

HT5 - High Temperature Stationary Phase for Capillary Gas Chromatography

INTRODUCTION

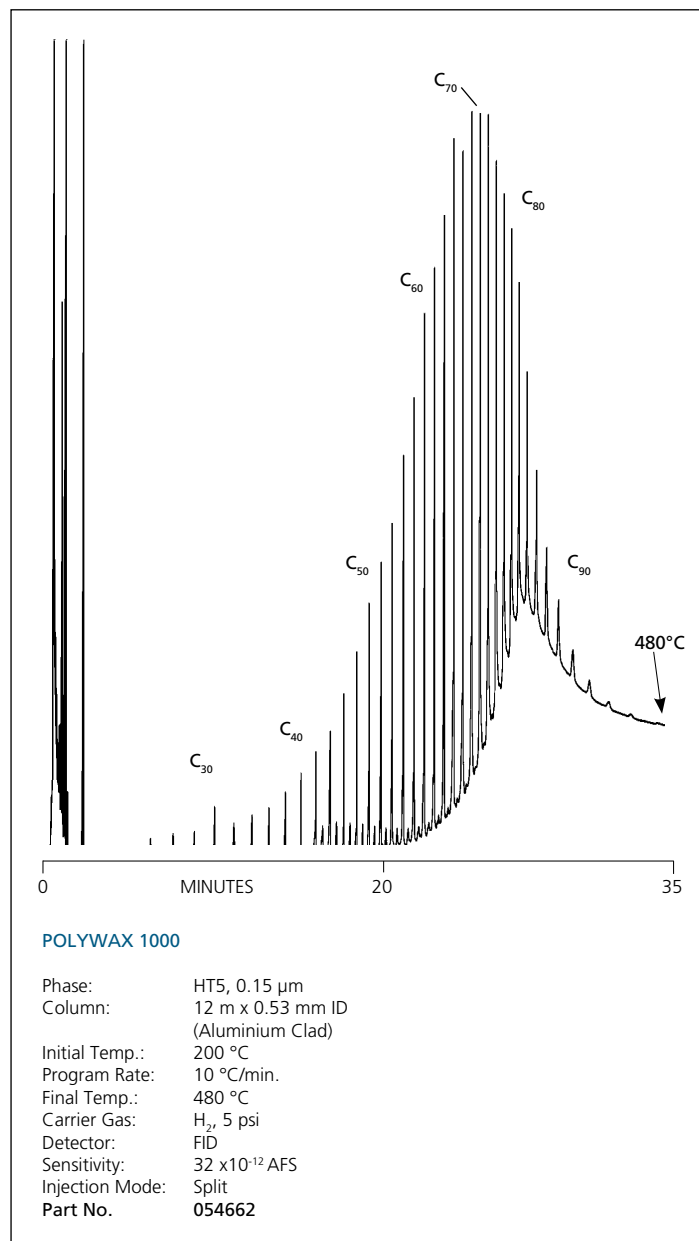
HT5 was the first carborane modified siloxane phase to be commercially available on fused silica capillary columns. With an equivalent polarity to 5 % phenyl, HT5 is a bonded phase capable of operating at temperatures up to 480 °C (with exterior coated aluminum clad columns).

For many classes of high molecular weight materials, gas chromatography using high temperature columns, is a more desirable technique than alternatives such as HPLC and SFC. HT5 equips the analyst with a robust column, providing higher resolution, shorter analysis time and ease of operation.

Clearly, the performance limitations of high temperature gas chromatography will be the thermal stability of the compounds to be analyzed, and their possible interaction with the capillary column. Well suited to this technique are many high molecular weight polar and fractionalized compounds.

Although HT5 was designed with high temperature analysis in mind, the column is also well suited for operation at more conventional temperatures (280 °C / 300 °C). HT5 effectively exhibits zero bleed at these temperatures which makes it perfectly suited for use with mass spectrometers and other specific detector systems where column bleed is critical. The siloxane-carborane backbone of the HT5 stationary phase, which gives HT5 its outstanding thermal stability, also provides some unusual, and often very useful, selectivity characteristics.

