

FAST • HIGH PEAK CAPACITY • LOW BACK PRESSURE

# HALO<sup>®</sup> & HALO<sup>®</sup> PROTEIN & PEPTIDE

The high efficiency of sub-2  $\mu\text{m}$  UHPLC columns combined with the low pressure and high speed of monolith columns.

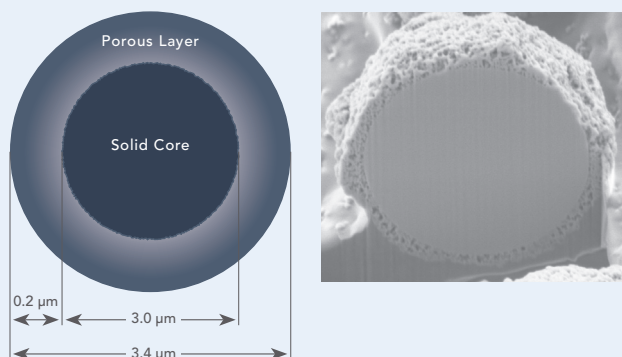
- Fast
- High peak capacity
- Low back pressure
- Stable at high temperature
- Use with UHPLC or conventional HPLC equipment

Put these new, high-performance chromatographic tools to work in your laboratory.

## Fused-Core particle technology makes HALO Protein and HALO Peptide columns possible

HALO UHPLC columns are not your typical UHPLC columns. The particles packed into HALO columns are made using groundbreaking Fused-Core<sup>®</sup> particle technology that produces superficially porous particles (also known as core-shell particles) that make possible the manufacture of very high efficiency columns without the very high pressure of other UHPLC columns. HALO Protein and HALO Peptide columns, thanks to Fused-Core technology, minimize the compromises that must be made between efficiency, speed of separation and column back pressure. It is like combining the benefits of low pressure and high speed that one gets from monolith columns with the high efficiency of UHPLC columns packed with sub-2 micron particles.

FIGURE 1: Groundbreaking Fused-Core particle technology



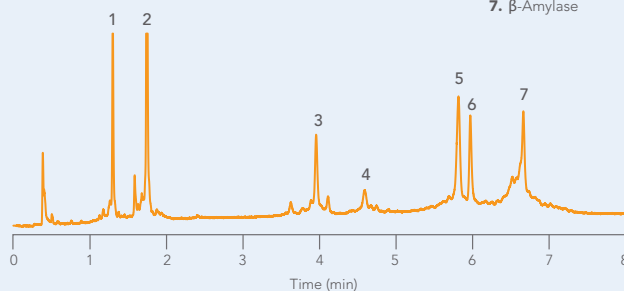
Fused-Core particle technology facilitates the production of particles with specifically engineered and carefully controlled pore size, particle size and diffusion path length. These parameters are then selected for optimum separation of proteins and peptides, depending on the molecular size of the analytes. The cartoon on the left illustrates the basic structure of the particle and the SEM on the right shows what a HALO Protein particle actually looks like.

HALO Protein and Peptide UHPLC columns are specifically designed for fast, high-resolution separation of proteins and peptides. The particles packed in these columns are engineered to have pore sizes, particle sizes and diffusion path lengths that are optimum for the separation of proteins up to 500 kDa (HALO Protein columns) and peptides in the range of 3 to 20 kDa (HALO Peptide columns).

The use of highly stable bonding chemistry ensures that separations are rugged and reliable and the low back pressure of these columns allow them to be used effectively on either UHPLC or conventional HPLC equipment.

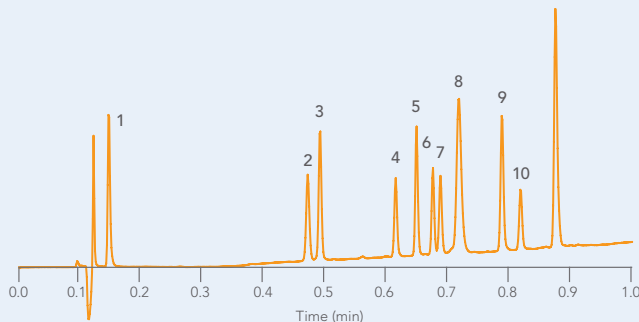
FIGURE 2: Fast separation of proteins and peptides.

**Column:** HALO Protein C4, 2.1 x 100 mm  
**Mobile Phase:** A: Water/0.1% TFA, B: 80/20 Acetonitrile/Water + 0.1% TFA  
**Gradient:** Time %B  
0 - 2 min. 35 - 47.5  
2 - 8 min. 47.5 - 60  
**Flow rate:** 0.5 mL/min  
**Temp:** 60 °C  
**Pressure:** 109 bar  
**Sample:**  
1. Cytochrome c  
2. Lysozyme  
3.  $\alpha$ -Chymotrypsin  
4. Catalase  
5. Carbonic anhydrase  
6. Enolase  
7.  $\beta$ -Amylase



**Column:** HALO Peptide ES-C18, 4.6 x 50 mm  
**Mobile Phase:** A: 0.1% TFA/10% ACN, B: 0.1% TFA/70% ACN  
**Gradient:** 0% to 87.5% B in 1 min  
**Flow Rate:** 5.0 mL/min  
**Temperature:** 60 °C  
**Pressure:** 330 bar  
**LC System:** Conventional HPLC, Agilent 1100

**Sample:**  
1. Gly-Tyr  
2. Val-Tyr-Val  
3. Angiotensin 1/2 (1-7) amide  
4. Met-enk  
5. Angiotensin 1/2 (1-8) amide  
6. Angiotensin II  
7. Leu-enk  
8. Ribonuclease A  
9. Angiotensin (1-12) (human)  
10. Angiotensin (1-12) (mouse)  
11. Porcine Insulin



The top chromatogram demonstrates the high speed separation of 7 proteins in less than 8 minutes with a HALO Protein C4 column. The chromatogram on the bottom shows the separation of 9 peptides and 2 proteins in less than 60 seconds with a HALO Peptide ES-C18 column.

