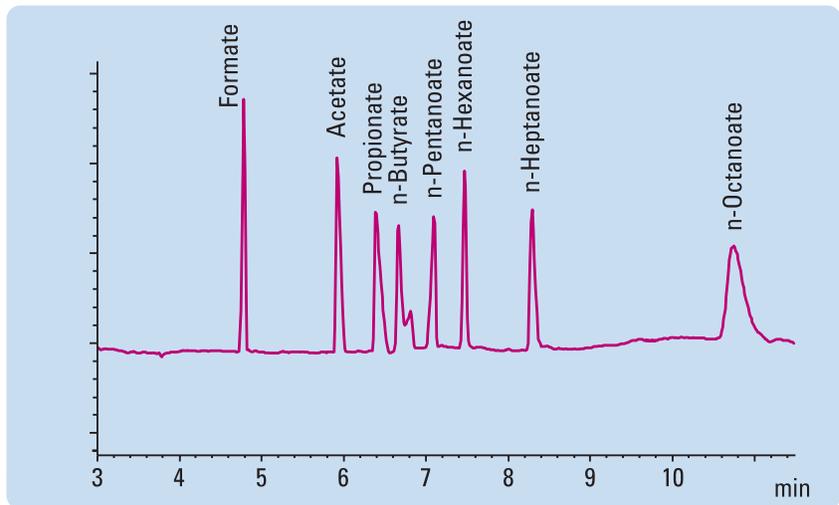
Solutions Kits for CE

Agilent continues to introduce new CE solutions kits designed to simplify many of your applications:

- plating bath solution
- forensic anions
- cations
- inorganic anions
- organic acids
- μ PAGE kits for high resolution DNA fragments analysis

These kits include all you need to begin your CE analyses: buffers, capillaries, conditioning solutions, test samples, methods, and detailed descriptions. Each kit is designed to take advantage of the automation of the Agilent CE system to make your time in the laboratory more efficient. All kits are prepared using the same quality procedures as for our buffers and are thoroughly tested and supported.

While the kits have been optimized for use with the Agilent CE system, they may be used with virtually any commercial or home-built CE system.



Separation of short-chain carboxylic acids using the Organic Acids Solutions Kit



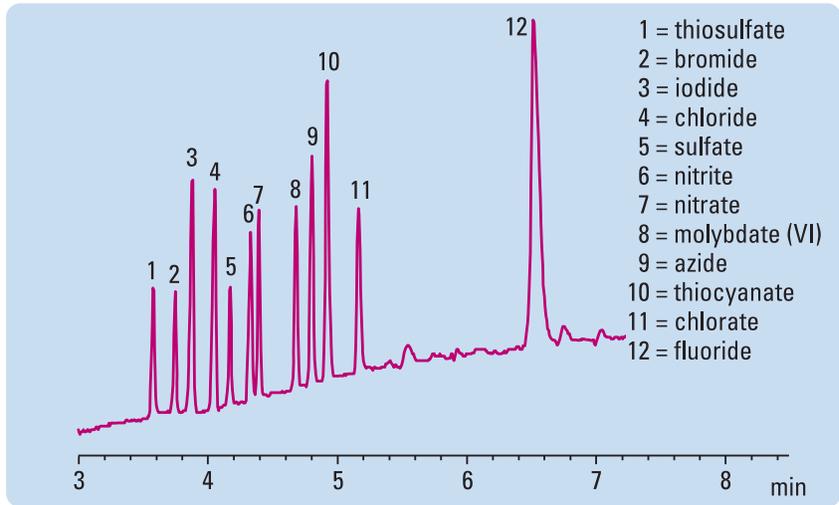
Solutions Kits for Small Ions

Inorganic Anion Solutions Kit

The Inorganic Anion Solutions Kit contains all components needed for the analysis of common inorganic anions such as chloride, bromide, iodide, fluoride, sulfate, and phosphate. Applications include the analysis of inorganic ions in:

- ultra-pure water
- waste water
- high purity chemicals
- drug formulations
- pulp and paper solutions
- semiconductor solutions

Using an indirect-UV detection system optimized for small anions, analyses are sensitive and rapid, and provide an alternative to traditional ion chromatography. The kit contains the buffer, capillaries, test mixture, and instructions.



Separation of common anions

Inorganic Anion Solutions Kit

| Component | Quantity | Part Number |
|---|----------|------------------|
| Inorganic Anion Solutions Kit | 1 | 5063-6511 |
| Buffers and Solutions | | |
| Inorganic anion buffer | 250 mL | 8500-6797 |
| Ultra pure water for CE | 500 mL | 5062-8578 |
| 0.1 N NaOH | 250 mL | 5062-8575 |
| 1.0 N NaOH | 250 mL | 5062-8576 |
| Capillary | | |
| Bare fused silica capillary, 50 µm id, L = 80.5 cm | 2/pkg | G1600-62211 |
| Test Mixture | | |
| Anion standard contains: 1000 ppm each of fluoride, chloride, bromide, nitrite, nitrate, sulfate; and 2000 ppm phosphate | 10 mL | 5062-8524 |
| Other Components | | |
| Product literature | 1 | 5968-9050E |

Note:

the following part should be ordered separately when used with the Agilent CE System: Alignment Interface for standard 50 µm i.d. capillary (color code: green) Part Number: G1600-60210



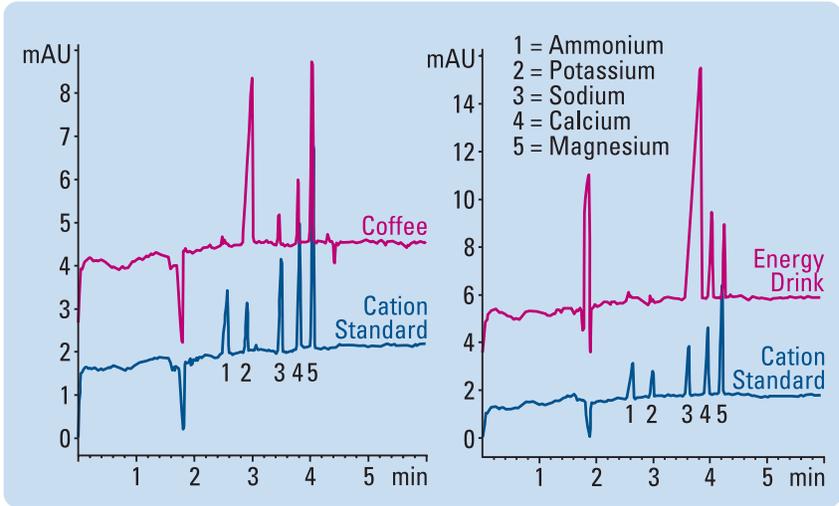
Solutions Kits for Small Ions

Cation Solutions Kit

The new Cation Solutions Kit provides everything you need for the analysis of inorganic and low-molecular-mass organic cations. It is specially designed for the separation of alkali metal ions, alkaline-earth metal ions and alkyl amines in a wide range of different matrices.

Each kit contains a cation buffer, bare fused silica capillaries, a cation standard, CE grade water and a detailed description of the analysis method and most common applications, including detection limits and reproducibility data. The new Cation Solutions Kit and the separation methods were developed to fit perfectly with the Agilent CE instrument and to support its high automation capabilities. The methods are easy to perform and provide accurate and quantitative analyses.

Note:
the following part should be ordered separately when used with the Agilent CE System: Alignment Interface for 50 µm i.d. extended light path capillary, BF3 (color code: red) Part Number: G1600-60230



Cations in Coffee and Energy Drink

Food applications

- Wine
- Juice
- Coffee
- Beer
- Soft drinks
- Mineral water

Chemical/Environmental/ Pharmaceutical applications

- OTC Drugs
- Drinking water
- Waste water

Cation Solutions Kit

| Component | Quantity | Part Number |
|--|----------|------------------|
| Cation Solutions Kit | 1 | 5064-8206 |
| Buffers and Solutions | | |
| Cation buffer for CE | 250 mL | 5064-8203 |
| Ultra pure water for CE | 500 mL | 5062-8578 |
| Capillary | | |
| Bare fused silica capillary, extended light path BF3, 50 µm id, L = 64.5 cm | 2/pk | G1600-61232 |
| Test Mixture | | |
| Cation test mixture contains: 100 ppm each Ammonium, Potassium, Sodium, Calcium, Magnesium | 25 mL | 5064-8205 |
| Other Components | | |
| Product literature | 1 | 5968-9043E |

Organic Acids Solutions Kit

The Organic Acids Solutions Kit is ideal for the analysis of short alkyl-chain carboxylic acids. Employing an indirect UV detection agent optimized for organic acids, the methodology is simple, sensitive, and provides accurate quantitative analysis. Suited for the analysis of organic acids in a wide range of matrices, it is especially useful for determination of organic acids in beverages, and food.

Each organic acids solutions kit contains capillaries, buffers, an organic acids standard and instructions complete with a sample electropherogram to help you begin organic acids analyses immediately.

Food applications

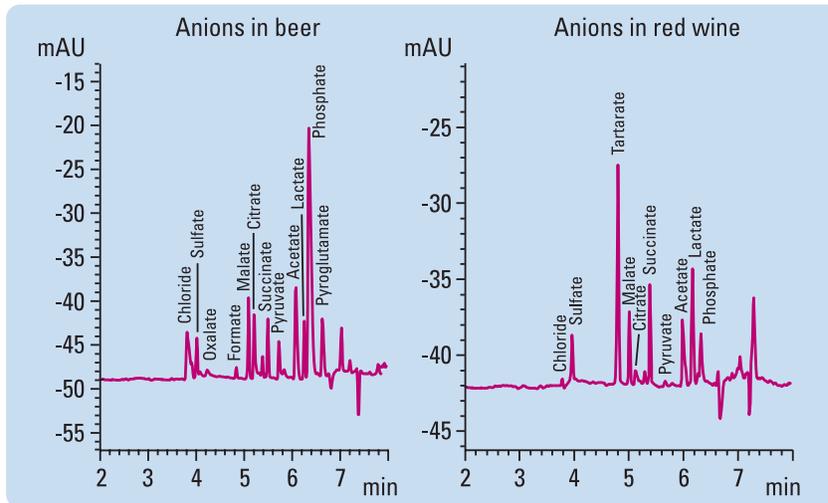
- Beer
- Wine
- Juice

Chemical applications

- Raw materials
- drug formulations

Note:

the following part should be ordered separately when used with the Agilent CE System: Alignment Interface for 75 µm i.d. capillary (color code: blue) PartNumber: G1600-60310



Organic acids in beer and red wine

Organic Acids Solutions Kit

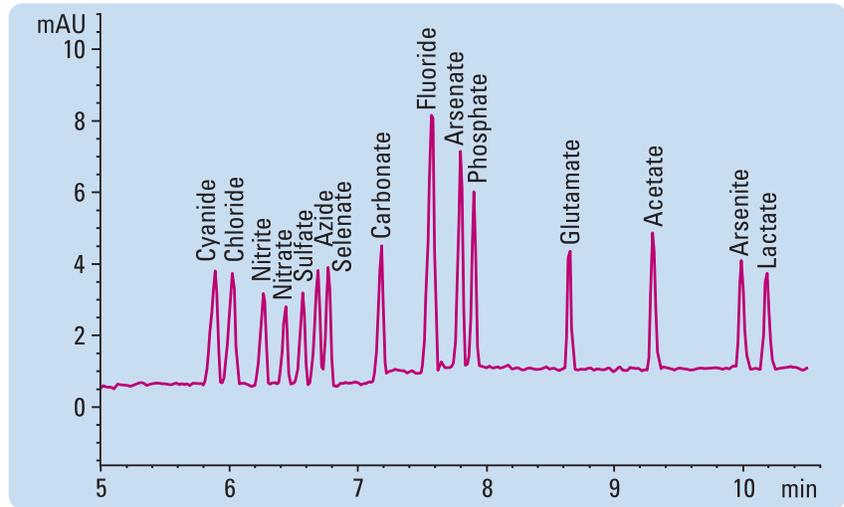
| Component | Quantity | Part Number |
|---|----------|------------------|
| Organic Acids Solutions kit | 1 | 5063-6510 |
| Buffers and Solutions | | |
| Organic acids buffer | 250 mL | 8500-6785 |
| Ultra pure water for CE | 500 mL | 5062-8578 |
| 1.0 N NaOH | 250 mL | 5062-8576 |
| 0.1 N NaOH | 250 mL | 5062-8575 |
| Capillary | | |
| Bare fused silica capillary, 75 µm id, L = 80.5 cm | 2/pk | G1600-62311 |
| Test Mixture | | |
| Organic acid test mixture contains: 1000 ppm each, Malate, Succinate, Lactate | 20 mL | 8500-6900 |
| Other Components | | |
| Product literature | 1 | 5968-9047E |



Solutions Kits for Small Ions

Forensic Anions Kit

This highly focused kit was developed specifically for the analysis of poisonous compounds, such as cyanide, azide, selenate, arsenate, and arsenite. In cases of poisoning, analytical tools are needed to determine the identity of the toxins quickly and accurately. A rapid determination of anionic toxins in adulterated foods and beverages is possible using CE with indirect UV detection. The forensic and other anions can be detected within 15 minutes with minimal sample preparation.