A quick, simple and reliable chromatographic technique is now available for the analysis of high molecular weight waxes and polyethylenes. Due to the excellent resolving power of the HT5 column and a temperature operating range of 10 °C to 480 °C, the analysis of hydrocarbons from C4 to C100 and above can be achieved in a relatively short analysis time.



Example of High Temperature Application

PRODUCT DATA

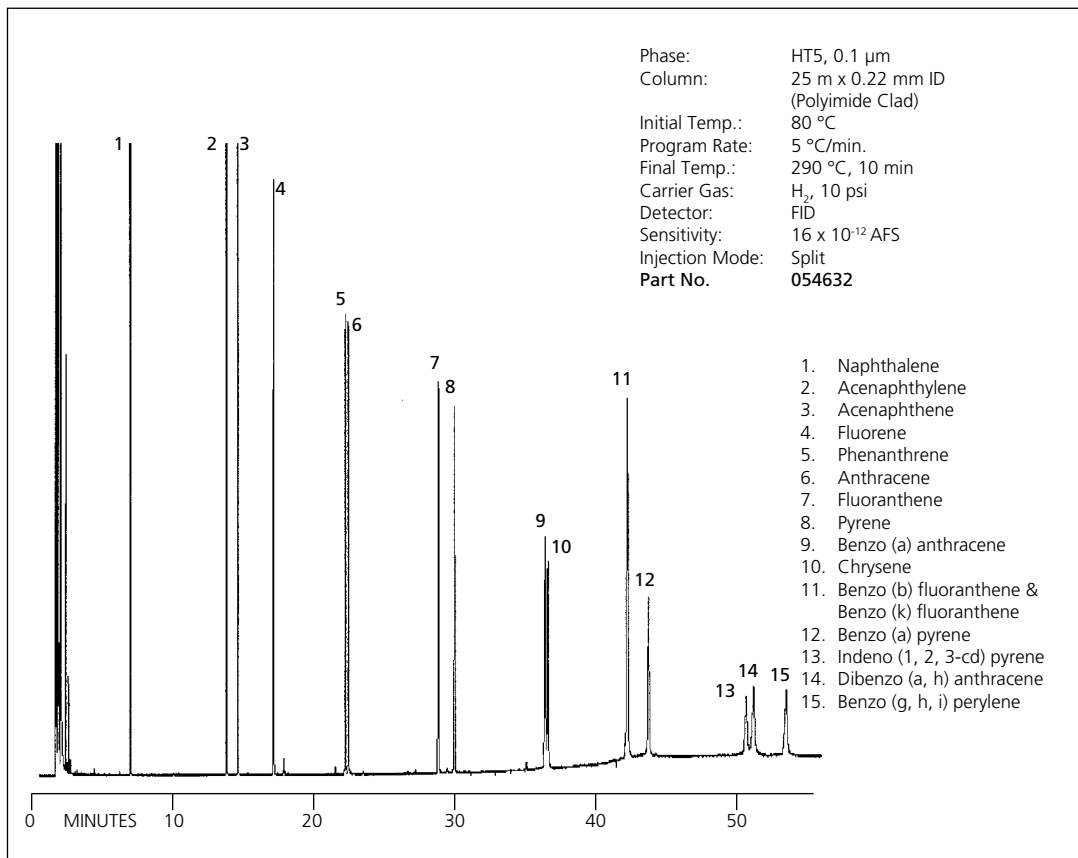


Figure 1. Polynuclear Aromatic Hydrocarbons

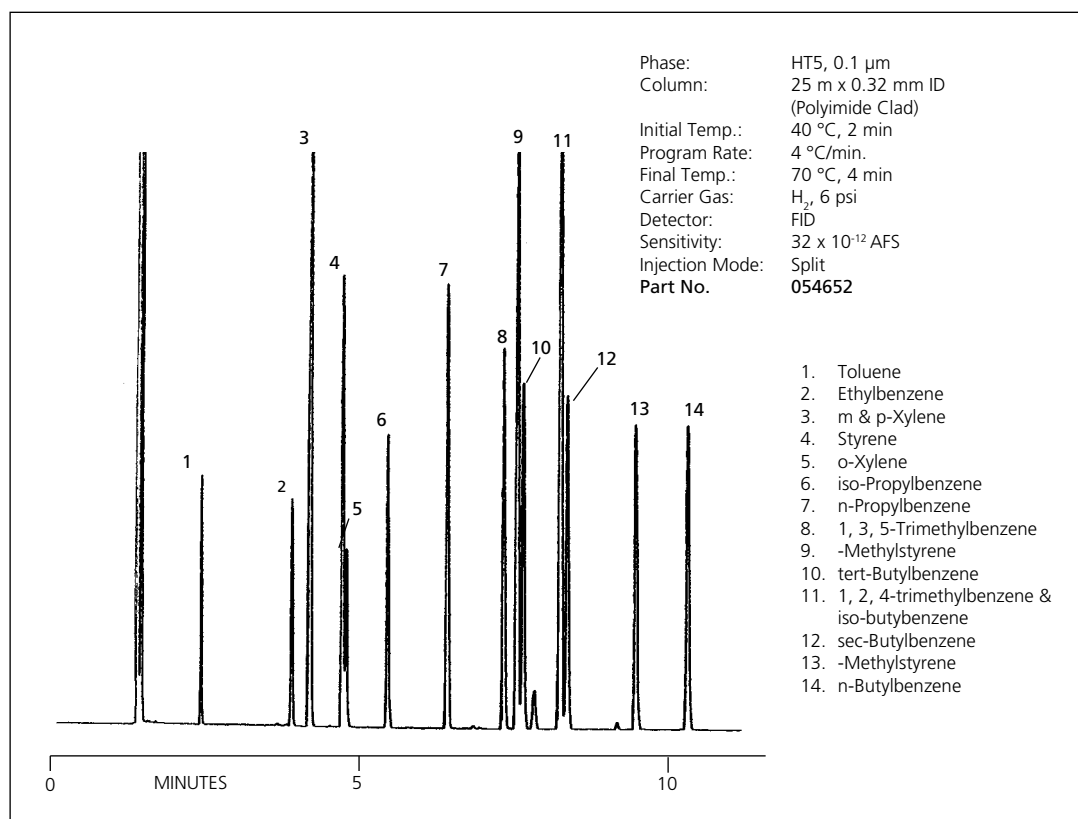


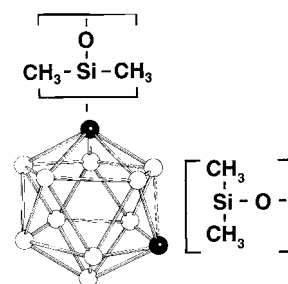
Figure 2. Substituted Benzenes

SPECIFICATIONS

HT5 is a carborane modified polysiloxane with an equivalent polarity of 5 % phenyl.

Min. Operating Temp.= 10 $^{\circ}$ C
 Max. Continuous Temp.= 460 $^{\circ}$ C*
 Max. Cycling Temp.= 480 $^{\circ}$ C*

* aluminum clad column



The analysis of 16 PAH (Polynuclear Aromatic Hydrocarbons) illustrates the compatibility of the HT5 column for this application (Figure 1). Excellent separation of the isomer pairs phenanthrene/anthracene and benzo(a)anthracene/chrysene is achieved while maintaining a constant stable baseline.

HT5 can also be used to separate complex mixtures of volatile alkyl substituted aromatics (Figure 2).

