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Polyimide Cladding on CE Capillaries Explained - Tech Information

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Overview

This article explains what polyimide cladding is, why it is applied to capillary electrophoresis (CE) capillaries, and how its chemical and mechanical properties protect the delicate fused silica tubing. Polyimide serves as the standard outer coating for nearly all CE capillaries due to its exceptional thermal, chemical, and mechanical performance.

The information below outlines its composition, behavior under heat, flexibility, and why it is considered essential for both analytical precision and instrument durability.

What Is Polyimide Cladding?

Polyimide cladding is a protective outer coating applied to fused silica capillaries used in capillary electrophoresis (CE). Its primary function is to surround the fragile glass tubing with a durable, flexible barrier that enables the capillary to withstand handling, bending, solvents, and instrument-related stresses.

This coating is critical because bare fused silica—while ideal for optical detection—is extremely brittle. Polyimide provides the necessary mechanical strength without interfering with the capillary's analytical performance.

What Is Polyimide?

Polyimide is an aromatic, linear polymer widely used in high-performance materials due to its:

- Excellent thermal resistance
- Strong chemical resistance
- Mechanical durability
- Flexibility even at extreme temperatures

Unlike many polymers:

- Polyimide does not melt because it thermally degrades before reaching its glass transition temperature.
- It is not cross-linked, which allows it to remain flexible and resilient rather than brittle.

These characteristics make it ideal as a protective cladding for delicate fused silica capillaries.

Why Is Polyimide Used on CE Capillaries?

Polyimide cladding supports CE capillaries in several essential ways:

1. Solvent Resistance

It withstands exposure to a wide variety of solvents, including:

- Organic solvents
- Aqueous buffers
- Cleaning solutions

This protects the underlying fused silica from solvent-related weakening.

2. Thermal Stability

Polyimide performs reliably over broad temperature ranges, making it suitable for:

- High-temperature CE applications
- Cooling/heating cycles
- Long analytical runs

Its heat tolerance ensures the coating remains stable under operational stress.

3. Barrier and Mechanical Protection

The coating protects the capillary from:

- Abrasion
- Environmental exposure
- Physical impact
- Micro-cracking of the fused silica

Without this protective layer, the capillary would break easily during handling or installation.

4. Flexibility

Polyimide allows capillaries to be:

- Coiled
- Routed through instruments
- Connected to autosamplers or cartridges
- Used in tight instrument spaces

This flexibility is essential for CE instrument design and automation.

Together, these properties make polyimide-coated capillaries the standard for CE, suitable for routine, research, and automated diagnostic applications.

Technical Resources

🔗 Click ***HERE*** for Capillary Technical Properties
🔗 Click ***HERE*** for MICROSOLV Window Maker ordering information and images

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