Gas Chromatography

Tk Teknokroma Capillary Columns

Teknokroma has been at the forefront of chromatographic developments in Spain. From its beginnings at 1979, and in order to find the right solutions to the wide array of analytical problems that appear daily in a laboratory, Teknokroma has always been involved in the Spanish and European market, not only with columns from the leading world manufactures, but also of those of our own manufacture.

A few years ago, Teknokroma introduced the basic line of high resolution capillary columns (Teknokroma columns) which were very well received in the market.
Due to the on going research effort carried out by our Research Department in collaboration with the Consejo Superior de Investigaciones Científicas (CSIC) and the Instituto Químico de Sarriá (IQS) and the support obtained from various public administrations (CDTI, CIDEM, MINER and FCTAC) we have been able to continuously update and expand our product line with other stationary phases.

All of our columns are manufactured according to a strict established protocol, and within the ISO 9001:2000 quality rules.

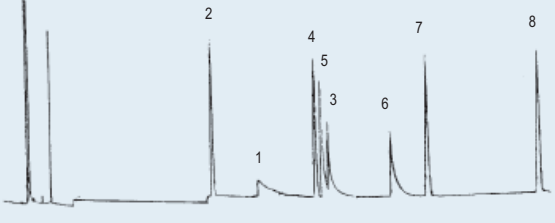
Stage 1: Hydrothermal treatment
Stage 2: Deactivation process
Stage 3: Wetting, bonding and crosslinking
Stage 4: Quality control

Stage 1: Hydrothermal Treatment

Teknokroma starts its manufacturing process with the selection of the best possible fused silica tubing. This tube presents an extremely reduced tolerance of internal diameters and has a polyimide outer coating capable of withstanding the highest temperatures without loss of its flexible mechanical characteristics. Each one of the batches of silica used in the process is conveniently characterized as an essential step to set the Hydrothermal Treatment conditions (Fig. 1) that will give rise to a surface containing a high and constant density of silanol groups, which will later be properly deactivated.
This treatment is indispensable, as the different capillary tubing manufactured batches present a very low and irregularly distributed silanol group density due to the high temperature manufacturing process (~2000ºC).

Fig. 1. Verification of Hydrothermal Treatment

1 2-Octanone
2 C-10
3 1-Octanol
4 C-11
5 2,6-Dimethylphenol
6 2,6-Dimethylaniline
7 C-12
8 C-13



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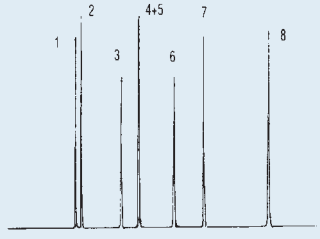
Stage 2: Deactivation process

The deactivation process, which is different for each type of stationary phase, is carefully controlled (fig. 2), ensuring that the tubing surface has acquired the necessary chemical inertness and surface tension in order to be able to proceed with the second stage of stationary phase deposition. This step also facilitates the introduction of specific functional groups on the tubing wall which are very useful for the later binding of the stationary phase or to give the columns a given end point characteristics.

Fig. 2. Deactivation Stage (Intermediate Test)

1 2-Octanone
2 C-10
3 1-Octanol
4 C-11
5 2,6-Dimethylphenol
6 2,6-Dimethylanyline
7 C-12
8 C-13



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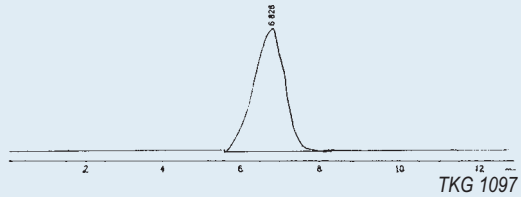
Stage 3: Wetting, bonding and crosslinking

Stationary phase selection for optimum wetting of the column is a critical point in regards to column quality. Teknokroma uses extremely pure polymers for its phases, in order to guarantee that our columns will respond to the requirements that our customers expect in terms of efficiency, reproducibility, stability and minimal bleeding.