PRODUCT DATA

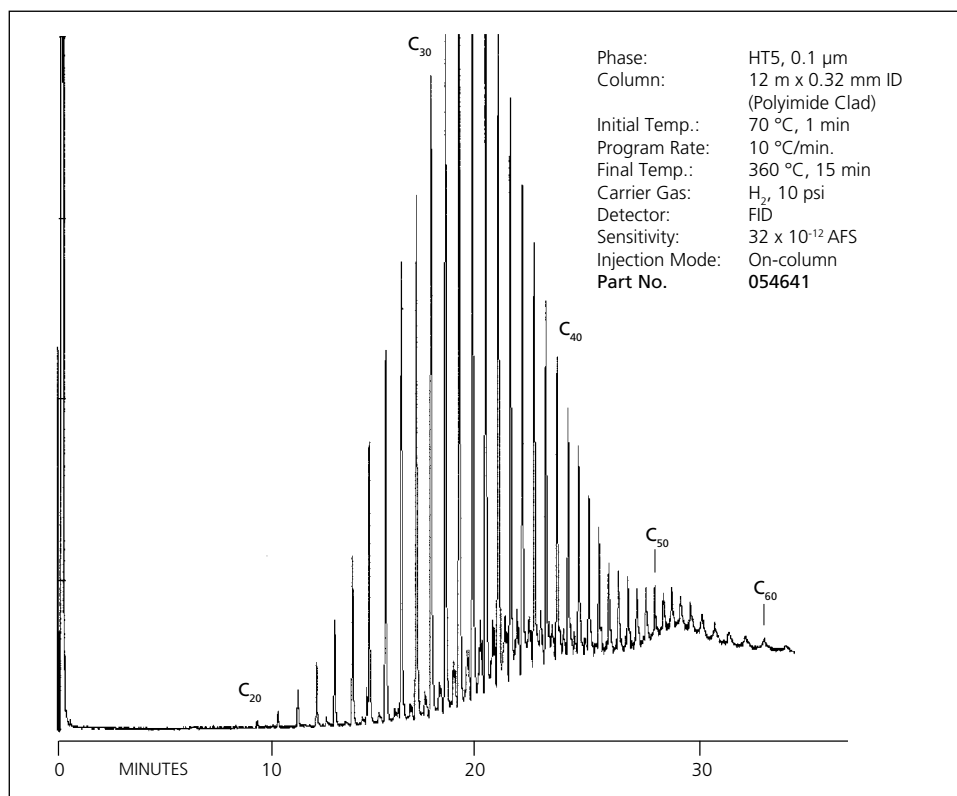


Figure 3 - Wax Sample

These two chromatograms illustrate the range of high and low molecular weight waxes that can be analysed on polyimide (Figure 3) and aluminium coated (Figure 4) HT5 columns.

Though restricted to a maximum temperature of 360 $^{\circ}\text{C}$ - 370 $^{\circ}\text{C}$, the polyimide coated capillaries still allow a considerable range of hydrocarbons to be analysed. In the above example straight chain hydrocarbons up to C60 are analysed without difficulty.

