

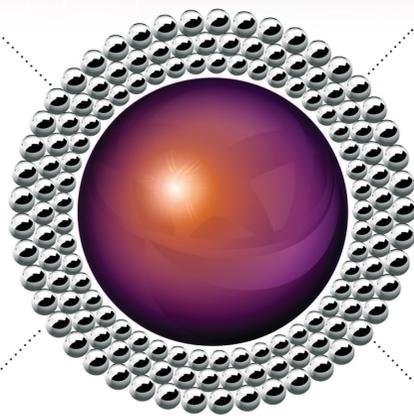
The key components of Core Enhanced Technology

Solid Core Particles

2.6µm diameter particles with a solid core generate high speed, high resolution separations without excessive backpressure

Automated Packing Process

Enhanced automated procedures ensure that all columns are packed with the highest quality



Tight Control of Particle Diameter

Enhanced selection process keeps particle size distribution to a minimum and produces high efficiency columns

Advanced Bonding Technology

Optimized phase bonding creates a series of high coverage, robust phases

Core Enhanced Technology

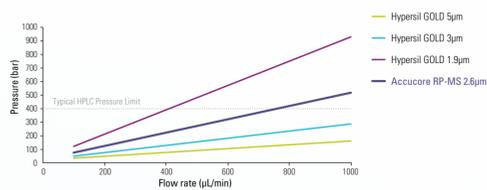
Core Enhanced Technology offers the advantages associated with sub-2µm packing materials – fast, high-resolution separations – without the high backpressures required to work with the smaller particles.

The Core Enhanced Technology effect in Thermo Scientific Accucore HPLC Columns

Low Pressure

$$\Delta P \sim \frac{250L\eta F}{d_p^2 d_c^2}$$

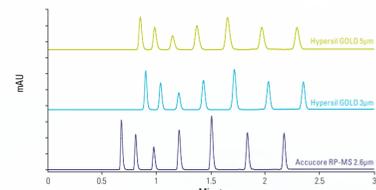
- L Column length (cm)
- η Mobile phase viscosity
- F Flow rate (ml/min)
- d_p^2 Particle diameter (µm)
- d_c^2 Column diameter (cm)



High Peak Capacity

$$n_c = 1 + \left(\frac{t_r}{W}\right)$$

- n_c Peak capacity
- t_r Gradient time
- W Peak width (10% height)



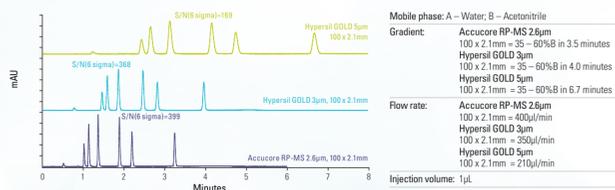
| Column | Normalized Peak Capacity |
|----------------------|--------------------------|
| Accucore RP-MS 2.6µm | 158 |
| Hypersil GOLD 3µm | 132 |
| Hypersil GOLD 5µm | 100 |

Mobile phase: A – Water; B – Acetonitrile
 Gradient: 65 – 95% B in 2.1 minutes, 95% B for 0.4 minute
 Flow rate: 400µl/min
 Injection volume: 1µl
 Temperature: 40°C
 Detection: UV at 247nm (0.1s rise time, 20Hz)
 Analytes: 1. Acetophenone, 2. Propiophenone, 3. Butyrophenone, 4. Valerophenone, 5. Hexanophenone, 6. Heptanophenone, 7. Octanophenone

Increased Sensitivity

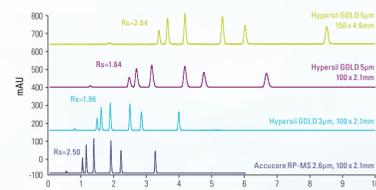
$$c_{max} \propto \frac{\sqrt{N} V_i}{L d_c^2 (1 + k)}$$

- c_{max} Concentration at peak apex
- N Efficiency
- V_i Injection volume
- L Column length
- d_c Column internal diameter
- k Capacity factor



| Column | S/N (6-sigma) for Monuron | Increase in Sensitivity |
|--------------------------------|---------------------------|-------------------------|
| Accucore 2.6 µm 100 x 2.1mm | 399 | 136% |
| Hypersil GOLD 3 µm 100 x 2.1mm | 368 | 117% |
| Hypersil GOLD 5 µm 100 x 2.1mm | 169 | – |