Analysis of an Anion Standard with the Forensic Anion Analysis Kit

Forensic Anions Kit

| Component | Quantity | Part Number |
|--|-----------|------------------|
| Forensic Anion Solutions Kit | 1 | 5064-8208 |
| Buffers and Solutions | | |
| Basic anion buffer | 5 x 50 mL | 5064-8209 |
| Ultra pure water for CE | 500 mL | 5062-8578 |
| Capillary | | |
| Bare fused silica capillary, 50 µm id, 104 cm, L = 112.5 cm | 2/pk | G1600-64211 |
| Test Mixture | | |
| Inorganic anion test mixture contains: 1000 ppm each of fluoride, chloride, bromide, nitrite, nitrate, sulfate; and 2000 ppm phosphate | 10 mL | 5062-8524 |
| Other Components | | |
| Product literature | 1 | 5968-9049E |

Note:

the following part should be ordered separately when used with the Agilent CE System: Alignment Interface for standard 50 µm i.d. capillary (color code: green) Part Number: G1600-60210

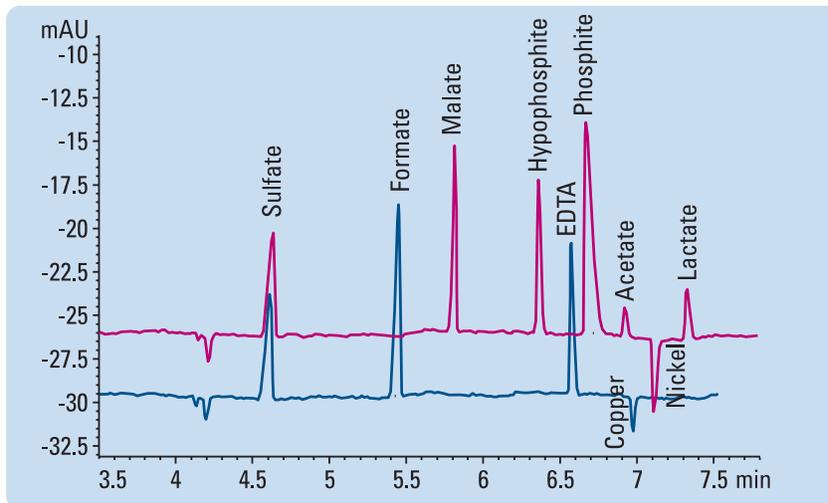


Agilent Plating Bath Analysis Kit

The Agilent Plating Bath Analysis Kit was developed for the analysis of inorganic and organic anions together with UV-absorbing metal cations (e.g. Ni²⁺, Cu²⁺, Co²⁺) in plating bath solutions. The bath solutions contain a variety of components such as reducing agents (which drive the plating reaction) and organic acids (as buffering and/or metal complexing agents) in addition to metal cations. Inorganic anions are also present as counter-ions of the plating metals.

This kit allows the analysis of inorganic and organic anions together with some metals in a single run. This unique feature derives from the background electrolyte's high stability constants for metal cations (which allows their analysis as anionic complexes). The kit is also suitable for the analysis of electro-iron plating solutions, e.g. where different levels of Fe²⁺ and Fe³⁺ need to be monitored.

Note:
the following part should be ordered separately when used with the Agilent CE System: Alignment Interface for standard 50 µm i.d. capillary (color code: green) Part Number: G1600-60210



Nickel- and Copper-Plating Bath

The buffer supplied in this kit is pre-made with the pH already adjusted so no further preparation is required. The kit also includes capillaries and a standard test mixture. To ensure

that the kit and instrument are functioning properly, a detailed test procedure is provided including typical electropherograms.

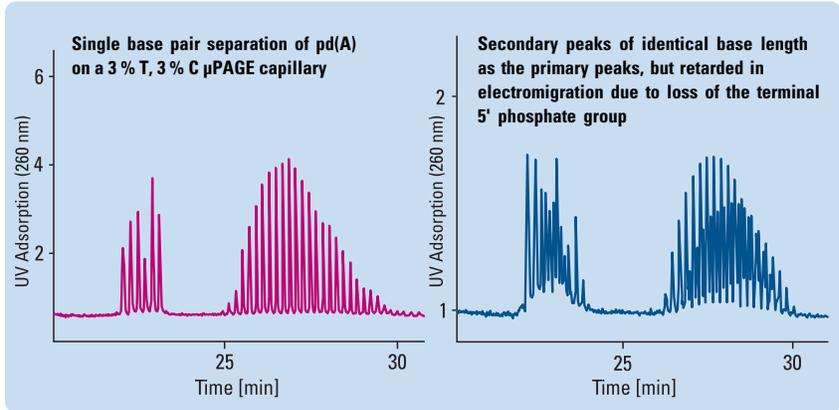
Agilent Plating Bath Analysis Kit

| Component | Quantity | Part Number |
|---|----------|------------------|
| Plating Bath Analysis Kit | 1 | 5064-8228 |
| Buffers and Solutions | | |
| Plating bath analysis buffer | 250 mL | 5064-8236 |
| Ultra pure water for CE | 500 mL | 5062-8578 |
| Capillary | | |
| Bare fused silica capillary, id = 50 µm, L = 80.5 cm | 2/pk | G1600-62211 |
| Test Mixture | | |
| Plating bath test mixture includes: 1000 ppm each of sulfate, malate, hypophosphite, phosphite, lactate; and 611 ppm nickel | 20 mL | 5064-8237 |
| Other Components | | |
| Product literature | 1 | 5968-9048E |

μPAGE Solutions Kits for High Resolution DNA Fragments Analysis

μPAGE poly-acrylamide gel-filled capillaries are the most direct vehicles to transfer all of your applications from slab gel to CE, enjoying the automation, high speed, high resolution, and quantitative advantages of CE. The capillaries are ideal for high resolution separations of oligonucleotides, single-stranded and double-stranded DNA fragments, polymerase chain reaction (PCR) products, sequencing reaction products and oligosaccharides.

μPAGE capillaries are available in three different pore sizes. The size of the molecular sieving pores is controlled by the monomer concentration (%T) and the degree of polymer cross-linking (%C). Gels with higher %T and %C values have smaller pores and are, therefore, more effective at resolving smaller molecules. μPAGE-10 (10 %T, 0 %C) capillaries provide high resolution capabilities for separation of antisense therapeutic agents, primers and probes as well as nucleotides.



Oligonucleotide samples with or without terminal 5' phosphate group

μPAGE-5 (5 %T, 5 %C) allows single base resolution of oligonucleotides [pd(A)] ranging from 20–150 bases while μPAGE-3 allows fast analysis of larger DNA fragments.

Three different μPAGE kits are available. For your convenience, μPAGE capillaries and μPAGE buffers can be purchased together or separately. To achieve the highest reproducibility and provide optimal longevity, use μPAGE buffer with μPAGE capillaries.

μPAGE Starter Kit

Includes 3 μPAGE capillaries, 75 cm total length, 50 cm effective length
 μPAGE pd(A)_{25-30, 40-60} oligonucleotide standard for μPAGE-3 and μPAGE-5 kits
 μPAGE pd(A)₂₅₋₃₀ oligonucleotide standard for μPAGE-10 kit
 μPAGE buffer, 2 x 237 mL

| μPAGE capillary in Kit | ID [μm] | Part Number |
|------------------------|---------|-------------|
| μPAGE-10 (10 %T, 0 %C) | 100 | 192-1311 |
| μPAGE-5 (5 %T, 5 %C) | 75 | 192-5211 |
| μPAGE-3 (3 %T, 3 %C) | 75 | 192-3211 |

μPAGE Basic Kit

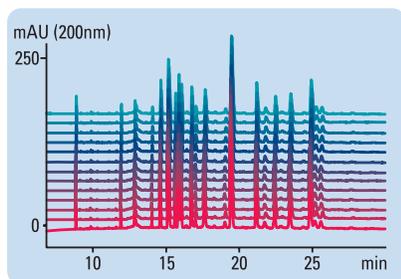
Includes 3 μPAGE capillaries, 75 cm total length, 50 cm effective length
 μPAGE pd(A)_{25-30, 40-60} oligonucleotide standard for μPAGE-3 and μPAGE-5 kits
 μPAGE pd(A)₂₅₋₃₀ oligonucleotide standard for μPAGE-10 kit
 μPAGE buffer, 30 mL

| μPAGE capillary in Kit | ID [μm] | Part Number |
|------------------------|---------|-------------|
| μPAGE-10 (10 %T, 0 %C) | 100 | 191-1311 |
| μPAGE-5 (5 %T, 5 %C) | 75 | 191-5211 |
| μPAGE-3 (3 %T, 3 %C) | 75 | 191-3211 |



Standard Bare Fused-Silica Capillaries for G1600A CE Instrument

Fused-silica capillaries are the heart of CE. Capillaries from Agilent Technologies are designed and optimized for ease of use and reliability. All capillary ends are cut to a smooth, mirror-like finish using fiber optic technology. In addition, the polyimide outer-coating is removed from the ends. These processes ensure minimal sample adsorption and help maintain sharp peak shapes. All capillaries have a pre-made detection “window” and a built-in alignment stopper which allows rapid and precise insertion in the alignment interface.



CZE of a tryptic digest of recombinant human growth hormone using a standard fused silica capillary with 75 μm internal diameter

Helpful hint:

Different inner diameters of capillaries need to use different alignment interfaces to guarantee optimal detection. The color coding of the capillary and the alignment interface allow you to easily match the correct interface with the capillary.