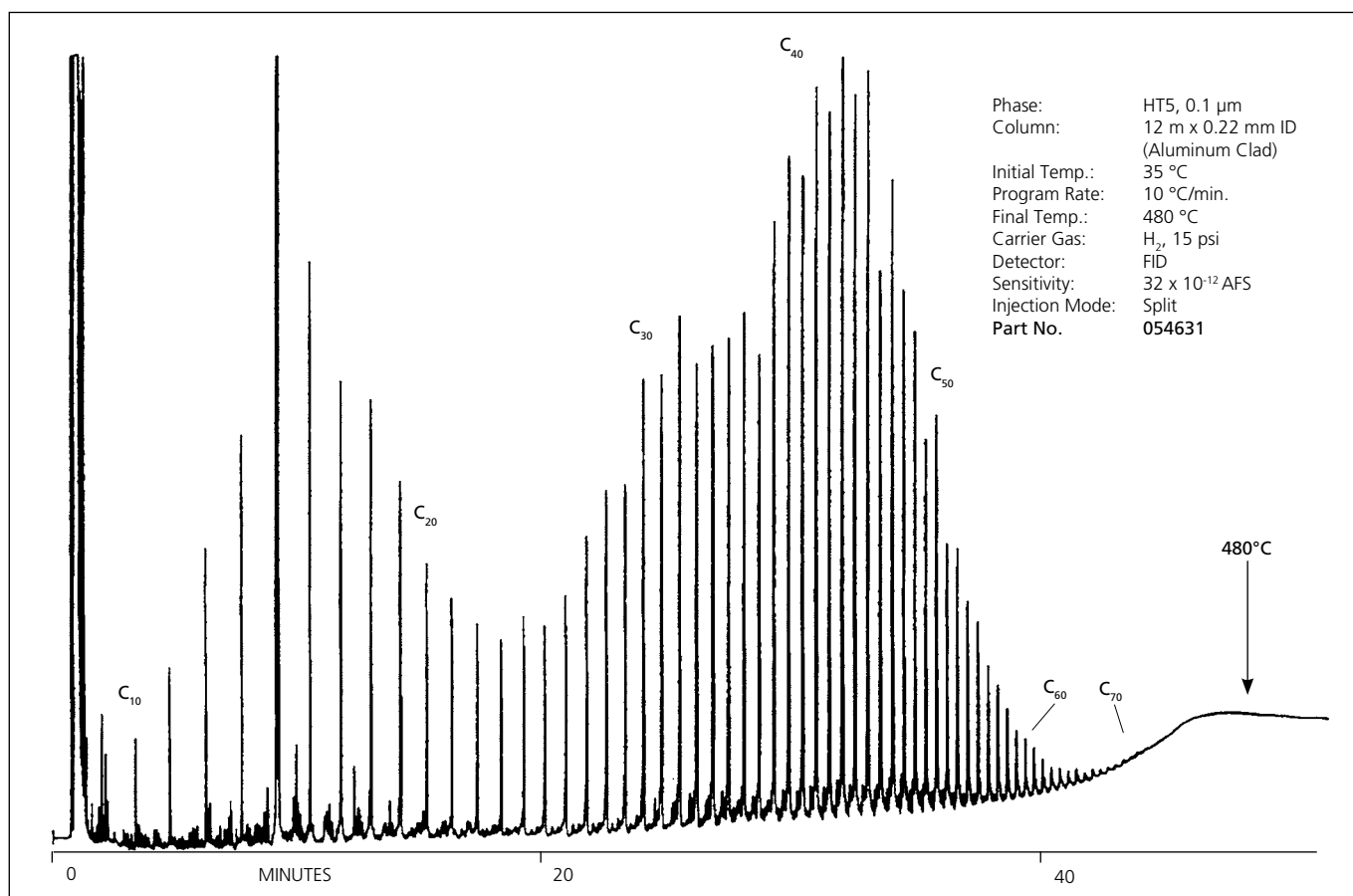


Figure 4 . Crude Oil and Wax Mixture

PRODUCT DATA

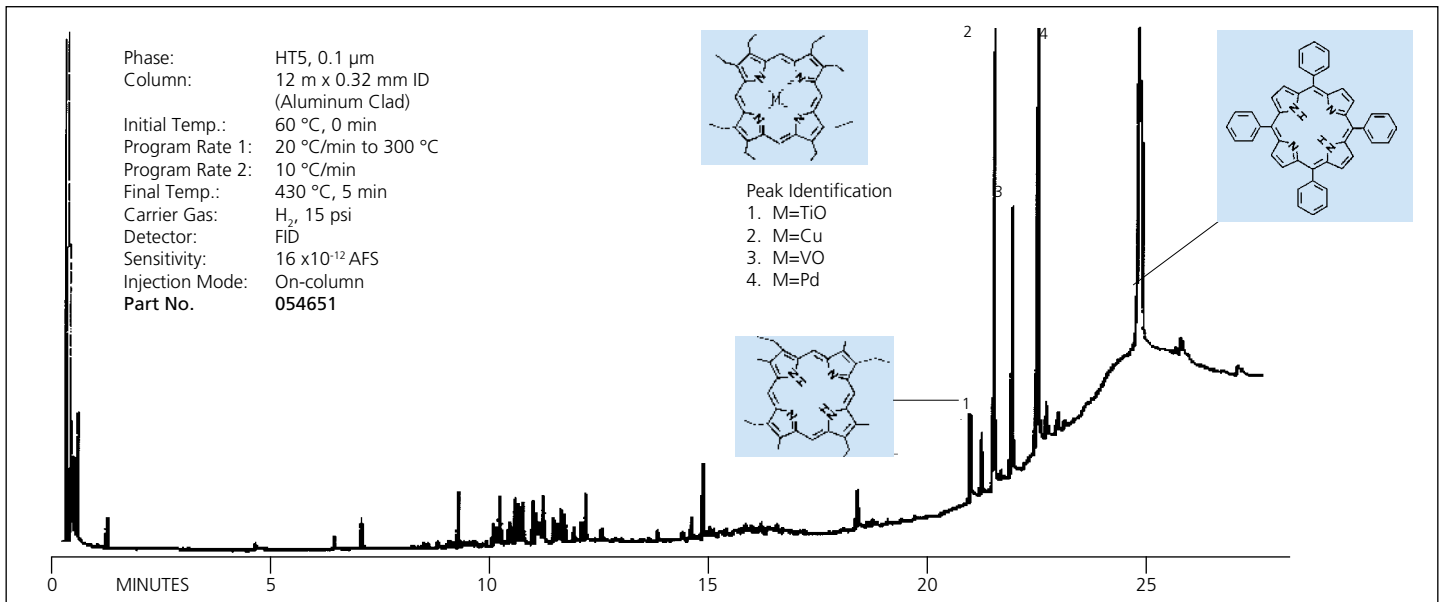


Figure 5. Porphyrins

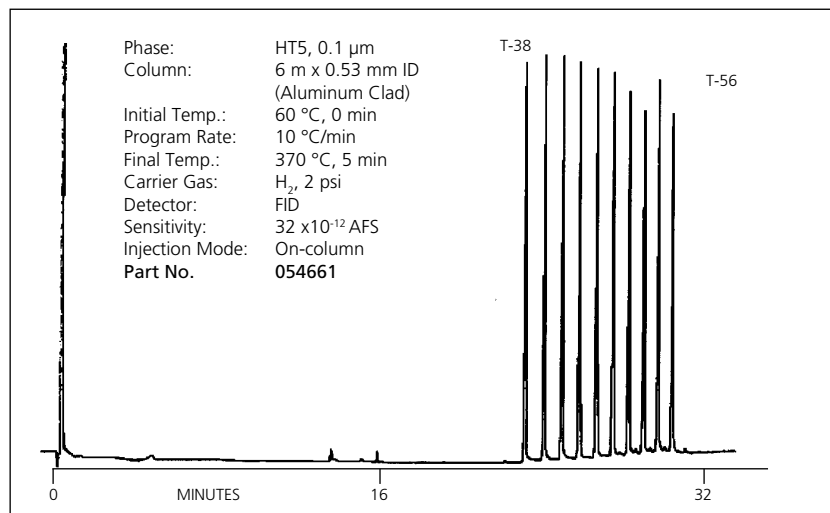


Figure 6. Triglycerides Standard

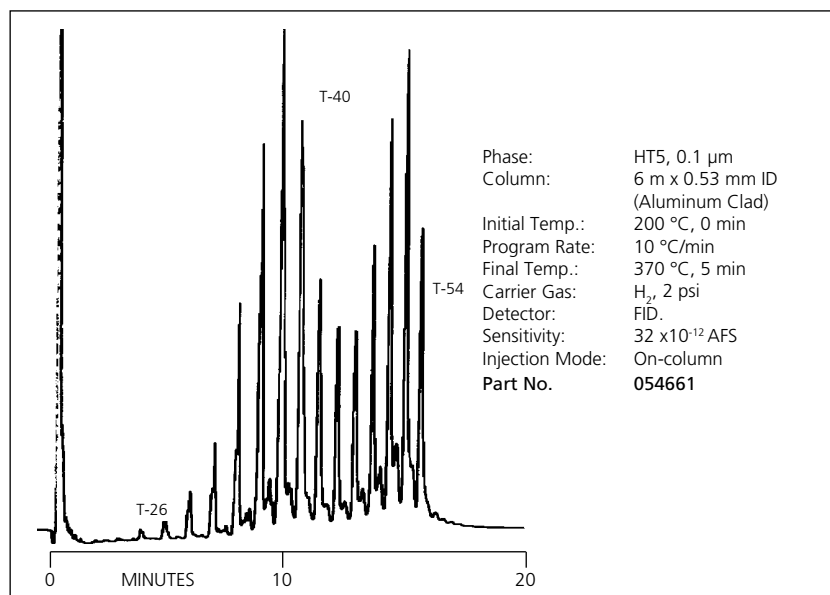


Figure 7. Butter Milk Fat

Another example of the unique quality of HT5 capillary columns is in the analysis of metal complexed and free based alkylporphyrins (Figure 5). Traditionally their analysis has required the preparation of low boiling point derivatives as no stationary phase could operate at temperatures higher than 400 $^{\circ}\text{C}$. Because alkylporphyrins are very thermally stable, their analysis, either as metal complexes or free bases, becomes extremely easy. The ease in which this analysis can be performed is well illustrated, where baseline resolution is obtained for a mixture of metal complexed and based alkylporphyrins.