Fast Separations



| | Accucore RP-MS 2.6µm, 100 x 2.1mm | Hypersil GOLD 3µm, 100 x 2.1mm | Hypersil GOLD 5µm, 100 x 2.1mm | Hypersil GOLD 5µm, 150 x 4.6mm |
|--|-----------------------------------|--------------------------------|--------------------------------|--------------------------------|
| Resolution (critical pair) | 2.50 | 1.96 | 1.64 | 2.64 |
| Run time (min) including gradient re-equilibration | 6.00 | 7.00 | 11.50 | 17.00 |

Mobile phase: A – Water; B – Acetonitrile
 Gradient: Accucore RP-MS 2.6µm 100 x 2.1mm = 35 – 60%B in 3.5 minutes
 Hypersil GOLD 3µm 100 x 2.1mm = 35 – 60%B in 4.0 minutes
 Hypersil GOLD 5µm 100 x 2.1mm = 35 – 60%B in 6.7 minutes
 Hypersil GOLD 5µm 150 x 4.6mm = 35 – 60%B in 10.0 minutes
 Flow rate: Accucore RP-MS 2.6µm 100 x 2.1mm = 400µl/min
 Hypersil GOLD 3µm 100 x 2.1mm = 350µl/min
 Hypersil GOLD 5µm 100 x 2.1mm = 210µl/min
 Hypersil GOLD 5µm 150 x 4.6mm = 100µl/min
 Injection volume: 1µl (Hypersil GOLD 5µm 150 x 4.6mm = 5µl)
 Temperature: 30°C
 Detection: UV at 247nm (0.1s rise time, 20Hz)
 Analytes: 1. Tobuthiuron, 2. Metoxuron, 3. Monuron, 4. Chlorotoluron, 5. Diuron, 6. Linuron

Rugged Columns with Very Long Lifetimes

Accucore Phase Characterization



Accucore RP-MS
 Optimized for MS detection, excellent combination of speed and quality of separation



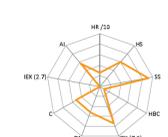
Accucore C18
 Optimum retention for non-polar analytes



Accucore aQ
 Compatible with 100% aqueous mobile phases, special selectivity for polar analytes



Accucore Phenyl-Hexyl
 Unique selectivity for aromatic and moderately polar analytes



Accucore PFP
 Alternative selectivity to C18, particularly for halogenated analytes

HILIC

Accucore HILIC
 Enhanced Retention of polar and hydrophilic analytes



Phase Characterization Based on Tanaka Test

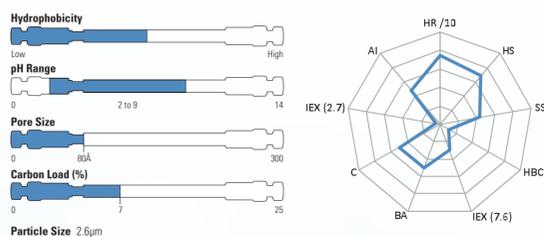
| Silica Support Properties | Bonded Phase Properties | Hydrophobic Interactions | Secondary Interactions | Acidic Interactions | HILIC Interactions |
|--------------------------------|-------------------------|-------------------------------|------------------------------------|----------------------------------|-------------------------------|
| Surface Area | Carbon Load | Hydrophobic retention | Base activity | Acid interaction | HILIC retention & selectivity |
| Pore Size | | Hydrophobic selectivity | Chelation | Ion exchange capacity pH 2.6 | |
| Particle Size | | Steric selectivity | Ion exchange capacity (pH 7.6) | | |
| Particle Size Distribution | | Hydrogen bonding capacity | | | |

Thermo Scientific Accucore HPLC Columns Selectivity

Phase Properties and Characterization

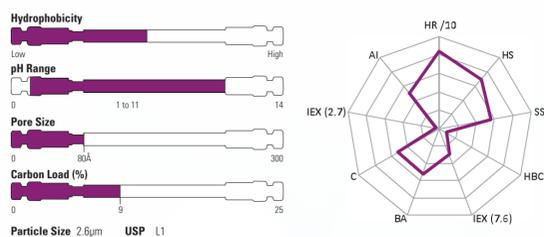
Radar plots show the results of the Accucore phase characterization and allow for quick and easy comparison of the phase selectivities.