Standard Bare Fused Silica Capillaries (2/pk)

| Capillary id [μm] | Total Length [cm] | Effective Length [cm] | Optical Path Length [μm] | Color code | Part Number |
|--------------------------------|-------------------|-----------------------|---------------------------------------|------------|-------------|
| 50 | 33 | 24.5 | 50 | ● | G1600-63211 |
| | 48.5 | 40 | 50 | ● | G1600-60211 |
| | 64.5 | 56 | 50 | ● | G1600-61211 |
| | 80.5 | 72 | 50 | ● | G1600-62211 |
| | 112.5 | 104 | 50 | ● | G1600-64211 |
| 75 | 33 | 24.5 | 75 | ● | G1600-63311 |
| | 48.5 | 40 | 75 | ● | G1600-60311 |
| | 64.5 | 56 | 75 | ● | G1600-61311 |
| | 80.5 | 72 | 75 | ● | G1600-62311 |
| | 112.5 | 104 | 75 | ● | G1600-64311 |
| 100 | 33 | 24.5 | 100 | ● | G1600-63411 |
| | 48.5 | 40 | 100 | ● | G1600-60411 |
| | 64.5 | 56 | 100 | ● | G1600-61411 |
| | 80.5 | 72 | 100 | ● | G1600-62411 |
| | 112.5 | 104 | 100 | ● | G1600-64411 |

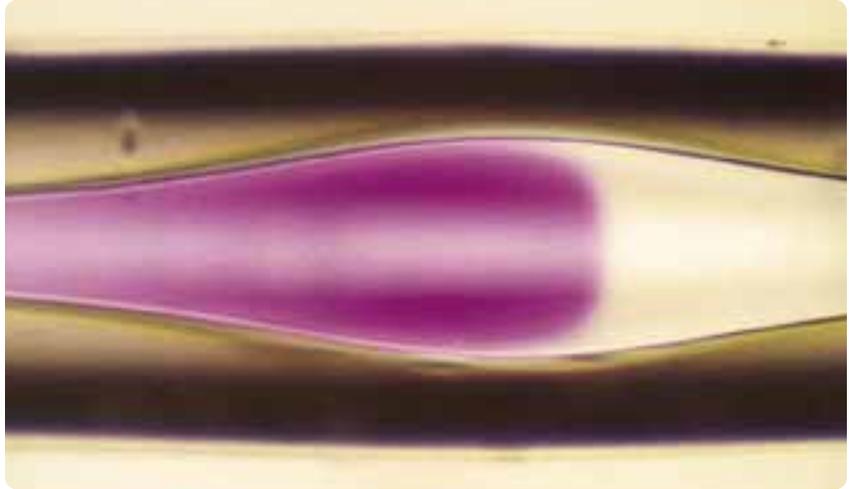
Note:

All capillaries are supplied in package size of 2/pack.

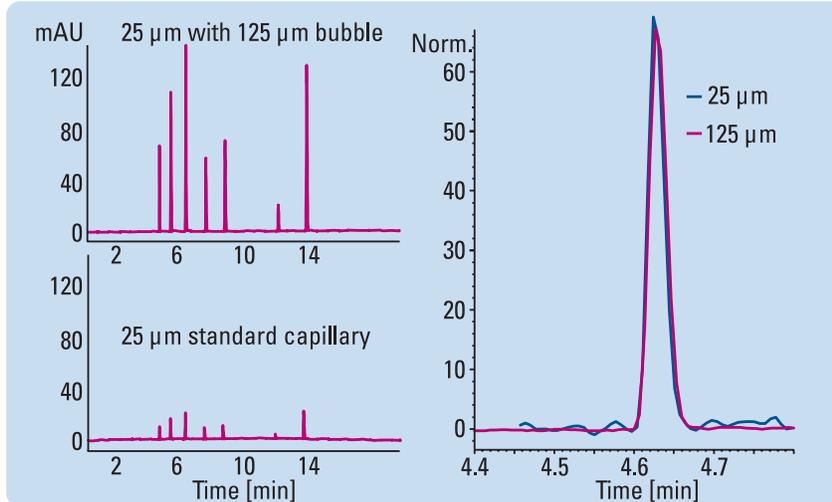
Extended Light Path Capillaries (Bubble Cell Capillaries) Bare Fused-Silica

Use Agilent Technologies Extended Light Path Capillaries (“bubble” cell capillaries) to improve sensitivity 3- to 5-fold over standard capillaries. With Extended Light Path Capillaries the inner diameter is increased only at the detection window, offering the sensitivity of a wide inner diameter capillary and the low current generation of a narrow one.

Resolution is not sacrificed when used with Agilent Technologies’ matching optical alignment interfaces.



Enhanced sensitivity with Agilent Extended Light Path Capillaries (“bubble” cell)

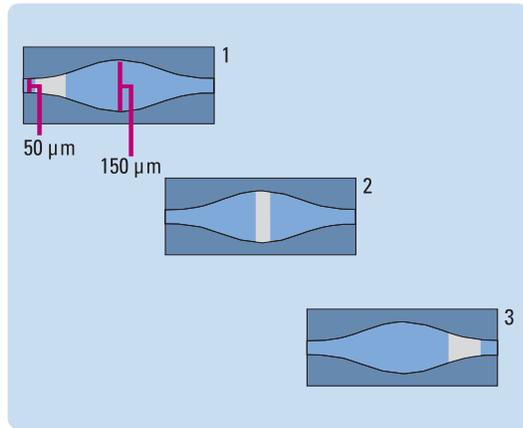


Analysis of cold medicine ingredients in a standard capillary (id 25 µm) and an Agilent Extended Light Path Capillary

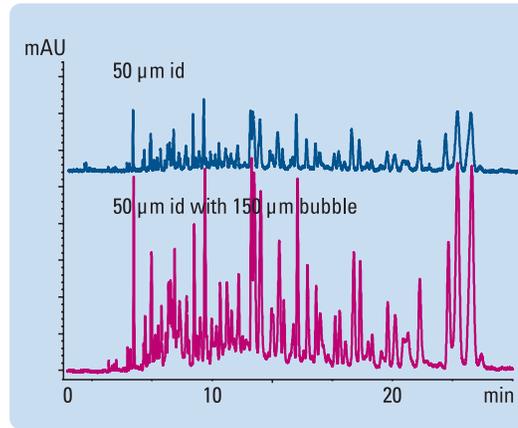
Through a computer-controlled, proprietary process the diameter is increased three to five times with a manufacturing precision better than 3%. Take advantage of this process to extend the detection pathlength of 25 µm id capillaries to 125 µm, 50 µm to 150 µm, and 75 µm to 200 µm!

Helpful Hint:

Use narrow 25 and 50 µm id “bubble” cell capillaries for highly conductive buffers **without** sacrificing sensitivity



Electroosmotic flow maintains the “plug” flow in the bubble. Optical slits matched to the zone geometry maintain resolution



CZE analysis of a tryptic digest of carbonic anhydrase using a standard capillary (id 50 µm) compared with an Agilent Extended Light Path Capillary

Agilent Technologies Extended Light Path Capillaries Bare Fused-Silica (2/pk)

| Capillary id [µm] | Total Length [cm] | Effective Length [cm] | Bubble Factor | Optical Path Length [µm] | Color Code | Part Number |
|-------------------|-------------------|-----------------------|---------------|--------------------------|------------|-------------|
| 25 | 48.5 | 40 | 5 | 125 | ● | G1600-60132 |
| | 64.5 | 56 | 5 | 125 | ● | G1600-61132 |
| | 80.5 | 72 | 5 | 125 | ● | G1600-62132 |
| 50 | 48.5 | 40 | 3 | 150 | ● | G1600-60232 |
| | 64.5 | 56 | 3 | 150 | ● | G1600-61232 |
| | 80.5 | 72 | 3 | 150 | ● | G1600-62232 |
| | 112.5 | 104 | 3 | 150 | ● | G1600-64232 |
| 75 | 48.5 | 40 | 2.7 | 200 | ● | G1600-60332 |
| | 64.5 | 56 | 2.7 | 200 | ● | G1600-61332 |
| | 80.5 | 72 | 2.7 | 200 | ● | G1600-62332 |
| | 112.5 | 104 | 2.7 | 200 | ● | G1600-64332 |

For more information refer to:
D. N. Heiger, P. Kaltenbach, H-J. P. Sievert,
Electrophoresis, 1994, 15(10), 1234-1247
and PN 5963-1889E.

Universal Bare Fused-Silica Capillaries

These are capillaries with a window and 75 cm effective length and, 363 µm od, fitting into any CE instrument. To cut them to the correct length we recommend using the P/N 5183-4669 CE column cutter.

| Capillary id [µm] | Total Length [cm] | Effective Length [cm] | Part Number |
|-------------------|-------------------|-----------------------|-------------|
| 20 | 100 | 75 | 190-0431 |
| 50 | 100 | 75 | 190-0131 |
| 75 | 100 | 75 | 190-0231 |
| 100 | 100 | 75 | 190-0331 |

Bulk Fused-Silica Capillaries, 363 µm od

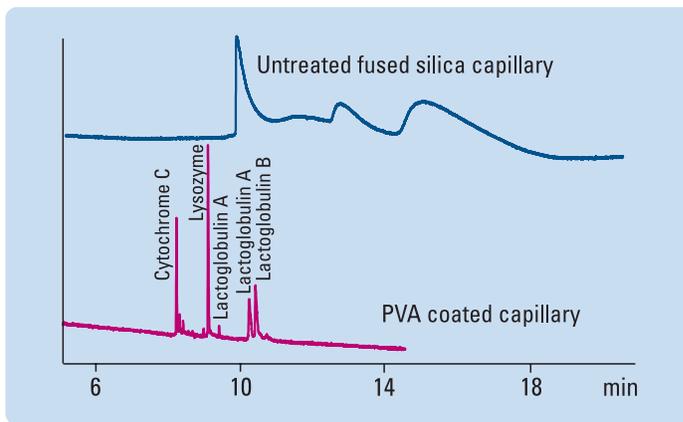
| Capillary id [µm] | Total Length [m] | Part Number |
|-------------------|------------------|-------------|
| 20 | 5 | 160-2660-5 |
| 50 | 5 | 160-2650-5 |
| 75 | 5 | 160-2644-5 |

Coated Capillaries

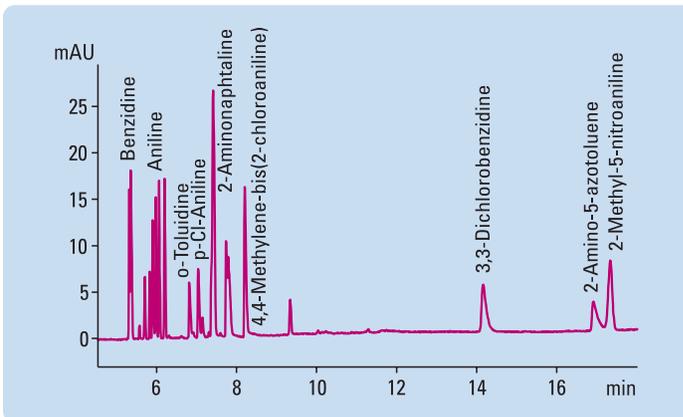
Polyvinyl Alcohol-Coated (PVA) Capillaries

PVA capillaries contain a permanently adsorbed layer of polyvinyl alcohol. This coating shields the silanol groups of the fused silica and effectively eliminates electroosmotic flow (EOF). Using a proprietary deposition process, the PVA coating is stable over a wide pH range – even under basic conditions – from pH 2.5 to 9.5. This stability allows use of a wide range of common CE buffers. Because the silica surface is covered, many proteins and amines can be analyzed without the peak tailing found with uncoated capillaries. In addition, since EOF is eliminated, cumbersome washing procedures are unnecessary and migration time reproducibility can be improved.

PVA capillaries can be used for a variety of applications, including protein analysis at physiological pH, isoelectric focusing, and small anion analysis without the need for flow-reversal agents in the buffer.



