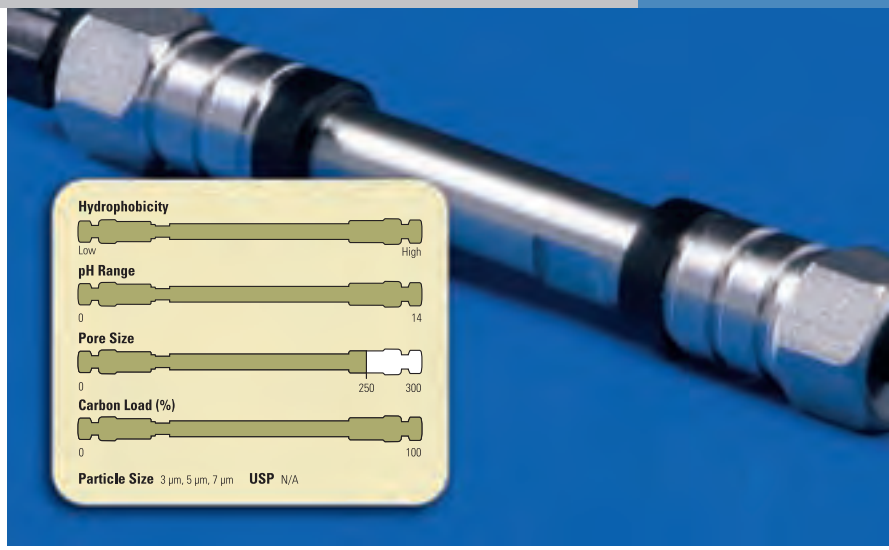
- **Higher speed**
- **Higher peak capacity**
- **Higher sensitivity**
- **Column stability at elevated temperature**

Product Specifications

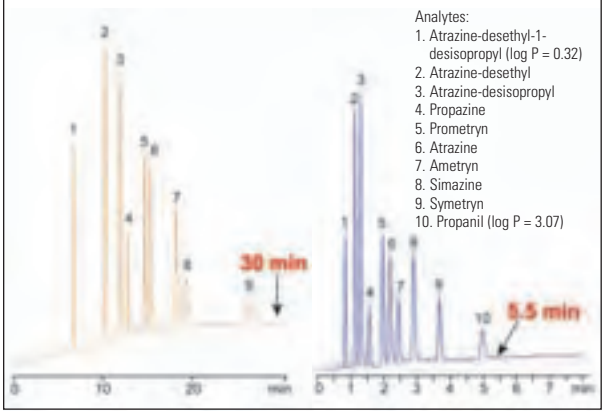
Hypercarb Columns

For Ultra High Temperature HPLC



Hypercarb 5 µm, 100 x 4.6 mm

Mobile Phase:	A: H_2O B: ACN	Mobile Phase:	A: H_2O B: ACN
Gradient:	5 to 100% B in 15 minutes	Isocratic:	A:B (50:50)
Flow Rate:	1 mL/min	Flow Rate:	2 mL/min
Temperature:	40 °C	Temperature:	140 to 200 °C at 30 °C/min
Detection:	UV at 215 nm	Detection:	UV at 215 nm



Analysis time can be dramatically reduced using a temperature gradient

Hypercarb Columns for Ultra High Temperature HPLC

Porous Graphitic Carbon (PGC) is a unique stationary phase, composed of flat sheets of hexagonally arranged carbon atoms, at the molecular level. Hypercarb™ is unlike traditional silica bonded phases in both its structure and retentive properties, allowing for total pH stability and the retention and separation of highly polar species. Hypercarb columns are ideally suited to solve "problem" separations, in both reversed phase and normal phase HPLC and LC/MS applications. This extends to their use in ultra high temperature liquid chromatography (UHT-LC) applications where the use of very high temperatures (up to 200 °C) generally reduces retention and has the following advantages:

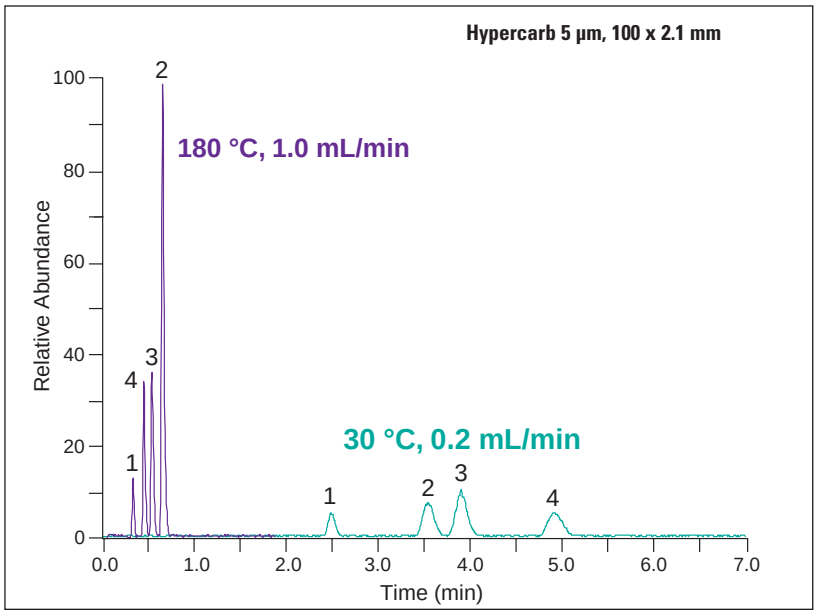
- **Higher speed:** In addition to the decrease in capacity factor with temperature, mobile phase viscosity is reduced at high temperatures and therefore higher flow rates can be utilized for fast separations, without compromising efficiency.
- **Higher peak capacity:** At higher temperatures peaks are more efficient and sharper, allowing for increased peak capacity.
- **Higher sensitivity:** Sharper chromatographic peaks improve signal-to-noise ratios. Additionally, when UHT-LC is used in combination with ESI and APCI detection, the mobile phase reaches the ion source at elevated temperature which aids the vaporization and desolvation processes, increasing the ionization efficiency and consequently the sensitivity of the analysis.

These enhancements are clearly illustrated in the following separation of four sulphonamides. When the temperature is raised from 30 °C to 180 °C and the flow rate from 0.2 mL/min to 2.0 mL/min, analysis time is reduced from 5 minutes to 0.6 minutes, while still maintaining baseline resolution of the four compounds. There is an accompanying 2 to 7 fold improvement in signal to noise ratio for the analytes.

This example also shows that temperature may also affect selectivity (elution order). Sulphonamides are basic compounds and as the temperature is increased, their pKa values decrease; therefore, the separation temperature affects the ionization state of the solute and its hydrophobic/polar retention on the stationary phase.

Using Temperature Gradients

Temperature gradients can also be used as a method development parameter to achieve gains in speed and peak capacity. In the example on the previous page, seven herbicides and three metabolites of atrazine, having a wide range of hydrophobicity, are separated in 5 minutes using a temperature gradient. The analysis time has been reduced by more than 7 fold (at 40 °C, propranil does not elute in 45 minutes).



The separation of sulphonamides using Hypercarb columns. Analysis time and signal to noise is improved at high temperatures.

Column Stability at Elevated Temperatures

UHT-LC has specific requirements in terms of column stability. Columns packed with modified silica supports, which are generally used in reversed phase HPLC, should not be used above 60 to 80 °C. At these temperatures, hydrolysis of the organosilane bond or dissolution of the silica may occur. Hypercarb is the ideal stationary phase for UHT-LC, since it is not affected by physical or chemical degradation at high temperature regardless of mobile phase used. Moreover, when used in UHT-LC/MS, there is no phase bleed. The column hardware used for Hypercarb high temperature applications is constructed from 100% stainless steel and in addition, does not contain PEEK components as these are not stable above 120 °C. All connectors and tubing should also be constructed from stainless steel. The table below lists the part number information for the more common high temperature Hypercarb columns.

Ordering Information

Hypercarb High Temperature Columns

Particle Size	Length (mm)	4.6 mm ID	3.0 mm ID	2.1 mm ID	1.0 mm ID
3 µm	30	35003-034646	35003-033046	35003-032146	35003-031046
	50	35003-054646	35003-053046	35003-052146	35003-051046
	100	35003-104646	35003-103046	35003-102146	35003-101046
5 µm	30	35005-034646	35005-033046	35005-032146	35005-031046
	50	35005-054646	35005-053046	35005-052146	35005-051046
	100	35005-104646	35005-103046	35005-102146	35005-101046

Please note that these columns are for use with elevated temperatures. For other dimensions, please inquire.

For technical tips and applications visit the **Chromatography Resource Center** at **www.thermo.com/columns**

Thermo Electron Corporation, Bellefonte, PA is ISO Certified.
Thermo Hypersil Ltd., Runcorn, UK is ISO Certified.
PS20353_E 12/06M

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China +86 10 5850 3588
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Germany +49 6103 408 1014
India +91 22 6742 9434
Italy +39 02 950 591
Japan +81 45 453 9100
Latin America +1 608 276 5659
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