HT5 allows the routine analysis of triglycerides by capillary gas chromatography to be performed without difficulty. The separation of triglycerides by their respective carbon number is of considerable importance particularly in the various food, cosmetic and confectionery industries. A range of triglyceride standards analyzed (Figure 6) using a relatively short column illustrates the high level of performance the HT5 column can provide. Butter milk fat was also analyzed using a HT5 column of only 6 meters in length and 0.53 mm ID (Figure 7). Excellent resolution between each respective carbon number group was achieved with an analysis time of only 17 minutes.

PRODUCT DATA

WHICH COLUMN SHOULD I SELECT ?

Though originally developed for high temperature applications, HT5 has also found a unique place in the analysis of complex mixtures analyzed at more conventional temperatures (280 °C - 300 °C). To accommodate these different areas of application, HT5 is available with two protective fused silica outer coatings, aluminum (AQ) and polyimide.

APPLICATIONS BELOW 360 °C - 370 °C

For analyses performed at temperatures below 370 °C SGE recommends the use of the conventional polyimide outer coated fused silica (QC). The polyimide used is a high temperature material, and can withstand continuous operation at these elevated temperatures for prolonged periods of time.

ORDERING INFORMATION - Phase Type HT5

Polyimide Clad

| ID (mm) | Film Thickness (µm) | 6 metre Part No. | 10 metre Part No. | 12 metre Part No. | 15 metre Part No. | 25 metre Part No. | 30 metre Part No. |
|---------|---------------------|------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| 0.22 | 0.1 | - | - | 054631 | - | 054632 | - |
| 0.25 | 0.1 | - | - | - | 054633 | - | 054634 |
| 0.32 | 0.5 | - | - | - | 054667 | - | 054668 |
| 0.32 | 0.1 | - | - | 054641 | - | 054642 | - |
| 0.53 | 0.1 | 054655 | - | - | - | - | - |
| 0.53 | 0.5 | - | 054670 | - | 054671 | - | 054672 |
| 0.53 | 0.15 | - | - | 054657 | - | 054658 | - |