Use of PVA capillaries to reduce protein adsorption



CZE analysis of basic amines using PVA capillaries (decomposition products of azo dyes)



For Agilent Capillary Electrophoresis System Users

| Capillary id [µm] | Total Length [cm] | Effective Length [cm] | Bubble Factor | Optical Path Length [µm] | Color Code | Part Number | Comment |
|-------------------|-------------------|-----------------------|---------------|--------------------------|------------|-------------|---------------------|
| 50 | 64.5 | 56 | none | 50 | ● | G1600-61219 | standard |
| | 64.5 | 56 | 3 | 150 | ● | G1600-61239 | extended light path |
| 50 | 125 | 21.6 | none | 50 | ● | G1600-67219 | for CE-MS |
| 75 | 64.5 | 56 | none | 1200 | | G1600-68319 | for HSDC |
| | 125 | 21.6 | none | 75 | ● | G1600-67319 | for CE-MS |
| 100 | 48.5 | 40 | none | 100 | ● | G1600-60419 | standard |
| | 64.5 | 56 | none | 100 | ● | G1600-61419 | standard |

Note: The PVA capillaries for CE-MS have a blue alignment stopper, matching the blue color code of the alignment interface for MS-UV-Vis detection. The alignment stopper of the 50 µm id PVA capillary for CE-MS has a black dot for easy identification.

For non-Agilent CE System Users

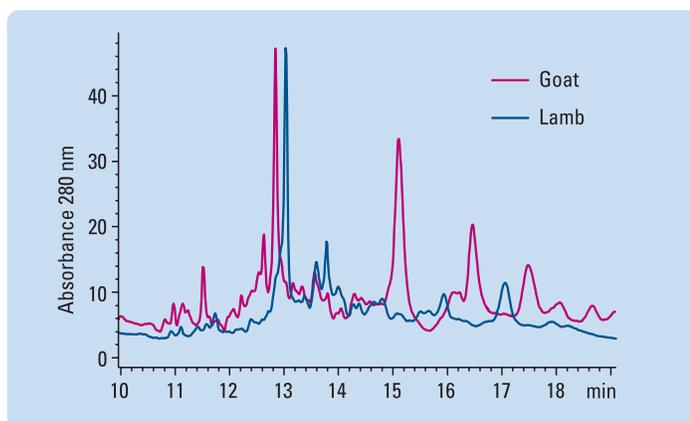
| Capillary id [µm] | Total Length [cm] | Effective Length [cm] | Bubble Factor | Optical Path Length [µm] | Part Number |
|-------------------|-------------------|-----------------------|---------------|--------------------------|-------------|
| 50 | 71 | 60 | none | 50 | G160U-61219 |
| | 71 | 60 | 3 | 150 | G160U-61239 |
| 100 | 56 | 45 | none | 100 | G160U-60419 |
| | 71 | 60 | none | 100 | G160U-61419 |

Note:

When extended pathlength capillaries are used in non-Agilent systems, loss of resolution may be found if the axial slit width is not reduced. In Agilent Technologies systems the alignment interface contains properly matched slits to maintain resolution (for details, see PN 5963-1889E).

The PVA coating is available in standard capillaries, or in Agilent Extended Light Path Capillaries (“bubble” cell capillaries) for high sensitivity applications. Both capillary types are available in greater lengths for use in non-Agilent systems!

Now the PVA is also available for use with the High Sensitivity Detection Cell for even further improved HPLC-like sensitivity. In addition PVA coated capillaries are offered for CE-MS applications. The capillaries are provided with normally positioned detection window to allow tandem UV-Vis and MS detection for improved sample identification.



Analysis of meat proteins by c-IEF using PVA capillaries

For more information refer to:
 Poly(vinyl alcohol)-coated Capillaries
 – A Solution for many Application Areas on Capillary Electrophoresis
 U. Jegle, T. Soga, R. Grimm, H. Godel,
 R. Schuster and G. Ross,
 LC-GC International, March 1997.

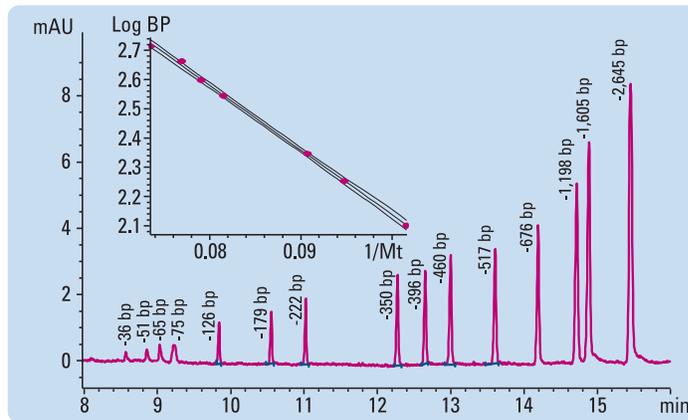
Coated Capillaries

CEP Coated Capillaries

CEP capillaries contain a permanently bonded polymer coating. This CEP coating shields the silanol functionality of the capillary surface and helps prevent sample adsorption. Additionally, the EOF is nearly eliminated making the capillary ideal for applications such as DNA separations with sieving polymer buffers (see dsDNA kit, page 13). Elimination of EOF also simplifies analysis of anions and organic acids by direct UV detection. Without EOF-reduction, highly mobile ions such as nitrate can migrate in the opposite direction to the slower, longer chain acids.

The CEP coated capillary is stable from pH 2 to 8. It can be used with borate buffers offering a different surface functionality to help alleviate sample adsorption.

Each batch of CEP coated capillaries is rigidly tested by Agilent Technologies and includes a representative electropherogram to assure quality.



Restriction fragment separation (36–2645 bp)

| Capillary id [μm] | Total Length [cm] | Effective Length [cm] | Optical Path Length [μm] | Part Number |
|-------------------|-------------------|-----------------------|--------------------------|-------------|
| 75 | 97 | 72 | 75 | G1600-62318 |

For Agilent CE systems and non-Agilent CE systems

Bulk μSIL-DB Capillaries

The μSIL-DB coated capillaries are available as μSIL-DB-1 and μSIL-DB-17. In combination with a cellulose based buffer system, μSIL-DB coated capillaries have been widely used in cIEF applications, PCR product and DNA fragment separation and many other CE applications which require reduced EOF.

| Capillary | Capillary ID [μm] | Length [m] | Film Thickness [μm] | Part Number |
|------------|-------------------|------------|---------------------|-------------|
| μSIL-DB-1 | 50 | 10 | 0.05 | 126-1012 |
| μSIL-DB-1 | 50 | 10 | 0.20 | 126-1013 |
| μSIL-DB-1 | 100 | 10 | 0.10 | 127-1012 |
| μSIL-DB-17 | 50 | 10 | 0.10 | 126-1713 |
| μSIL-DB-17 | 100 | 10 | 0.10 | 127-1712 |
| μSIL-DB-17 | 100 | 10 | 0.20 | 127-1713 |

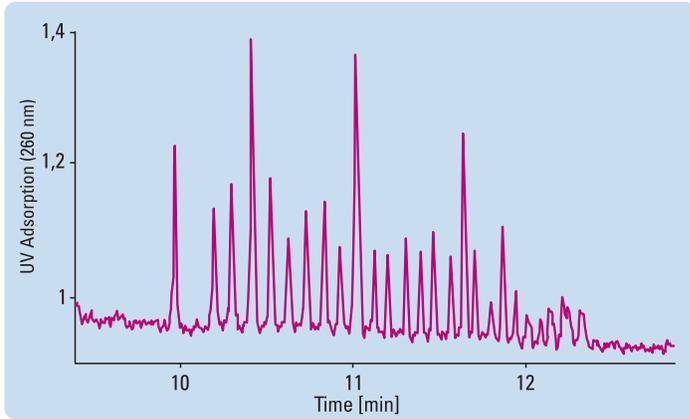
Cross-linked and Bonded μ SIL Capillaries

μ SIL-FC and μ SIL-DNA Capillaries With Windows

A series of coated capillaries specifically designed for CE which are prepared by cross-linking and bonding a novel, proprietary fluorocarbon (FC) polymer. μ SIL-FC capillaries are chemically inert, hydrophobic, and stable from pH 2.5–10.0.

These capillaries are a must-have for cIEF, protein, peptide and carbohydrate separations, as well as replaceable gel CE applications such as oligonucleotides, DNA fragments, and PCR product separations.

μ SIL-DNA capillaries are also coated with an FC polymer but have a 75 μ m ID to accommodate the viscosity of entangled polymer solutions. All μ SIL capillaries are batch tested to ensure the highest performance and reproducibility.

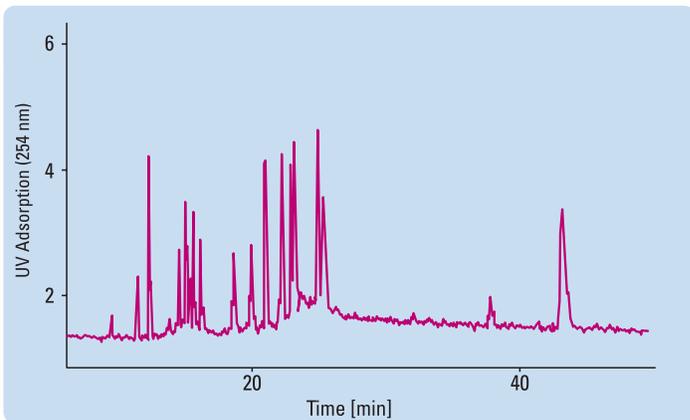


Analysis of Allelic ladder with μ SIL-DNA

μ SIL-WAX Capillaries With Windows

μ SIL-WAX features a modified, polyethylene oxide, hydrophilic coating made through a special cross-linking and bonding process. The coating effectively masks active

silanol sites, offering exceptional efficiency, resolution, peak shape and reproducibility. The highly stable coating and near-zero EOF of μ SIL-WAX makes the capillary ideal for CE-MS, and protein and peptide separations from pH 2–5.



Analysis of Myoglobin tryptic digest using μ SIL-WAX



| Capillary | Capillary ID [μ m] | Total Length [cm] | Effective Length [cm] | Film Thickness [μ m] | Unit | Part No. |
|---------------|-------------------------|-------------------|-----------------------|---------------------------|------|----------|
| μ SIL-FC | 50 | 80 | 50 | 0.075 | 3/pk | 194-8111 |
| μ SIL-DNA | 75 | 65 | 50 | 0.075 | 2/pk | 199-2602 |
| μ SIL-WAX | 50 | 100 | 75 | 0.1 | 2/pk | 196/7203 |
| μ SIL-WAX | 100 | 100 | 75 | 0.1 | 2/pk | 197-7202 |

Capillaries for Capillary Electrochromatography (CEC)

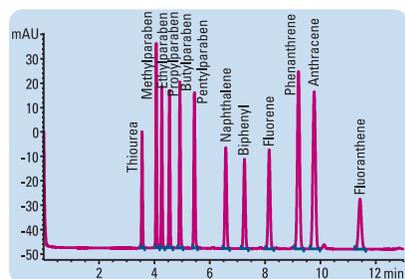
Capillary Electrochromatography is a hybrid of CE and LC and can be performed in the Agilent CE system. Using CE capillaries packed with LC stationary phases, CEC offers the loadability and selectivity of LC and the high efficiency of CE.

Using the high pressure capabilities of the Agilent CE system, both ends of the CEC capillary can be pressurized. This process prevents outgassing upon application of high voltage and significantly extends capillary lifetime.

