

Detailed Hydrocarbon Analyses by Capillary GC

Quantitative separation of the paraffin, isoparaffin, aromatic, naphthene, and olefin content of gasolines and other complex hydrocarbon mixtures (PNA, PONA, and PIANO analyses) is critical for process control and product quality testing. Petrocol capillary GC columns were designed specifically for these analyses.

Key Words:

- detailed hydrocarbons analyses
- hydrocarbons
- gasoline
- naphtha
- reformat
- light hydrocarbons

Versatile Petrocol™ DH series nonpolar methyl silicone capillary columns were designed specifically for analyses of complex hydrocarbon mixtures. The type of analysis and the resolution required determine the most appropriate column.

Petrocol DH 50.2 Columns: 50 meters/typically 250,000 plates — Developed to meet the column performance requirements in ASTM Method D5134 (1), and equivalent to Hewlett-Packard PONA columns, high efficiency 50m x 0.20mm ID Petrocol DH 50.2 columns can separate most of the major components in complex hydrocarbon mixtures for categorizing into the appropriate class: paraffin, isoparaffin, aromatic, naphthene, or olefin. The columns are capable of performing these high resolution separations in relatively short analysis times.

Petrocol DH Columns: 100 meters/typically 400,000 plates — 100m x 0.25mm ID Petrocol DH columns can be used to achieve difficult separations, ranging from resolving light hydrocarbon gases or closely eluting isomers to detailed separations of highly complex mixtures such as petroleum naphthas, reformates, and liquified coal fractions. The column is listed for this purpose in Canadian General Standards Board Methodology (2). C3-C12 hydrocarbons in gasolines are well resolved and easily quantified, using an ambient initial column temperature. To increase sample capacity and improve resolution, a 100-meter column also can be used in place of a Petrocol DH 50.2 column for PONA and PIANO analyses, or to resolve impurities in commercial MTBE product, as noted in the new ASTM method for this analysis (3).

Petrocol DH 150 Columns: 150 meters/typically 550,000 plates — 150-Meter Petrocol DH 150 columns' very high efficiency and low phase ratio (0.25mm ID, 1.0µm phase film; $\beta = 63$) ensure highly effective light hydrocarbon separations. These columns are particularly useful for analyses of light hydrocarbon gases and light hydrocarbon streams. Most of these analyses can be performed using ambient (25°C-35°C) or mildly subambient (0°C or -20°C) initial temperatures. Petrocol DH 150 columns also can separate oxygenates in light hydrocarbon streams, and provide excellent separations of many of the common impurities in MTBE product

(3), TAME product, and other oxygenated fuel additives. At lower temperatures, the 150-meter column can be used to accomplish many other difficult light hydrocarbon separations.

ASTM Qualitative Reference Materials — The naphtha, reformat, and alkylate reference materials listed in this update are authentic refinery samples, characterized by the ASTM and listed specifically among the reagents and materials in Method D5134-90 (1). They are intended for assisting analysts to establish analytical conditions and determine the retention times of hundreds of hydrocarbons in highly complex samples. (Many of the identified components are compounds included in the quantitative reference standards described below.) Refer to the chromatograms, columns, and conditions described in Method D5134-90, and to the data sheet included with the standards.

Quantitative Reference Standards — The quantitative Alphas standards listed here are very accurately prepared (weight % / mole % / liquid volume % to three decimal places) mixtures of paraffins, isoparaffins, aromatics, naphthenes, and olefins, designed for PNA, PONA, and PIANO (Figure A) analyses. They are intended for establishing retention times and indices and determining detector response factors. 100-Meter Petrocol DH columns are used to generate the test chromatograms and detailed retention time data in the certification paperwork included with each standard.

A 3½", 1.44MEG CertiDisk™ data disk, containing complete certification data for the paraffins, isoparaffins, aromatics, naphthenes, and olefins mixes and the PIANO mix, plus a worksheet and other very useful information, is included at no additional charge with the PIANO Mix (Cat. No. 4-4593) and PIANO Kit (Cat. No. 4-4594). The worksheet (Lotus 1-2-3® format) and database can greatly simplify the task of organizing certification data. Calculations are easily performed with a few keystrokes. The programs also enable you to perform searches based on retention times, making it easier to identify peaks.