Accucore RP-MS



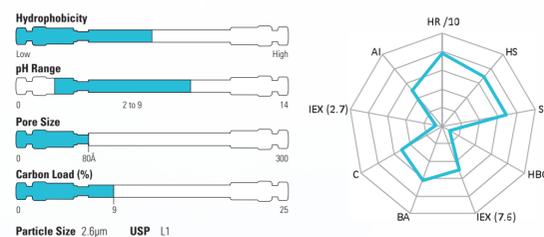
- Optimized for MS detection, excellent combination of speed and quality of separation**
- Optimized for MS detection
 - Excellent Peak Shapes
 - Excellent Combination of Speed and Efficiency

Accucore C18



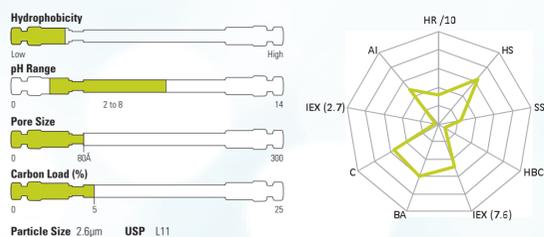
- Optimum retention for non-polar analytes**
- Optimum retention of non-polar compounds
 - Hydrophobic interaction mechanism
 - Separate a broad range of analytes

Accucore aQ



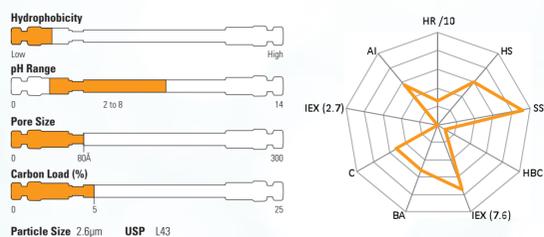
- Compatible with 100% aqueous mobile phases, special selectivity for polar analytes**
- Retention and Resolution of Polar Analytes
 - Polar Endcapped C18 Stationary Phase for Alternative Selectivity
 - Ideal for Highly Aqueous Mobile Phases

Accucore Phenyl-Hexyl



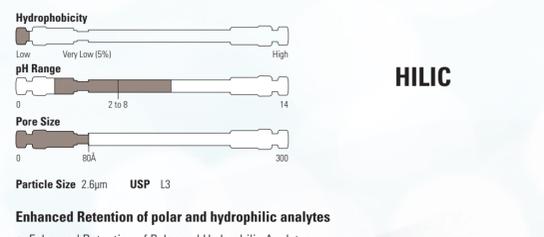
- Unique selectivity for aromatic and moderately polar analytes**
- Mixed-Mode Selectivity for Aromatic and Moderately Polar Analytes
 - Enhanced Pi-pi Interactions with Aromatics
 - Moderate Hydrophobicity

Accucore PFP



- Alternative selectivity to C18, particularly for halogenated analytes**
- Alternative Selectivity to C18
 - Extra Retention for Halogenated Species
 - Unique Selectivity for Non-halogenated Polar Compounds

Accucore HILIC



- Enhanced Retention of polar and hydrophilic analytes**
- Enhanced Retention of Polar and Hydrophilic Analytes
 - Alternative Selectivity to C18 without Ion-pair or Derivatization
 - Improved Sensitivity for MS detection

HILIC

Features of Accucore HPLC Columns Related to Core Enhanced Technology

| | Solid Core Particles | Tight Control of Particle Diameter | Advanced Bonding Technology | Automated Packing Process |
|-----------------------------|----------------------|------------------------------------|-----------------------------|---------------------------|
| Fast Separations | • | • | • | • |
| High Peak Capacity | • | • | • | • |
| Increased Sensitivity | • | • | • | • |
| Lower Pressure | • | • | • | • |
| Loading Capacity | • | • | • | • |
| Reproducible Chromatography | • | • | • | • |
| Long Lifetime | • | • | • | • |
| Wide Selectivity | • | • | • | • |