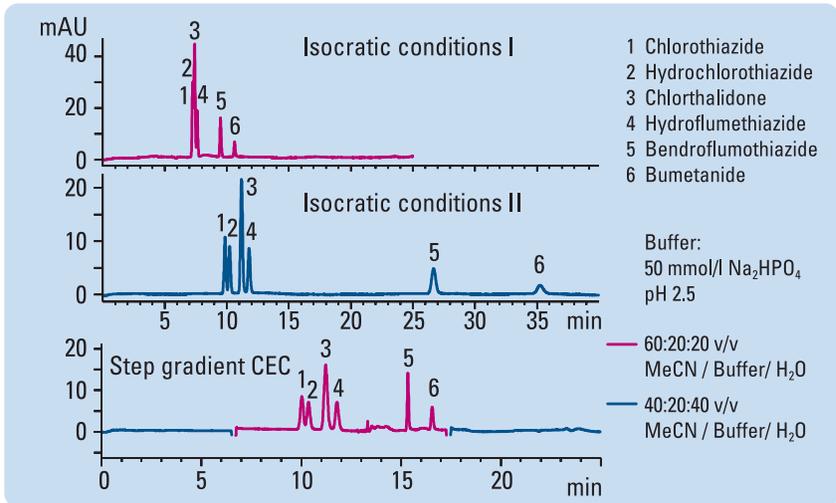
Use CEC to improve resolution of solutes which are difficult to resolve by HPLC, for hydrophobic solutes which cannot be solubilized in MEKC buffers, or for reduced sample and solvent consumption compared to HPLC.

Helpful Hint:

CEC capillaries require an Agilent CE system with external gas supply capabilities.



Capillary Electrochromatography of parabenes and aromatics



Capillary Electrochromatography of diuretic test mixture (courtesy of Dr. Melvin Euerby, Astra Charnwood, UK)

Standard CEC Capillaries

| Description | Dimensions length × id [mm] | Detection | Part Number |
|----------------------|-----------------------------|-----------|-------------|
| CEC-Hypersil C18, | 3 μm 250 × 0.1 | Standard | 5063-6512 |
| CEC-Hypersil C18, | 3 μm 400 × 0.1 | Standard | 5063-6513 |
| CEC-Hypersil C8, | 3 μm 250 × 0.1 | Standard | 5063-6535 |
| CEC-Hypersil C8, | 3 μm 400 × 0.1 | Standard | 5063-6540 |
| CEC-Hypersil Phenyl, | 3 μm 250 × 0.1 | Standard | 5063-6536 |
| CEC-Hypersil Phenyl, | 3 μm 400 × 0.1 | Standard | 5063-6541 |

CEC Capillaries for HSDC*

| Description | Dimensions length × id [mm] | Detection | Part Number |
|----------------------|-----------------------------|-----------|-------------|
| CEC-Hypersil C18, | 3 μm 250 × 0.1 | HSDC* | 5063-6537 |
| CEC-Hypersil C18, | 3 μm 400 × 0.1 | HSDC* | 5063-6542 |
| CEC-Hypersil C8, | 3 μm 250 × 0.1 | HSDC* | 5063-6538 |
| CEC-Hypersil C8, | 3 μm 400 × 0.1 | HSDC* | 5063-6543 |
| CEC-Hypersil Phenyl, | 3 μm 250 × 0.1 | HSDC* | 5063-6539 |
| CEC-Hypersil Phenyl, | 3 μm 400 × 0.1 | HSDC* | 5063-6544 |

*use with High Sensitivity Detection Cell (HSDC) only

For test sample order: 01080-68704

Alignment Interfaces and Capillary Cassette

Agilent Technologies alignment interfaces are an integral part of the Agilent diode-array detection system. These interfaces contain optical slits which are precisely matched to the capillary inner diameter for optimized sensitivity and linear detection range.



In the Agilent CE System the quick-change cassette allows capillary exchange in less than a minute

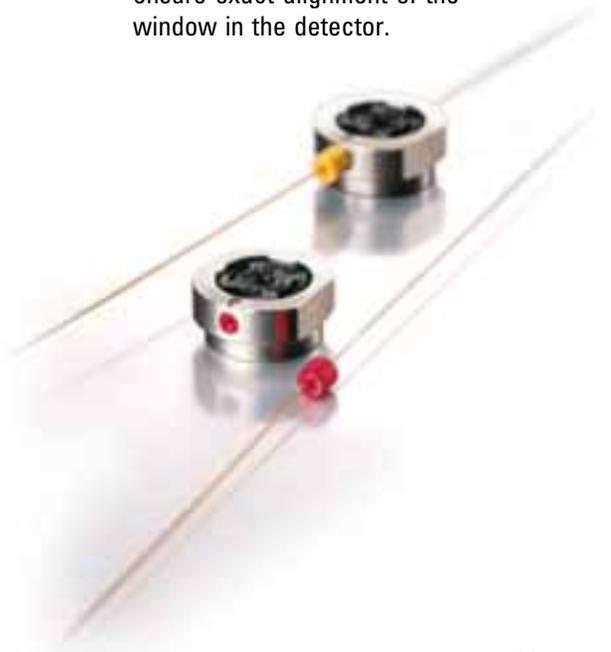
Alignment Interfaces

| Description | Color Code | Corresp. capillary | Part Number |
|---|------------|--------------------|-------------|
| Alignment interface for standard capillaries with id 50 µm | Green | Green | G1600-60210 |
| Alignment interface for standard capillaries with id 75 and 100 µm | Blue | Blue, Grey | G1600-60310 |
| Alignment interface for Agilent Extended Light Path capillaries with id 25 µm | Black | Black | G1600-60150 |
| Alignment interface for Agilent Extended Light Path capillaries with id 50 µm | Magenta | Magenta | G1600-60230 |
| Alignment interface for Agilent Extended Light Path capillaries with id 75 µm | Yellow | Yellow | G1600-60330 |
| PEEK alignment interface for CE-MS (360 od capillaries) | Green | Green, Grey | G1600-60400 |

Notes:

- Standard 75, and 100 µm id capillaries use the same interface (blue).
- PVA coated 50 and 75 µm id capillaries for CE-MS use the same non-metallic interface with color code green.

In combination with the capillary cassette, alignment interfaces simplify capillary exchange, protect the fragile detection window and ensure exact alignment of the window in the detector.



Cassette

| Description | Part Number |
|---|-------------|
| Capillary cassette for use with standard capillaries, extended light path capillaries and the High Sensitivity Detection Cell | G1600-60002 |

Helpful Hint:

The cassette and interfaces accept all commercially available capillaries (~365 µm od).

Agilent Technologies High Sensitivity Detection Cell

The Agilent High Sensitivity Detection Cell Dramatically Enhances Sensitivity and Linearity for the Agilent CE Capillary Electrophoresis System

The Agilent High Sensitivity Detection Cell – a technological leap which extends sensitivity by an order of magnitude – provides a solution to sensitivity limitations often encountered in CE. This improvement will substantially increase the utility of CE for impurity analysis of chiral drugs, biologicals, and compounds of environmental interest, among others.

The High Sensitivity Detection Cell for the Agilent CE system not only improves detection sensitivity more than 10-fold over standard capillaries, but also extends linearity beyond 2000 mAU and provides unsurpassed spectral fidelity. These improvements are a result of a proprietary micromachined design which increases the detection pathlength from 75 μm to 1200 μm while dramatically reducing stray light.

The High Sensitivity Detection Cell has a design comprised of a fused silica cell body and removable capillaries. The light path through the cell is made from black fused silica which significantly minimizes stray light and defines the aperture for the diode-array spectrometer. In addition, the reflective interior functions as a “lightpipe”, insuring almost 100 % transmission of light which entered the cell. These properties result in enhanced linearity and unsurpassed spectral fidelity with the diode-array detector.

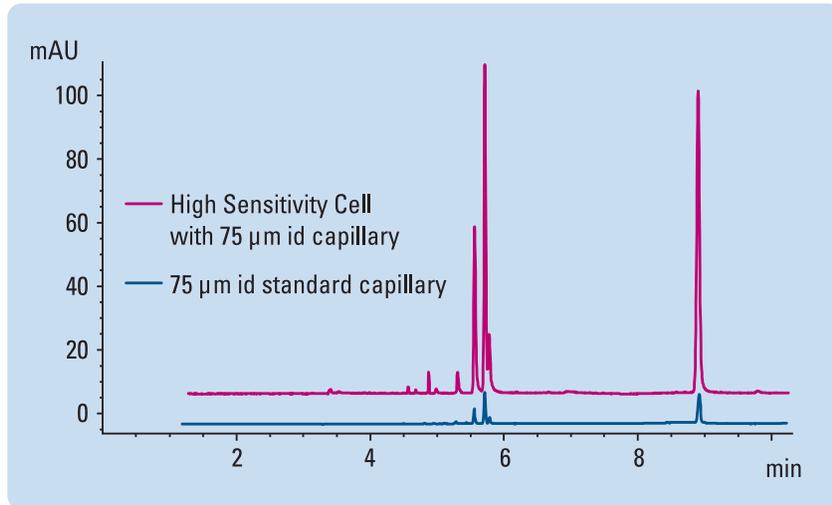
The high linear range allows quantification of both $< 0.1\%$ impurities and the main component in one run. This is useful for all impurity analyses and is especially useful for determining chiral excess.

Integral to the Agilent High Sensitivity Detection Cell function is maintenance of peak shape. The unique geometry of the capillaries insure proper coupling with the cell, virtually eliminate dead volume and maintain peak shape. The end of these capillaries include both a flaring of the inner diameter and beveling of the outer diameter.

The Agilent High Sensitivity Detection Cell can be used in all Agilent CE systems, regardless of age. As shown in the figure the cell is incorporated into an optical interface which is similar to that used for standard and bubble cell

capillaries – making capillary and cassette installation the same as for the other capillaries. The figure also illustrates the decoupled design which allows quick and easy replacement of capillaries. This process is simplified by use of pre-assembled ferrules and finger-tight fittings.





Agilent High Sensitivity Detection Cell vs. 75 µm Standard Capillary for the CZE separation of naphthalene sulfonic acids

Characteristics of the Agilent High Sensitivity Detection Cell

- 10-fold increase in signal-to-noise
- Detector linearity beyond 2000 mAU for accurate quantitative analysis
- Decoupled design allows replaceable capillaries and reduced cost operation
- Special capillary geometry insures maintenance of peak symmetry
- Full diode-array spectral capabilities
- Design fits all Agilent CE instruments

High Sensitivity Detection Cell (HSDC)

| Description | Part Number |
|---|-------------|
| High Sensitivity Detection Cell Kit Detection cell, 75 µm id inlet capillary (72 cm) and outlet capillary (8.5 cm) pair, capillary cassette, fittings (3 fitting screws with seals, 2 fitting caps), 4.5 mL cleaning solution | G1600-68713 |
| Replacement Capillary Kits: Bare Fused Silica 75 µm id capillary pair with 8.5 cm outlet and the following inlet: | |
| 56 cm effective length | G1600-68716 |
| 72 cm effective length | G1600-68715 |
| 88 cm effective length | G1600-68714 |
| Replacement Capillary Kit: PVA Coated Capillaries 75 µm id capillary pair with 8.5 cm outlet and the following inlet: | |
| 56 cm effective length | G1600-68319 |
| Replacement Fittings | G1600-63200 |
| 3 fitting screws with seals, 2 fitting caps | |
| Replacement Detection Cell | G1600-60027 |
| Cleaning Solution 1.3 kg | 5062-8529 |

Notes:

1. A modified capillary cassette is required for the Agilent High Sensitivity Detection Cell. This cassette is included with the kit and can also be used for all capillaries and optical interfaces.
2. CEC capillaries are also available for the HSDC (for part numbers see page 19).