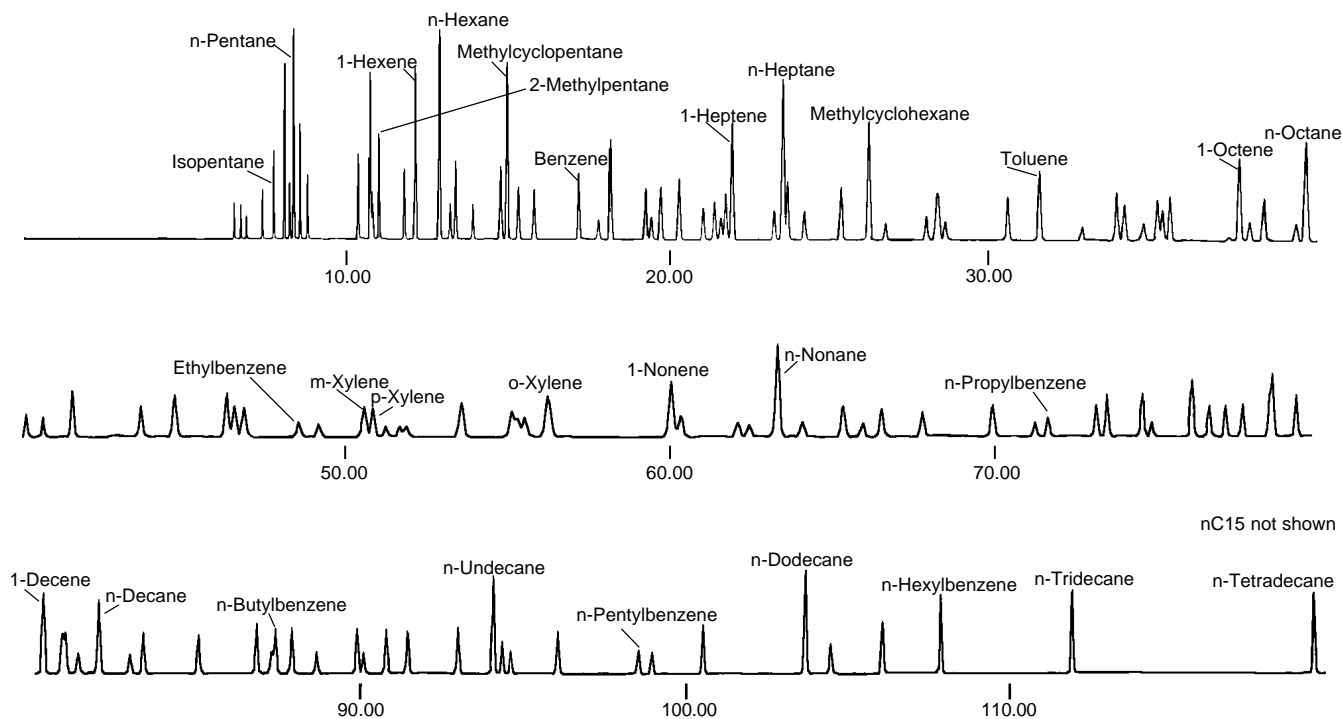
References

1. *Standard Test Method for Detailed Analysis of Petroleum Naphthas Through n-Nonane by Capillary Gas Chromatography* Method D5134-90, American Society for Testing and Materials, 1990.
Obtain from ASTM, 1916 Race Street, Philadelphia, PA 19103 USA.
2. *Methods of Testing Petroleum and Associated Products. Standard Test Method for the Identification of Hydrocarbon Components in Automotive Gasoline Using Gas Chromatography* CAN/CGSB-3.0 No. 14.3-M91, Canadian General Standards Board, 1991.
Obtain from CGSB, Sales Unit, Ottawa, Canada K1A 1G6 (ph. 819-956-0425 or -0426).
3. *Analysis of Methyl tert-Butyl Ether (MTBE) by Gas Chromatography* Test Method D5441, American Society for Testing and Materials, 1993(4).
Obtain from ASTM, 1916 Race Street, Philadelphia, PA 19103 USA.

Figure A. Alphagaz Quantitative P-I-A-N-O Mix

Column: **Petrocol DH, 100m x 0.25mm ID, 0.50µm film**
 Cat. No.: **24160-U**
 Oven: 35°C (15 min) to 60°C at 2°C/min, hold 20 min, to 200°C at 2°C/min
 Carrier: helium, 30cm/sec
 Det.: FID (300°C)
 Inj.: 0.4µL PIANO Mix (Cat. No. 4-4593), split (450:1) (300°C)

For more information, request Bulletin 868.



794-0012

Ordering Information:

Petrocol Fused Silica Capillary Columns*

DH 50.2 Column 50m x 0.20mm ID, 0.50µm film	24133-U
DH Column 100m x 0.25mm ID, 0.50µm film	24160-U
DH 150 Column 150m x 0.25mm ID, 1.0µm film	24155

Qualitative Reference Materials, 6 x 1mL

Naphtha	48265-U
Reformate	48266
Alkylate	48267-U
Refinery Kit (2 x 1mL of each of above)	48268

Alphagaz Quantitative Reference Standards

Paraffins Mix, 0.1mL (11 n-paraffins, retention indices 500.0-1500.0)	44585-U
Isoparaffins Mix, 0.1mL (35 isoparaffins, retention indices 483.4-974.2)	44586-U
Aromatics Mix, 0.1mL (37 aromatics, retention indices 638.6-1247.2)	44587
Naphthenes Mix, 0.1mL (29 naphthenes, retention indices 549.0-1146.9)	44588
Olefins Mix, 0.1mL (28 olefins, retention indices 457.4-988.7)	44589
P-I-A-N-O Mix, 0.1mL (140 components of 5 class mixes above)*	44593-U
P-I-A-N-O Kit (0.1mL P-I-A-N-O Mix, 0.1mL each of 5 class mixes)*	44594-U

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 for expert answers to your questions.

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 Petrocol — Sigma-Aldrich Co.

*Includes CertaDisk.

Fused silica capillary columns manufactured under HP US Pat. No. 4, 293,415.

•Individually tested to ensure consistent coating efficiency, column activity, and k' for nonpolar hydrocarbons.

NOTE: A 150-meter Petrocol DH 150 column requires a head pressure of approximately 75psi for optimum linear velocity. The head pressure requirement can be reduced to approximately 50psi by using hydrogen as the carrier gas.

Note 8

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