The polymers used are carefully fractionated to eliminate the low molecular weight components and trace catalyst. This results in a higher thermal stability and lower bleeding. Then, these polymers are tested by means of spectroscopic (FTIR, UV, NMR), chromatographic (GPC) techniques and by differential thermal analysis. Fig. 3 shows the molecular exclusion chromatography of the polymer TRB-5 with its corresponding thermogravimetric curve in Fig. 4.

The crosslinking and bonding of the stationary phase is achieved by avoiding the use of peroxides which are the cause of many of the problems related to residual activity due to phase degradation and thermal instability exhibited in numerous imported columns.

Fig. 3. GPC Chromatogram of TRB-5 polymer



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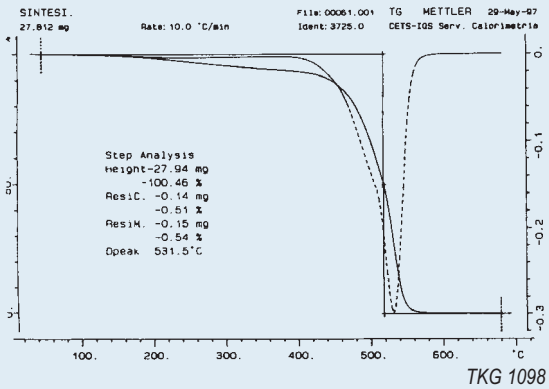
The fact that a given stationary phase is crosslinked and/or chemically bonded to the capillary tube inner wall allows, if necessary, the recovery or regeneration of an accidentally contaminated column by washing it with the adequate series of solvents.

Fig. 4. DTA Curve of TRB-polymer



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Stage 4. Quality Control

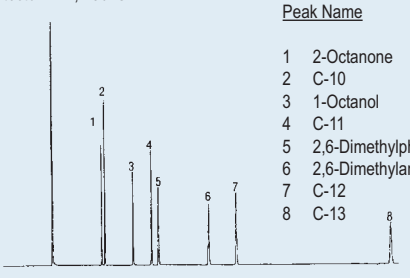
S E L E C T P R O V E N Q U A L I T Y

When you buy a Teknokroma capillary column you receive a product designed and manufactured in our laboratory with the aim to help you solve your analytical problems and which meets all of our quality criteria.
At the same time you obtain from our Technical Department at Teknokroma the assurance that we will be at your side to help you with all the problems and concerns experience in the lab.

Remember that each column is individually tested and the accompanying test data is the proof that the column meets our quality specifications and thus we expect it to meet your demands. Each one of the columns obtained by this process is rigorously controlled by means of a strict Quality Control Test (fig. 5 and 6), which ensures that you will receive a guaranteed quality product.

Fig. 5 Quality Control Test

Column: **TRB-5**, 60m x 0.25 mm ID x 0.25 µm.
Carrier gas: He, 25 psi.
Oven: 110°C (Isothermal).
Injection: 1µl, split. (1:100:250ºC)
Concentration: Approx. 5ng of each compound on column
Detector: FID, 250°C



Peak Name

1 2-Octanone
2 C-10
3 1-Octanol
4 C-11
5 2,6-Dimethylphenol
6 2,6-Dimethylaniline
7 C-12
8 C-13

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Stationary Phase

The selection of the ideal column for a given analysis may look like a complex problem since we need to be right on the selection of the polarity of the stationary phase as well as column length, internal diameter and film thickness.
The polarity of the stationary phase is chosen depending on the kind of compounds you wish to separate. Non polar phases, such as TRB-1 and TRB-5, separate compounds by their boiling points. Intermediate polarity phases such as TRB-WAX, TRB-1701, combine retention by boiling point with the more selective interaction through hydrogen bridges or dipolar moments, etc., and thus provide a higher selectivity. The principal mechanisms of polar phases such as TR-CN100 (Cyanosilicone with 100% of cyano propyl groups) lie in the dipole-dipole interactions between the functional groups of the stationary phase and those from the substances to be separated. These type of phases retain polar compounds more than non polar ones.