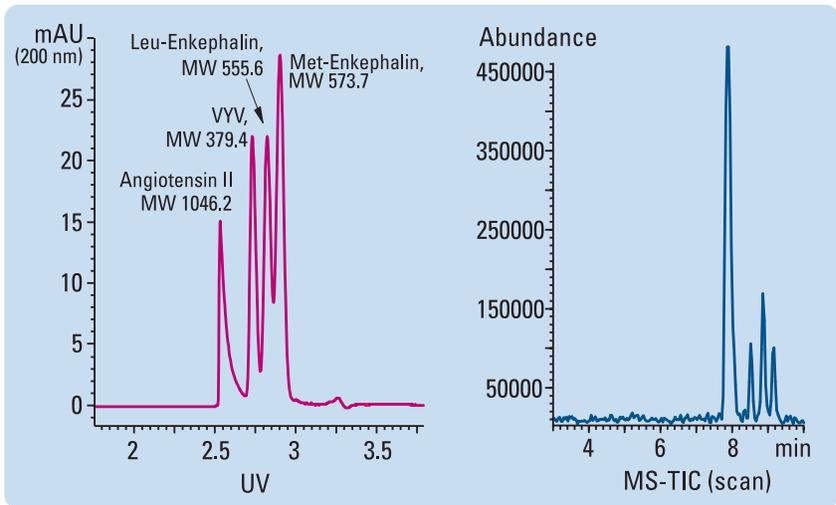
For more information refer to:
Publication No. 5965-5984E.

CE-MS Accessories

The G1603A CE-MS Adapter kit includes a MS-cassette, two bare fused silica capillaries and the accessories to prepare the Agilent CE to be coupled to the electrospray mass spectrometer. It does not contain the accessories needed to prepare the MS. The CE-MS adapter kit can be used with the Agilent 1100 Series MSD, and MSD Trap System or virtually any other electrospray MS-platform.

The CE-MS cassette completely thermostats the capillary until it exits the CE system. A methods development configuration uses on-line diode array detection (DAD) and MS. For rapid or routine MS analysis the DAD can be by-passed to decrease the total capillary length and reduce analysis time.

The CE-ESI-MS Nebulizer Kit includes the electrospray needle and splitter assembly which allows the direct connection of the CE-instrument with the Agilent 1100 Series MSD. The CE-ESI-MS



CE-MS of 4 component peptide mixture (210 fmol)

Bebulizer Kit needs the CE-MS Adapter Kit for fully supporting the CE-MS coupling.

The CE with tandem UV-Vis and MS detection allows the analysis of complex mixtures. Analyte mixtures are separated and the components detected via UV-Vis absorption,

allowing preliminary identification based on peak elution time and/or UV-Vis spectra when compared to a standard. The on-line coupling to electrospray-ionization mass spectrometry (ESI-MS) then reveals unambiguous information on the solute's molecular weight and possibly also structure.



Agilent CE-MS Adapter Kit ⁽¹⁾

| Description | Part Number |
|---|-------------|
| Includes CE-MS interface cassette, non-metallic alignment interface for 360 µm od capillaries, CE-MS capillary (id 50 µm, l=21.6 cm, L=125 cm), protective tubing and warning label, ground cable | G1603A |
| The following parts of the kit can be ordered separately: | |
| CE-MS cassette, metallic | G1600-60013 |
| PEEK alignment interface for 360 µm od capillaries | G1600-60400 |
| CE-MS capillary, bare fused silica, id 50 µm, l=21.6 cm, L=125 cm (2/pk) | G1600-67311 |

⁽¹⁾ Interfacing the capillary requires an electrospray needle which is not included in this kit but in the CE-ESI-MS Nebulizer Kit. For coupling with non-Agilent MS please contact the MS vendor.



CE-ESI-MS Nebulizer Kit for 1100 LC/MSD and LC/MSD Trap

| Description | Quantity | Part Number |
|--|----------|-------------|
| CE-ESI-MS Nebulizer Kit | | G1607A |
| The kit includes the following parts which can also be ordered separately: | | |
| ES needle assembly | 1 | G1607-60041 |
| CE-MS Neb. cover | 1 | G1607-60034 |
| Hex key set II | 1 | 8710-2164 |
| DIN 3115 screwdriver | 1 | 5022-2142 |
| CE-ESI sprayer | 1 | G1607-60001 |
| Splitter assembly | 1 | G1607-60000 |
| Ferrule 360 µm | 1 | 5022-2141 |
| Nut fingertight | 2 | 0100-1543 |
| Flex loc element | 2 | 1520-0401 |
| Screw M4×0.7 | 2 | 0515-0982 |
| Gasket | 2 | G1607-20030 |
| Fitting | 2 | 0100-1544 |
| Ion kit (ammonium acetate) | 1 | 8500-4410 |
| CE-MS test sample | 1 | 5063-6590 |

Capillaries for CE-MS

| Description | Color Code | Part Number |
|--|------------|-------------|
| CE-MS capillary, bare fused silica, i.d. 50 µm, l=21.6 cm, L=125 cm (2/pk) | ● | G1600-67311 |
| CE-MS capillary, PVA coated, i.d. 50 µm, l=21.6 cm, L=125 cm (1/pk) | ● | G1600-67219 |
| CE-MS capillary, PVA coated, i.d. 75 µm, l=21.6 cm, L=125 cm (1/pk) | ● | G1600-67319 |

For more detailed information refer to the technical note:
CE-ESI-MS: An Integrated Solution – PN 5968-1328E

Buffers and Reagents for CE



The premade buffers, ready-to-use right out of the bottle, help eliminate the time-consuming buffer preparation process.

In addition to a set of kit buffers, which are specially designed for dedicated applications, Agilent offers a series of basic CZE buffers covering a broad pH range. Further the product portfolio includes special buffers for protein analysis and for Micellar Electrokinetic Chromatography (MEKC). Cleaning and conditioning solutions complete the offer.

All Agilent buffers and reagents are designed to meet the stringent demands of CE. Manufactured under GLP/GMP conditions in ISO9001 facilities, each is shipped with assay information and verification of purity. Chemicals are all electrophoresis grade, with nearly all ionic and organic impurities removed. Solutions are prepared under Class 10 cleanroom conditions and pre-filtered through 0.2 mm filters to ensure removal of particulates.

To maintain high reproducibility all buffer solutions are standardized to 0.02 pH units in accredited laboratories. Superior quality control ensures reproducible results – bottle-to-bottle and batch-to-batch.

Agilent Technologies' Capillary Electrophoresis program includes premade buffers designed to reduce your time at the laboratory bench



CE-grade Water

| Item | Volume | Part Number |
|-------------------------|--------|-------------|
| Ultra pure water for CE | 500 mL | 5062-8578 |

Capillary Conditioning Solutions

| Item | Volume | Part Number |
|---------------------------------|--------|-------------|
| 0.1 N sodium hydroxide solution | 250 mL | 5062-8575 |
| 1.0 N sodium hydroxide solution | 250 mL | 5062-8576 |
| 0.1 N phosphoric acid solution | 250 mL | 5062-8577 |

CZE Buffers for Charged Analytes

| Item | Volume | Part Number |
|---|--------|-------------|
| 50 mM sodium phosphate buffer, pH 2.5 | 250 mL | 5062-8571 |
| 50 mM sodium phosphate buffer, pH 7.0 | 250 mL | 5062-8572 |
| 50 mM sodium tetraborate buffer, pH 9.3 | 250 mL | 5062-8573 |
| 20 mM sodium tetraborate buffer, pH 9.3 | 100 mL | 8500-6782 |

Buffers for CZE of Proteins

| Item | Volume | Part Number |
|--|--------|-------------|
| 50 mM phosphate, 0.05% hydroxyethyl cellulose buffer, pH 2.5 | 250 mL | 8500-6786 |
| 150 mM phosphate, 200 mM ammonium sulfate buffer, pH 7.0 ¹⁾ | 250 mL | 8500-6787 |

¹⁾ Use 25 µm id capillary to limit current generation (see page 14)

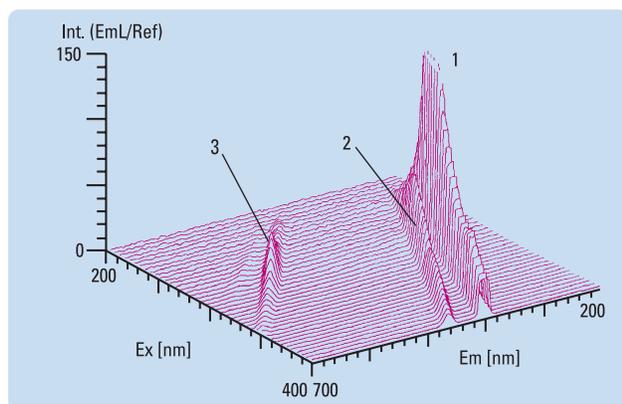
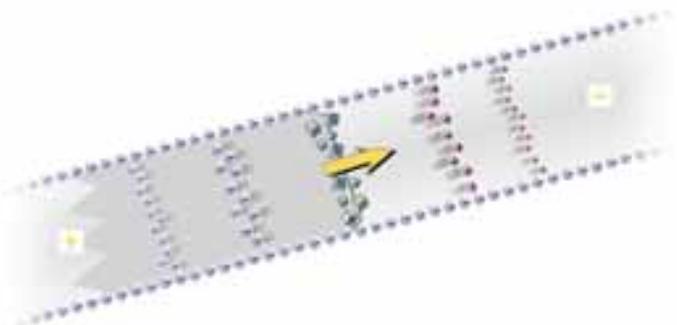
Micellar Electrokinetic Chromatography (MEKC) Buffer for Neutral and Charged Analytes

| Item | Volume | Part Number |
|---|--------|-------------|
| 50 mM sodium tetraborate, 100 mM sodium dodecyl sulfate buffer, pH 9.3 | 250 mL | 5062-8574 |

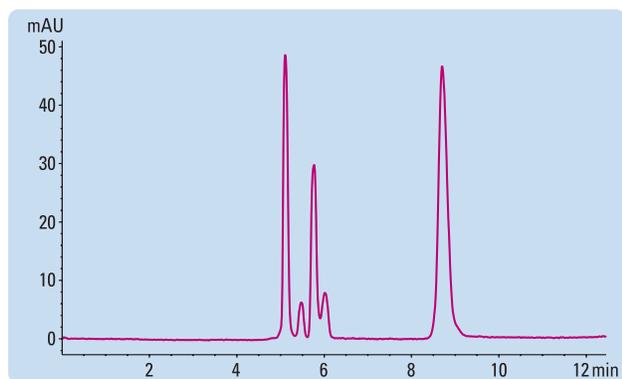
Dilute with 50 mM sodium tetraborate, pH 9.3 (PN 5062-8573) to reduce SDS concentration without affecting the tetraborate composition or pH

µPAGE Buffer Solutions and Oligo Standards

| Item | Volume | Part Number |
|--|------------|-------------|
| µPAGE 385 Tris-borate and urea buffer | 4 x 237 mL | 590-4001 |
| µPAGE 10 Tris-borate and urea buffer | 4 x 237 mL | 590-4005 |
| µPAGE 385 pd(A) _{25-30, 40-60} Oligonucleotide standard | 3 x 50 mL | 590-4000 |
| µPAGE 10 pd(A) ₂₅₋₃₀ Oligonucleotide standard | 3 x 50 mL | 590-4006 |



The total fluorimetry spectrum of the 50 mM borate buffer pH 9.2 verifies that the solution is free of fluorescence-active impurities (1 and 2 = Rayleigh stray light of zero and first order, 3 = Raman stray light)



