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TECHNICAL ARTICLE

BPX1-SimD

A New Era in Simulated Distillation Technology - Part II

Data supplied by Dr. J. Lubkowitz and the staff at Separation Systems Inc.

This application is part two in the series on simulated distillation of petroleum products. The previous article (Solutions, November 1997) detailed data from the BPX1 0.1 μm film thickness and high temperature simulated distillation.

The BPX1 SimD columns are specifically optimized for ASTM Method D2887 and the new High Temperature Simulated Distillation method (HTSD). These columns can also be used for ASTM methods for oil volatility and for gasoline and gasoline fractions (ASTM D3710). SGE has already shown with the BPX line of capillary columns the ability to produce the most thermally stable long life columns.

BPX1 was designed as a high temperature alternative to conventional 100% dimethylpolysiloxane stationary phases. With an operating temperature of 400ºC for the column being featured in this article, this column is superior to all other dimethylpolysiloxane columns on the market.

The BPX1 column offers two major advantages over competitors' conventional dimethylpolysiloxane columns. First the lower bleed at the upper temperatures required for extended high temperature results in better integration and therefore better quantitation for the higher hydrocarbon numbers. Second, lower column bleed means less loss of column phase and therefore a smaller decrease in capacity ratios (the phase thickness remains constant). This is important to the practicing chromatographer as the calibration can be carried out less often because of greater stability of retention times and the constant background for subtraction.

Extended Simulated Distillation

The analysis of a standard retention time standard is shown in **Figure 1.** This mixture uses hydrocarbons ranging from C6 to C20, Polywax 655 and C40.

Figure. 1. Retention Time Standard

Phase:	**BPX1, 0.9μm**		
Column:	**10m x 0.53mm ID**	**Separation Systems Injector**	
Initial Temp.:	40°C	Initial Temp.:	80°C
Rate:	10°C	Rate:	10°C
Final Temp.:	390°C, 10 min.		
Detector Temp:	400°C		
Carrier Gas:	Helium, 20mL/min		
Instrument:	HP 6890		
Part No:	**054801**		

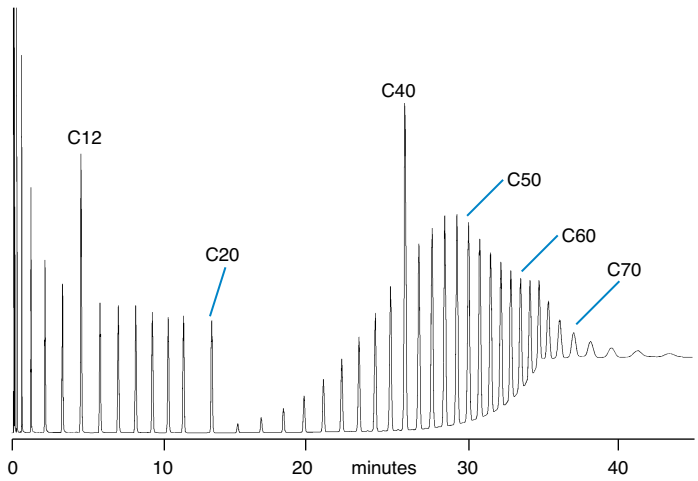

Figure. 2. Enlarged section of Figure 1.