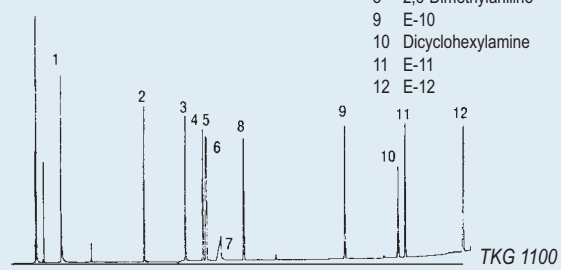
In general, non polar phases are more thermally stable than the polar phases. In other words, the higher the column polarity, the lower its thermal stability. Most of the Teknokroma columns are cross-linked, which results in high thermal stability.
The cross-linking in a stationary phase produces slight changes in the physicochemical characteristics of the phase as well as in its polarity relative to the uncross-linked phase. Thus TEKNOKROMA also offers in its catalog columns with non bonded phases that show the selectivity of the original phase (for instance TR-SE30, TR-SE54, TR-20M, etc.).

Length

The efficiency of a chromatographic column (number of theoretical plates per meter) is a function of its length. The standard length used for most of the separations is 25-30 meters. With this length one can obtain a high efficiency with relative short times of analysis. Columns of 15m are used for rapid control analyses, reaction monitoring, etc. as well as for the chromatography of high molecular weight substances while columns of 50-60 m, 100 m or 150 m are used for very complex samples. Teknokroma exclusively manufactures a 150 m column for detail analyses of

Fig. 6. GROB test

Column: **TRB-5**, 30m x 0.25 mm ID x 0.25 µm.
Carrier gas: He, 12 psi.
Injection: 1µl, split, (1:100), 260ºC
Detector: FID, 280°C



Peak Name

1 2,3-Butanediol
2 C-10
3 1-Octanol
4 2,6-Dimethylphenol
5 C-11
6 Nonanal
7 2-Ethylhexanoic acid
8 2,6-Dimethylaniline
9 E-10
10 Dicyclohexylamine
11 E-11
12 E-12

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petroleum and essential oil hydrocarbons. As a general rule, we can say that in a constant temperature chromatographic analysis, the number of theoretical plates and analysis time are directly proportional to the column length while resolution is directly proportional to the square root of the theoretical plates. Thus, we need to take into account that when we double column length, its resolution only increases by 40% whereas analysis time doubles.

Internal Diameter

The column internal diameter is inversely proportional to its separation power. The smaller the diameter, the larger the efficiency and thus a higher resolution but at the same time the loading capacity decreases.
For samples containing a large number of substances where you may need a given resolution, it is recommended to use small internal diameter columns (0.20-0.25 mm) and for samples with a high range of concentrations higher internal diameter columns are recommended (0.32-0.53 mm) since these larger diameters allow for the injection of a higher sample amount.

Columns of 0.53 mm ID (semicapillary) have a loading capacity similar to that of packed columns, which they replace in many analyzes, with better resolution, higher chemical inertness and lower analysis time.
The 0.32-0-53 mm ID columns can be used with either the injector for capillary columns or with the packed column injector, due to the high flow-rates at which they can operate.

In the increasingly used GC-MS systems it is recommended to work with small ID columns (0.10mm, 0.15mm, 0.18mm, 0.20 mm and 0.22 mm) so as not to exceed the capacity of the vacuum system. Recently, capillary columns of 0.1 mm ID have appeared on the market. These generate high plate numbers or, in other words, to reduce analysis time without losing resolution. The high efficiency of these columns (7000-10000 plates/meter) allows the resolution of complex samples using shorter column lengths, thus with very short analysis times, with the resulting cost reduction for the laboratory. Evidently, their loading capacity is a limiting factor and in order to obtain the best performance from these columns we need to take into account instrumental factors (injector-detector).

Film Thickness

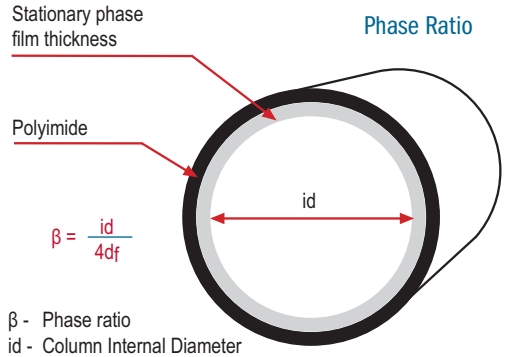
The film thickness of the stationary phase deposited inside the capillary column exerts an influence on the number of effective theoretical plates that can be obtained with the column for a given separation, on its loading capacity, on the bleed level and on the elution temperature of a compound.
A film thickness of 0.25-0.32 µm is the standard thickness allowing for a compromise between loading capacity and resolution; and for the injection of samples with a wide volatility range.