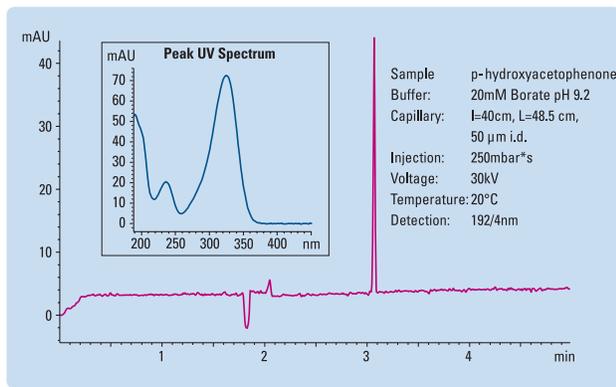
CZE analysis of a peptide mixture using premade 50 mM sodium phosphate buffer, pH 2.5

Agilent CE System Start-up and Test Kits

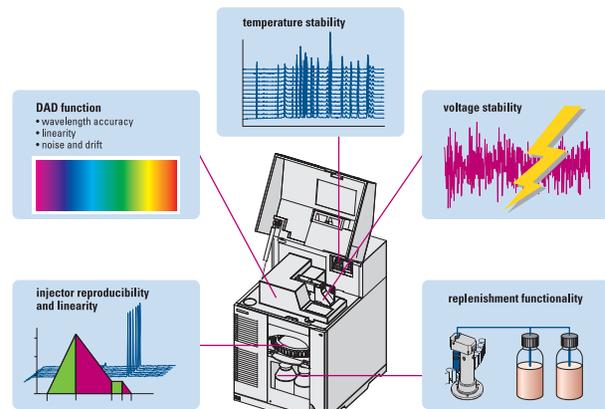
Agilent Technologies offers chemical test kits and validation packages to help comply with regulatory and quality standards. The Installation Qualification (IQ) Chemical Kit and Hardware Start-up Kit which are shipped with new instruments are useful for rapidly

verifying system functionality. For rigorous testing, the Operational Qualification (OO) / Performance Verification (PV) Kit can be used to verify DAD noise, drift, linearity, and wavelength accuracy, and replenishment functionality.

The OO/PV Kit is only part of the validation services available from Agilent Technologies. When implemented by our qualified personnel it can be used to help validate your Agilent CE system.



IQ and OO/PV test method



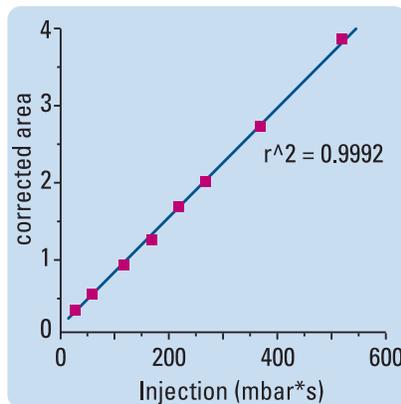
Operational Qualification / Performance Verification - OO/PV

Agilent CE Hardware Start-up Kit

| Item | Part Number |
|---|-------------|
| Includes one Extended Light Path capillary (l 56 cm, id 50 µm), one standard capillary (l 56 cm, id 50 µm), one test capillary (l 40 cm, id 50 µm), one alignment interface for standard capillaries (id 50 µm), and one alignment interface for Extended Light Path capillaries (id 50 µm) | G1600-68706 |

Agilent CE Installation Qualification (IQ) Chemical Kit

| Item | Part Number |
|--|-------------|
| Includes buffer 20 mM borate, pH 9.2, 100 mL, test sample 4-(hydroxy)acetophenone 1 mM, 2 mL, capillary conditioning solution 0.1 N sodium hydroxide, 100 mL, and manual with methods and instructions | 5063-6514 |



OO/PV injection linearity test

Agilent CE Operational Qualification (OO) / Performance Verification (PV) Kit

| Item | Part Number |
|---|-------------|
| Includes buffer 20 mM borate, pH 9.2, 100 mL, test samples 0.1, 0.5, 1.0, and 5.0 mM 4-(hydroxy)-acetophenone, 2 mL ea., capillary conditioning solution 0.1 N sodium hydroxide, 100 mL, test capillary l = 40 cm, L = 48.5 cm, id 50 µm, diskette with methods, sequence, and spectral library, and instruction manual | 5063-6515 |
| OO/PV Chemical Kit includes buffer and test sample for separate re-order of the chemicals | 5063-6520 |

Capillary Electrophoresis Supplies and Accessories



Vials and Caps

| Item | Part Number |
|--|-------------|
| Buffer vials | |
| Vial polypropylene, 1 mL (100/pk) | 5182-0567 |
| Buffer vials for CE, clear glass, 2 mL (100/pk) | 5182-9697 |
| Buffer vials for CE, clear glass, 2 mL (500/pk) | 5183-4623 |
| Buffer vials for CE, amber glass, 2 mL (100/pk) | 5183-4619 |
| Buffer vials for CE, amber glass, 2 mL (500/pk) | 5183-4622 |
| Sample vials | |
| Vial polypropylene, 100 µL (1000/pk) | 9301-0978 |
| Vial glass-lined polypropylene, 100 mL (100/pk) recommended for routine use | 9301-0977 |
| Standard vial caps | |
| Vial caps PUR (polyurethane for re-sealing) (100/pk) | 5181-1512 |
| Vial caps PEO (polyethylene olefin for chemical resistance) (100/pk) | 5181-1507 |
| Vial caps PEO (polyethylene olefin for chemical resistance) (500/pk) | 5181-1513 |



5183-4669



590-3003

Accessories

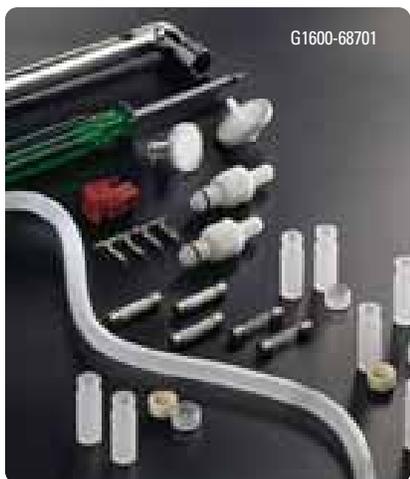
| Description | Part Number |
|---|-------------|
| 50-vial rack (5/pk) | 9301-0722 |
| Ceramic capillary scribes (4/pk) | 5181-8836 |
| CE capillary column cutter | 5183-4669 |
| Diamond blade replacement kit for CE cutter | 5183-4670 |
| Windows etching tool, 3/pk | 590-3003 |

Agilent CE System Accessory Kit

| Item | Part Number |
|--|-------------|
| Includes electrode tool, screwdriver, fuses, air filter, glass frit, PP vials and PUR caps | G1600-68701 |

Spare Parts

| Item | Part Number |
|--|-------------|
| Deuterium lamp | 2140-0585 |
| Electrode assembly, standard | G1600-60007 |
| Electrode assembly, short | G1600-60033 |
| 12 mm socket wrench (electrode tool) | 8710-2076 |
| O-ring silicone (5/pk) | 5062-8544 |
| Pre-puncher | G1600-67201 |
| Electrolyte bottle | 9300-1748 |
| Glass frit | 5041-2168 |
| Filter frit adapter | 5062-8517 |
| Bottle cap for electrolyte bottle | 9300-1747 |
| Bottle sealing O-Ring | 0905-1163 |
| Plug for electrolyte bottle | G1600-23223 |
| Air filter | 3150-0619 |
| Plastic screw box for puncher, insulation plate (10/pk) | G1600-62402 |
| 260 nm diode-array filter for DNA analysis with polyacrylamide-filled capillaries and oligonucleotide analysis | G1600-62700 |



G1600-68701

Agilent Technologies: Quality CE Support and Applications Literature

Agilent Technologies' involvement in CE was inspired by the initial ground work of Professor J. W. Jorgenson in 1981. Research at Agilent began in the early 1980s with a series of fundamental publications by McManigill and coworkers at Agilent laboratories.

Since then Agilent Technologies has created a network of specialists all over the world. With major research groups in the US and Germany, application experts in the US, Germany, and Japan, and CE field specialists all over the world, Agilent is ready to help you with your separation challenges. A continuous stream of publications from Agilent, ranging from educational primers to scientific publications in respected journals, helps keep you up to date with the latest developments and trends in Capillary Electrophoresis.

Please contact Agilent Technologies for your free-of-charge copy of the literature listed on these pages, or visit us on the world wide web.



A Selection of Agilent Technologies Capillary Electrophoresis Application Literature

Application Notes

| Title | Publication No. |
|--|-----------------|
| Double-stranded DNA Analysis with the Agilent Capillary Electrophoresis System | 5988-4304EN |
| Oligonucleotide Analysis with the Agilent Capillary Electrophoresis System | 5988-4303EN |
| Analysis of human rhinovirus (common cold virus) in viral preparations by CZE | 5988-2591EN |
| Analysis of paraquat and diquat by CE/MS | 5988-1664EN |
| Analysis of peptides using CE/MS/MS | 5988-1426EN |
| CE and CE/MS for the Analysis of Natural Products | 5980-2081E |
| Analysis of fangchinoline and tetrandrine in Chinese traditional medicines by capillary electrophoresis | 5980-0456E |
| Quantitation of the alkaloids berberine, palmatine and jatrorrhizine in the Mahonia stem | 5980-0455E |
| Analysis of chlorogenic acid in traditional Chinese medicines by capillary electrophoresis | 5980-0457E |
| Rapid Screening of Amino Acids in Food by CE-ESI-MS | 5968-8952E |
| Optimized parameters for the analysis of tropane alkaloids by CE-ESI-MS | 5968-9414E |
| Analysis of Drugs of Abuse by CE-ESI-MS | 5968-9221E |
| Analysis of Hallucinogenic Mushrooms by CE-ESI-MS | 5968-9219E |
| Trace Anion Determination in Semiconductor Grade by Capillary Electrophoresis | 5968-8953E |
| ASTM approved method for water analysis by capillary electrophoresis | 5968-8660E |
| Simultaneous analysis of inorganic anions, organic acids, amino acids and carbohydrates using the Basic Anion Buffer | 5968-7715E |
| Analysis of Aromatic Amines in Leather Extracts by CE-MS | 5968-7929E |
| Rapid Monitoring of Carbohydrates in Food with Capillary Electrophoresis | 5968-6985E |
| Analysis of Mahuang Chinese herbal medicine by capillary electrophoresis | 5968-6418E |
| Analysis of Poisoned Food by Capillary Electrophoresis | 5968-5731E |
| Monitoring of Electroless Plating Baths by Capillary Electrophoresis | 5968-5761E |
| Analysis of Flavonoids in Plant Extracts by CE-MS | 5968-5729E |
| Analysis of Amphetamines in Urine by CE-ESI-MS | 5968-3879E |
| Analysis of Sulfur Anions in Kraft Liquors Using Capillary Electrophoresis | 5968-3306E |
| Highly Sulphonated Cyclodextrins for Chiral Analysis | 5968-2018E |
| Analysis of Anionic Contamination on Wafer Surfaces of Semiconductors | 5966-4601E |
| Development of a method for separation of the four stereoisomers of troglitazone using capillary electrophoresis | 5966-3111E |
| Analysis of Anions in Power Plant Waters using Capillary Electrophoresis | 5966-3741E |
| Second derivative spectral identification of tryptophan and tyrosine in peptides | 5966-2958E |
| Purity check of a synthetic alpha-homo polylysine preparation | 5966-2956E |
| Capillary zone electrophoresis of neuropeptides | 5966-2955E |
| Micropreparative capillary zone electrophoresis – tryptic digest analysis of recombinant GroES | 5966-2947E |
| Oligonucleotides—Fraction Collection from Capillary Gel Electrophoresis and Offline MALDI-TOF | 5965-9036E |
| Oligonucleotide Analysis by Capillary Gel Electrophoresis | 5965-9037E |
| Oligonucleotides Analysis of Antisense Therapeutics | 5965-9038E |
| High Sensitivity SDS-protein separations by Capillary Electrophoresis | 5965-9035E |
| Ultra-Low Level Impurity Analysis by Capillary Zone Electrophoresis | 5965-9034E |
| High Sensitivity Chiral Excess Analysis | 5965-9033E |
| Transfer of HPLC methods to Capillary Electrochromatography | 5965-9031E |
| Gradient LC analysis of herbicides and polyaromatic hydrocarbons by isocratic Capillary Electrochromatography | 5965-9032E |