Aluminum Clad

| ID (mm) | Film Thickness (µm) | 5 metre Part No. | 6 metre Part No. | 12 metre Part No. | 25 metre Part No. | 50 metre Part No. |
|---------|---------------------|------------------|------------------|-------------------|-------------------|-------------------|
| 0.22 | 0.1 | - | - | - | 054635 | 054636 |
| 0.32 | 0.1 | - | - | 054651 | 054652 | 054653 |
| 0.53 | 0.75 | 054673 | - | - | - | - |
| 0.53 | 0.1 | - | 054661 | - | - | - |
| 0.53 | 0.15 | - | - | 054662 | 054665 | - |

For more information contact our technical customer support team at: techsupport@sge.com

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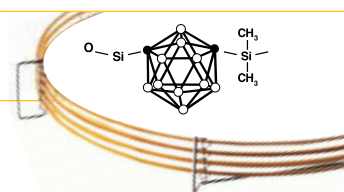
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HT5



GC Columns and Applications

- Ultra high temperature columns.
- Unique phase – no equivalent phases.
- Ideal for simulated distillation applications (petroleum industry).
- 460/480 °C upper temperature limit – Aluminum clad.
- 380/400 °C upper temperature limit – Polyimide clad.
- Bonded and cross-linked.
- Able to be solvent rinsed.

| | |
|---|---|
| Especially Suitable for these Industries: |    |
| Application Areas: | Simulated distillation, general hydrocarbon profiles, pesticides/herbicides, GC/MS applications. Applications FOO16, PET11, PET27, PET06. |
| Suitable Replacement for: | MXT-1 Sim Dist, HT-Sim, DistCB, MXT-500. |

| ID (mm) | Film Thickness (µm) | Length (m) | Temperature Limits (°C) | Part No. |
|-----------------------|---------------------|------------|-------------------------|----------|
| Polyimide Clad | | | | |
| 0.22 | 0.1 | 12 | 10 to 380/400 | 054631 |
| 0.22 | 0.1 | 25 | 10 to 380/400 | 054632 |
| 0.25 | 0.1 | 15 | 10 to 380/400 | 054633 |
| 0.25 | 0.1 | 30 | 10 to 380/400 | 054634 |
| 0.32 | 0.1 | 12 | 10 to 380/400 | 054641 |
| 0.32 | 0.5 | 15 | 10 to 380/400 | 054667 |
| 0.32 | 0.1 | 25 | 10 to 380/400 | 054642 |
| 0.32 | 0.5 | 30 | 10 to 380/400 | 054668 |
| 0.53 | 0.1 | 6 | 10 to 380/400 | 054655 |
| 0.53 | 0.5 | 10 | 10 to 380/400 | 054670 |
| 0.53 | 0.15 | 12 | 10 to 380/400 | 054657 |
| 0.53 | 0.5 | 15 | 10 to 380/400 | 054671 |
| 0.53 | 0.15 | 25 | 10 to 380/400 | 054658 |
| 0.53 | 0.5 | 30 | 10 to 380/400 | 054672 |
| Aluminum Clad | | | | |
| 0.22 | 0.1 | 12 | 10 to 460/480 | 054635 |
| 0.22 | 0.1 | 25 | 10 to 460/480 | 054636 |
| 0.32 | 0.1 | 12 | 10 to 460/480 | 054651 |
| 0.32 | 0.1 | 25 | 10 to 460/480 | 054652 |
| 0.32 | 0.1 | 50 | 10 to 460/480 | 054653 |
| 0.53 | 0.075 | 5 | 10 to 460/480 | 054673 |
| 0.53 | 0.1 | 6 | 10 to 460/480 | 054661 |
| 0.53 | 0.15 | 12 | 10 to 460/480 | 054662 |
| 0.53 | 0.15 | 25 | 10 to 460/480 | 054665 |

Expert Tip :

To prevent increasing retention times in your chromatography, replace the septum regularly.



For your gas purifiers see pages 165-166.