Thick films increase retention of the most volatile components whereas thin films provide faster elution at lower temperatures. As a general rule, thin films (0.1 µm) must be used for compounds with a high molecular weight such as triglycerides, antioxidants, etc., which have elution temperatures over 300°C. Thick films must be used for low boiling substances because thick films increase the interaction between the substances and the stationary phase. Specifically, 3-5 µm films are used to separate solvents, gases, and very volatile substances at room temperature or lower.

When the thickness of the stationary phase increases, thermal stability decreases, and thus the bleed level is higher which will limit the maximum operating temperature of the column.

The β factor defines the relation between the column internal diameter and the stationary phase thickness, thereby helping you to select the most appropriate column for your analysis.

In addition, the β factor allows for the easy exchange of columns since, for a given analysis with the same stationary phase, similar β factors will result in the same or very similar retention times and capacity factors. Of course, this implies taking into account the column loading capacity (phase thickness and internal diameter).



Factor β

β	Column suitable for the separation of:
>400	High molecular weight compounds
100 - 400	All purpose use
<100	Volatile compounds of low molecular weight

Bleed Level

The bleed level of stationary phase from a capillary column is the parameter which will determine the level of sensitivity in a given assay. It is directly related to the amount of stationary phase in the column and thus with the film thickness. It also increases exponentially with temperature (fig.7).

A low bleed level will allow you to work without problems with the whole range of modern high sensitivity detectors and at the same time will result in less contamination. This will also allow the quantification of high boiling point or high molecular weight compounds which are analyzed by means of high temperature gradients.

Maximum Efficiency

All manufacturing stages for capillary columns have been optimized in order to be able to offer our customers columns of very high efficiency.