| Title | Publication No. |
|--|------------------------|
| Analysis of Steroid Isomers by Capillary Electrochromatography | 5965-9030E |
| Analysis of Parabenes in Body Lotion by Capillary Electrochromatography | 5965-9028E |
| Analysis of Synthetic Dyes in Food Samples by Capillary Zone Electrophoresis | 5964-0280E |
| Simultaneous Analysis of Water Soluble Vitamins Using Capillary Electrophoresis | 5963-7568E |
| Capillary Zone Electrophoresis of Carbohydrates Derivatized with 4-Aminobenzoic Acid Ethyl Ester | 5963-1190E |
| CZE Analysis of Artificial Sweeteners and Preservative in Drinks | 5963-1122E |
| Peptide Mapping by and Analysis Using Capillary Electrophoresis | 5091-9062E |

In addition to the application notes Agilent provides so-called application briefs. An application brief describes the separation conditions for a wide range of different samples in a comprehensive format. For an overview and the content of the Agilent application briefs visit our Agilent home page on the worldwide web: <http://www.agilent.com/chem>

Scientific Journal Reprints

| Title | Publication No. |
|---|------------------------|
| CE/MS: Practical Implementation and Applications | 5988-2164EN |
| Simultaneous stereoselective analysis of tramadol and its main phase I metabolites by online CZE electrospray ionization mass spectrometry | 5980-1533E |
| A Comparison of CE-MS and LC-MS for Peptide Samples | 5980-1304E |
| Implementing 21 CFR Part 11 in Analytical Laboratories Part 3: Ensuring Data Integrity in Electronic Records | 5980-1305E |
| Implementing 21 CFR Part 11 in Analytical Laboratories Part 2: Security Aspects for Systems and Applications | 5980-1306E |
| Implementing 21 CFR Part 11 in Analytical Laboratories Part 1: Overview and Requirements | 5980-1308E |
| Capillary electrophoresis for the determination of forensic anions in adulterated foods and beverages | 5968-9463E |
| Simultaneous determination of inorganic anions, organic acids, amino acids and carbohydrates by capillary electrophoresis | 5968-4470E |
| Capillary preconditioning for analysis of anions using indirect UV detection in CZE. | |
| Systematic investigation of alkaline and acid prerinsing techniques by designed experiments | 5968-3329E |
| Simultaneous Determination of Monosaccharides in Glycoproteins by Capillary Electrophoresis | 5968-0772E |
| CE-ESI-MS of small molecules | 5966-4661E |
| Instrumental Validation in Capillary Electrophoresis and Checkpoints for Method Validation | 5965-9717E |
| Capillary electrophoretic determination of inorganic and organic anions using 2,6 pyridinedicarboxylic acid: effect of electrolyte's complexing ability | 5965-8067E |
| Capillary Electrochromatography – a high efficiency micro-separation technique | 5965-3430E |
| Micropreparative Single Run Fraction Collection of Peptides Separated by CZE for Protein Sequencing | 5963-3506E |

Technical Notes

| Title | Publication No. |
|--|------------------------|
| Capillary isoelectric focusing on the Agilent capillary electrophoresis system | 5988-0974EN |
| CE-ESI-MS: An Integrated Solution | 5980-2205E |
| Agilent ChemStation for GC, LC, LC/MSD, CE, UV-Visible and A/D Systems – Revision A.08.0x Enhancements | 5980-1090E |
| Capillary Thermostatting in Capillary Electrophoresis | 5968-8816E |
| HP ChemStation for GC, LC, LC/MSD, CE, UV-Visible and A/D Systems – Revision A.07.0x enhancements | 5968-6668E |
| Use of Mobilities for Improved Reproducibility in CE | 5968-2232E |
| High sensitivity Detection Cell for the Agilent Capillary Electrophoresis System | 5965-5984E |
| Agilent Capillary Electrophoresis System – Technical Description | 5965-6512E |
| Oligonucleotide Analysis – Optical filter for Polyacrylamide-filled Capillaries | 5963-9870E |
| Improved Reproducibility & Increased Sample Throughput in Capillary Electrophoresis | 5963-3296E |
| Use of Extremely Short Effective Length Capillaries in CE – Injection of Sample from the Outlet End of the Capillary | 5963-3403E |
| Diode-Array Detection in Capillary Electrophoresis – Part 1: Using HP Extended Light Path Capillaries | 5963-1889E |
| Diode-Array Detection in Capillary Electrophoresis – Part 2: Spectral Fidelity, Peak Purity, and Library Searching | 5963-1891E |

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Educational Primer and CD-ROMs

| Title | Publication No. |
|---|-----------------|
| CE Partner This CD-ROM includes tutorials on theory and basics of CE, interactive method development and validation, troubleshooting tools and a comprehensive searchable library of applications. | 5968-9893E |
| CEC Guidebook This CD-ROM includes many contributions from eminent workers in the field demonstrating the use of CEC to solve present day separation problems. These applications together with chapters on theory, instrumentation, method transfer and development make this an essential reference source for the novice and experienced user. | 5968-9892E |
| High Performance Capillary Electrophoresis - An Introduction. This primer provides the users with valuable information to apply these to specific applications. Fundamental concepts, with emphasis on basic theory, modes of operation and instrumental considerations. Major application areas with relevant examples and a basic literature survey are also included. | 5968-9963E |

Note:
Your Agilent Technologies representative can help you to receive new applications literature as it becomes available.

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Basic Capillary Electrophoresis Troubleshooting

| Symptom | Possible Cause | Solution(s) |
|---------|----------------|-------------|
|---------|----------------|-------------|

Unstable Current

| | | |
|-------------------------------|--|---|
| Variable or no current | Air bubble formed in capillary | Flush capillary, ramp voltage to limit initial heating, and/or degas buffers. |
| | Clogged capillary | Flush capillary with absorbing solution (such as NaOH). A "step" in the base line should be observed when viewing the on-line signal at 200 nm. If still plugged, flush manually with syringe or high pressure gas. |
| | Broken capillary | Replace capillary. |
| | No or incorrect solution in buffer vials | Fill/change buffer vials. |
| | Large volume injection | Normal situation. Current should stabilize during analysis. |

Unstable Baseline

| | | |
|---------------------------|---|--|
| Spikes in baseline | Precipitates in buffer | Filter buffer through 0.2 or 0.45 μ m filter. |
| | Micro air bubbles in buffer | Degas buffer by ultrasonication or vacuum. |
| | Precipitation of sample | Verify that sample components are sufficiently soluble in buffer. |
| Noisy baseline | Optical slit in capillary interface is occluded | Clean slit with methanol or water. View under magnifier. |
| | Aging deuterium lamp | Use DAD test to measure lamp output and time-on. Replace if necessary. |
| | Data acquisition rate too high | Determine peak width and decrease acquisition rate if appropriate. |
| | Improper reference wavelength | Acquire UV spectrum during analysis. Use lowest wavelength possible without impinging where sample absorbs. Also use wide bandwidth. |
| | Buffer absorbs at detection wavelength | Use minimally UV-absorbing buffers such as phosphate and borate, especially below 210 nm. |
| Drifting baseline | Improper capillary alignment | Re-seat capillary cartridge in detector block. |
| | Unequilibrated temperature | Allow 10-20 minutes for equilibration after opening top cover. |
| | Lamp recently ignited | Allow 15-30 minutes for equilibration after igniting lamp. |

Low Signal

| | | |
|-------------------|------------------------------------|--|
| Low signal | Sample concentration too low | Increase sample concentration. |
| | Insufficient sample stacking | Increase stacking by increasing difference between buffer and sample conductivities. |
| | Detection wavelength not optimized | Acquire UV spectrum during analysis. Use absorption maximum and appropriate bandwidth. |
| | Capillary id too narrow | Use Extended Light Path capillary |

Poor Peak Efficiency

| | | |
|--------------------|-------------------------|---|
| Broad peaks | Sample overloading | Decrease sample injection or concentration. |
| | Excessive Joule heating | Reduce voltage, buffer conductivity, or capillary id. |

| Symptom | Possible Cause | Solution(s) |
|---------|----------------|-------------|
|---------|----------------|-------------|

Poor Peak Efficiency

| | | |
|----------------------|---|--|
| Skewed peaks | Mismatched sample/buffer ion mobilities | Match mobilities or increase difference between buffer and sample conductivity. |
| | Sample overloading | Decrease sample injection or concentration. |
| Tailing peaks | Adsorption to capillary wall | Use pH extremes, high buffer concentrations, polymer additives, or coated capillary. |

Poor Migration Time Reproducibility

| | | |
|---|--|---|
| Adsorption to capillary walls | Changes in EOF caused by buffer (especially phosphates and detergents) or sample adsorption | Condition capillary and allow sufficient equilibration time. Replace capillary. |
| Hysteresis of wall charge | Caused by conditioning capillary at high (or low) pH and employing a low (or high) pH running buffer | Avoid pH differences. Allow sufficient equilibration time. |
| Changes in buffer composition | pH changes due to electrolysis | Replenish buffer. |
| | Buffer evaporation | Tightly cap buffer vials and reduce carousel temperature. |
| | Conditioning waste flushed into outlet reservoir | Use separate vial to collect waste. |
| | Conditioning solution carried over into buffer vial | First dip capillary in separate buffer or water vial. |
| Buffer reservoirs not level | Generation of laminar flow | Level liquid in reservoirs. If not replenishing buffer, do not use inlet vial for flushing capillary. |
| Different silanol content of capillary batches | Different wall charge and variations in EOF | Measure EOF and normalize. |
| Temperature changes | Changes in viscosity and EOF | Use system with capillary thermostating. |

Poor Peak Area Reproducibility

| | | |
|--|---|--|
| Sudden application of high voltage | Heating, thermal expansion of buffer, and expulsion of sample | Ramp separation voltage or inject buffer plug after sample. |
| Sample evaporation | Increasing sample concentration and peak area | Cap vials and/or reduce temperature of sample carousel. |
| Instrumental limitations | System rise time significant proportion of injection time | Increase injection time. |
| Sample carry-over | Extraneous injection | Use capillary with flat, smooth injection end. Remove polyimide from end of capillary. |
| Zero-injection caused by simply dipping the capillary in the sample | Extraneous injection | Cannot be totally eliminated. Increase injection amount to minimize effect. |
| Sample adsorption to capillary walls | Distorted peak shape (tailing) Non-eluting sample | Change buffer pH. Increase buffer concentration. Use additive such as cellulose or coated capillary. |
| Low signal-to-noise ratio | Integration errors | Optimize integration parameters. Increase sample concentration. Use peak height. |
| Temperature changes of capillary environment | Changes in viscosity and injection amount | Use system with capillary thermostating. |

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