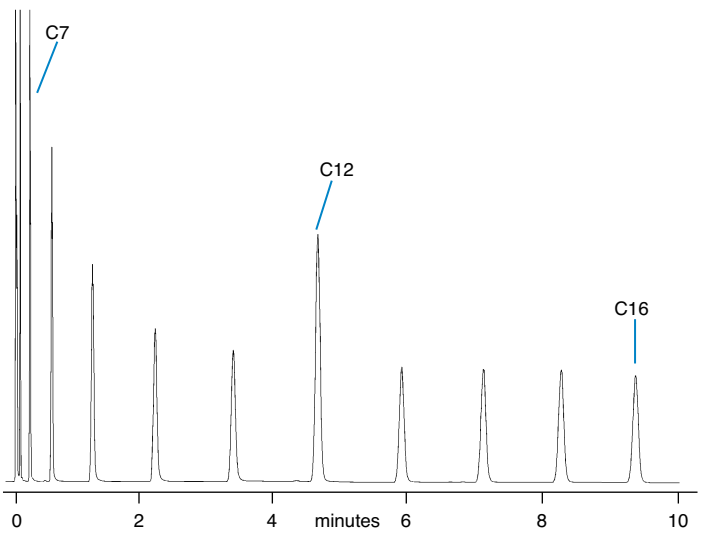

Figure 3. CS2 Blank

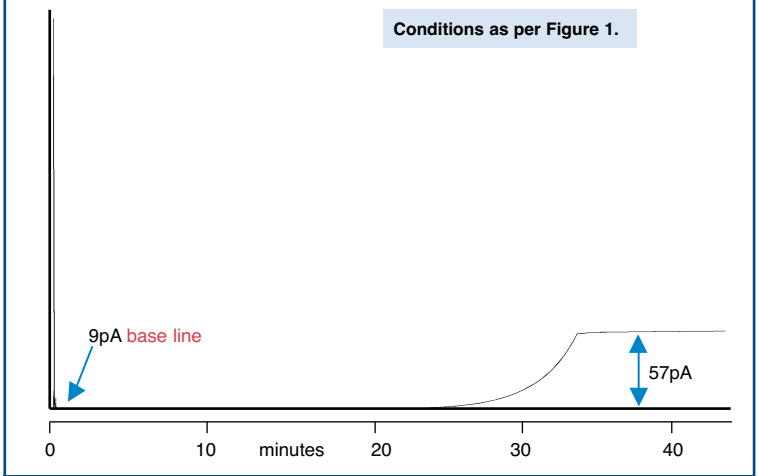

Figure 4. Reference Gas Oil #2

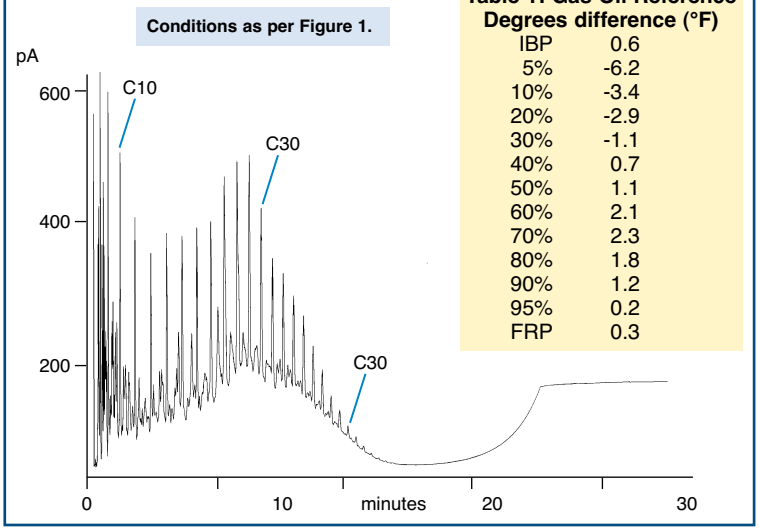

Table 1: Gas Oil Reference

Degrees	difference (°F)
IBP	0.6
5%	-6.2
10%	-3.4
20%	-2.9
30%	-1.1
40%	0.7
50%	1.1
60%	2.1
70%	2.3
80%	1.8
90%	1.2
95%	0.2
FRP	0.3

Table 2. QC Boiling Point Table ASTM D2887 Extended

% Off	BP(°F)	QC(°F)	Diff
IBP	238.8	240.0	-1.2
5.00	305.0	304.0	1.0
10.00	348.0	348.0	0.0
15.00	394.6	393.0	1.6
20.00	436.8	435.0	1.8
25.00	471.3		
30.00	500.7	499.0	1.7
35.00	527.9		
40.00	553.6	552.0	1.6
45.00	577.6		
50.00	594.6	594.0	0.6
55.00	610.2		
60.00	629.2	629.0	0.2
65.00	648.7	649.0	-0.3
70.00	668.3	668.0	0.3
75.00	689.9	690.0	-0.1
80.00	712.1	712.0	0.1
85.00	736.6	736.0	0.6
90.00	764.1	764.0	0.1
95.00	803.2	803.0	0.2

C40 is spiked into the mix as a reference point in the mixture for easy carbon counting. All major peaks beyond C18 are even numbered carbons. This chromatogram shows excellent separation, minimal bleed and the ability to quantify to C78 with the operating conditions stated in the figure.

Figure 2 is a portion of the previous chromatogram from the beginning of the analysis to 10 minutes into the run. It shows excellent resolution and peak shape of the early eluting components (C6 to C20).

Figure 3 is a blank analysis of neat carbon disulfide. This displays the bleed from the column at 390ºC of only 57 picoamps. This minimal bleed allows for easier integration of the peaks above C70.

The analysis of Reference Gas Oil #2 (**Figure 4**) is used to verify the calibration of the system with regard to boiling point distribution. It guarantees the effectiveness of the column to produce simulated distillation data that fits within specified guidelines of reproducibility.

The calculated data from this analysis are shown in Table 2. This data show excellent correlation between the expected temperature at which a certain percentage of the reference gas oil is expected to elute and the calculated temperature from the calibration.

Future articles will show applications of **BPX1** to approved ASTM D 2887 (Standard Test Method for Boiling Range Distribution of Petroleum Fractions by Gas Chromatography) and Detailed Hydrocarbon Analysis.

Distillation of crude oil and petroleum products has been a mainstay for decades in refinery and commercial laboratories in order to evaluate crude oils or products. Only in recent years have engineers accepted distillation data produced by gas chromataography. These "distillations" are called "simulated distillations" since they are not true distillations in the strict sense. ASTM method D2887 (Standard Test Method for Boiling Range Distribution of Petroleum Fractions by Gas Chromatography) is simulated distillation products and fractions which have a final boiling point of 538°C (1000°F) or lower at atmospheric pressure (C44). This method has been extended (but is still to be accepted by ASTM) to boiling points of up to 750°C (1380°C). Two methods which are used are called extended D2887 (to C70) and High Temperature Simulated Distillation (HTSD) (to C90 and beyond). Up to this point two capillary column phases have been used for these methods. The two phases used are SGE's HT5 and polymethylsiloxane.

All of the data presented was produced by Dr. Lubkowitz and the staff at Separation Systems Inc. on a system using the Separation Systems programmed temperature vaporization injector (PTV) and the SIMDIS EXPERT® software.

BPX1-SimD ORDERING INFORMATION

ID mm	Film µm	5m(Aluminium)	10m(Polyimide)
0.53	0.1	**054800**	-
0.53	0.9	-	**054801**
0.53	2.65	-	**054802**