## HALO Protein and HALO Peptide Specifications

### Stationary Phase Support

#### HALO Protein

- 3.4  $\mu\text{m}$  diameter spherical, ultra-pure, "Type B" silica
- 0.2  $\mu\text{m}$  porous layer fused to a 3.0  $\mu\text{m}$  solid core
- 400  $\text{\AA}$  pore size

#### Bonded Phase

C4: Dimethylbutylsilane, exhaustively endcapped and enhanced for high temperature stability

#### HALO Peptide

- 2.7  $\mu\text{m}$  (HALO) and 4.7  $\mu\text{m}$  (HALO-5) diameter spherical, ultra-pure, "Type B" silica
- HALO: 0.5  $\mu\text{m}$  porous layer fused to a 1.7  $\mu\text{m}$  solid core.
- HALO-5: 0.6  $\mu\text{m}$  porous layer fused to a 3.5  $\mu\text{m}$  solid core.
- 160  $\text{\AA}$  pore size
- Two bonded phases (C18 and CN) provide alternate selectivity to optimize peptide separations

#### Bonded Phases

ES-C18: Octadecyldiisobutylsilane, not endcapped

ES-CN: Cyanopropyl diisopropylsilane, exhaustively endcapped

For more information:



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## HALO Protein & Peptide UHPLC Columns

### HALO Protein C4

Dimensions (mm)	Part Number
2.1 x 50	93412-414
2.1 x 100	93412-614
2.1 x 150	93412-714
4.6 x 50	93414-414
4.6 x 100	93414-614
4.6 x 150	93414-714

#### Guard Columns, 3 pk

2.1 x 5	93412-114
4.6 x 5	93414-114

### HALO-5 Peptide ES-C18

Dimensions (mm)	Part Number
2.1 x 20	95122-202
2.1 x 30	95122-302
2.1 x 50	95122-402
2.1 x 75	95122-502
2.1 x 100	95122-602
2.1 x 150	95122-702
2.1 x 250	95122-902
3.0 x 30	95123-302
3.0 x 50	95123-402
3.0 x 75	95123-502
3.0 x 100	95123-602
3.0 x 150	95123-702
3.0 x 250	95123-902
4.6 x 30	95124-302
4.6 x 50	95124-402
4.6 x 75	95124-502
4.6 x 100	95124-602
4.6 x 150	95124-702
4.6 x 250	95124-902

#### Guard Columns, 3 pk

2.1 x 5	95122-102
3.0 x 5	95123-102
4.6 x 5	95124-102

### HALO-5 Peptide ES-CN

Dimensions (mm)	Part Number
2.1 x 20	95122-204
2.1 x 30	95122-304
2.1 x 50	95122-404
2.1 x 75	95122-504
2.1 x 100	95122-604
2.1 x 150	95122-704
2.1 x 250	95122-904
3.0 x 30	95123-304
3.0 x 50	95123-404
3.0 x 75	95123-504
3.0 x 100	95123-604
3.0 x 150	95123-704
3.0 x 250	95123-904
4.6 x 30	95124-304
4.6 x 50	95124-404
4.6 x 75	95124-504
4.6 x 100	95124-604
4.6 x 150	95124-704
4.6 x 250	95124-904

#### Guard Columns, 3 pk

2.1 x 5	95122-104
3.0 x 5	95123-104
4.6 x 5	95124-104

### HALO Peptide ES-18

Dimensions (mm)	Part Number
2.1 x 20	92122-202
2.1 x 30	92122-302
2.1 x 50	92122-402
2.1 x 75	92122-502
2.1 x 100	92122-602
2.1 x 150	92122-702
3.0 x 20	92123-202
3.0 x 30	92123-302
3.0 x 50	92123-402
3.0 x 75	92123-502
3.0 x 100	92123-602
3.0 x 150	92123-702
4.6 x 20	92124-202
4.6 x 30	92124-302
4.6 x 50	92124-402
4.6 x 75	92124-502
4.6 x 100	92124-602
4.6 x 150	92124-702
4.6 x 250	95124-904

#### Guard Columns, 3 pk

2.1 x 5	92122-102
3.0 x 5	92123-102
4.6 x 5	92124-102

### HALO Peptide ES-CN

Dimensions (mm)	Part Number
2.1 x 20	92122-204
2.1 x 30	92122-304
2.1 x 50	92122-404
2.1 x 75	92122-504
2.1 x 100	92122-604
2.1 x 150	92122-704
2.1 x 250	92122-904
3.0 x 30	92123-304
3.0 x 50	92123-404
3.0 x 75	92123-504
3.0 x 100	92123-604
3.0 x 150	92123-704
3.0 x 250	92123-904
4.6 x 30	92124-304
4.6 x 50	92124-404
4.6 x 75	92124-504
4.6 x 100	92124-604
4.6 x 150	92124-704
4.6 x 250	92122-904

#### Guard Columns, 3 pk

2.1 x 5	92122-104
3.0 x 5	92123-104
4.6 x 5	92124-104

#### Guard Column Holder

94900-001