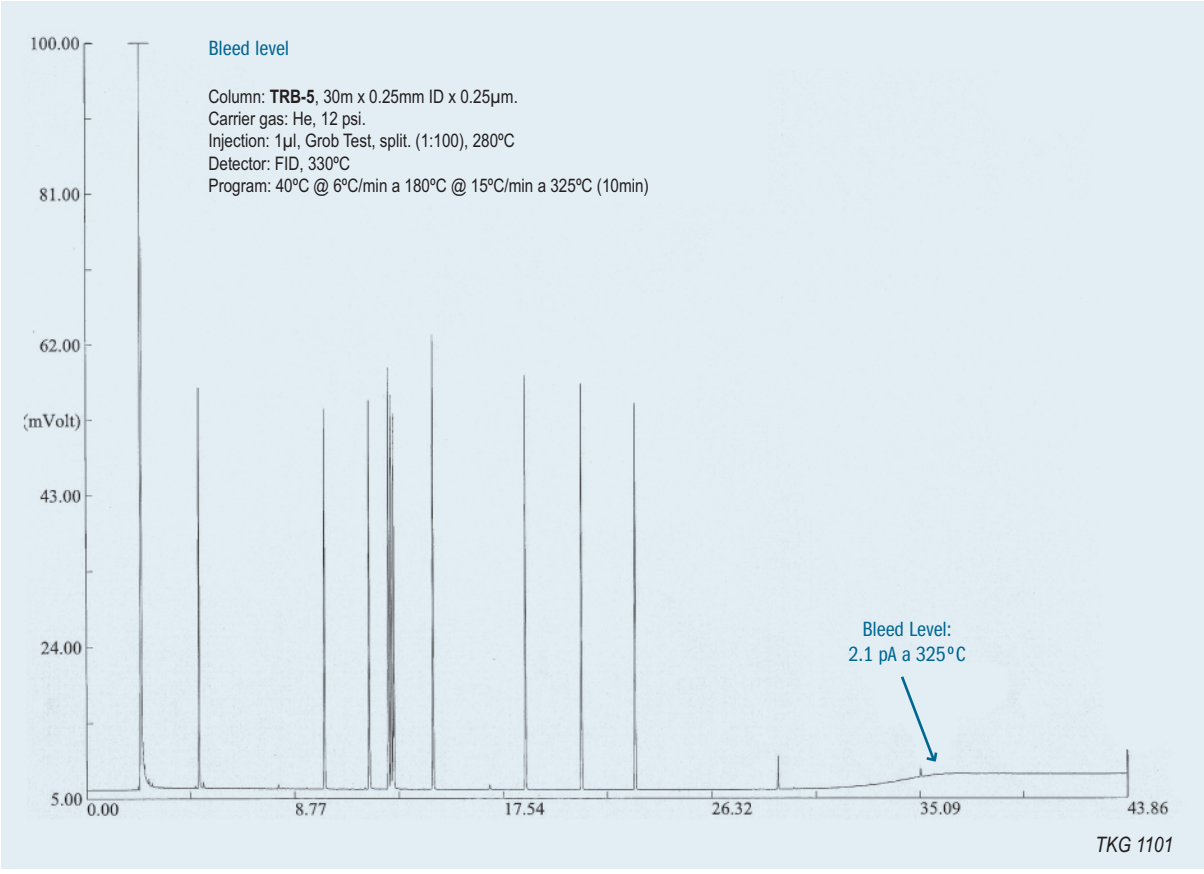
Wide Stationary Phase Selection

Teknokroma incorporates in its catalogue a selection of capillary columns prepared with the stationary phases most commonly used in the field of gas chromatography (Table 1).

Maximum Reproducibility

When you select a Teknokroma column for your analyses you can be assured that each of the steps in the production process has been thoroughly controlled to ensure that there are no deviations from the established quality parameters. All of the steps incorporate the maximum possible automation procedures.
This translates into a high reproducibility level with regards to the chromatographic performance of our columns.

Internal diameter (mm)	Theoretical Plates (N/m)
0,10	7.000 - 9.000
0,20	4.700 - 5.500
0,25	3.300 - 4.600
0,32	2.700 - 3.700
0,53	1.400 - 2.200



Stationary Phase Cross Reference (Table 1)

TEKNOKROMA	PHASE COMPOSITION	AGILENT	SUPELCO	RESTEK	VARIAN	SGE	ALLTECH	QUADREX	PHENOMENEX	MACHEREY-NAGEL	USP CODE
TRB-1	100% dimethyl polysiloxane	HP-1, HP101, Ultra-1, DB-1	SPB-1, Equity-1	Rtx-1	CP-Sil 5 CB	BP-1	AT-1	007-1	ZB-1	Optima-1	G1,G2,G38
TRB-1ht		DB-1ht		Stx-1HT			AT-1 ht		ZB-1ht		
TRB-1ht SimDist		DB-1ht SimDist		MXT-1 SimDist	CP-SimDist						
TRB-1MS		HP-1MS, DB-1MS	EQUITY-1	Rxi-1ms, Rtx-1ms	VF-1ms, CP-Sil 5 CB MS		AT-1 ms		ZB-1ms	Optima-1ms	
TRB-SULFUR			SPB-1Sulfur		CP-Select CB for Sulfur						
TRB-2887		DB-2887	Petrocol-2887	Rtx-2887							
TRB.50.2PONA		HP-PONA	Petrocol DH 50.2	Rtx-1 PONA	CP-SIL PONA CB	BP-1 PONA					
TRB-PETROL		DB-PETRO	Petrocol DH	Rtx-1 PONA							
TRB-PETRO.150			Petrocol DH 150								
TRB-5	95% dimethyl-5%diphenyl polysiloxane	HP-5,Ultra-2,DB-5	SPB-5, Equity-5	Rtx-5	CP-SIL 8 CB	BP-5	AT-5	007-2	ZB-5	Optima-5	G27,G36
TRB-5ht		DB-5ht							ZB-5ht		
TRB-5MS		HP-5MS, PAS-5	Equity-5	Rtx-5 MS, Rxi-5ms	VF-5ms, CP-Si 8 CB MS				ZB-5ms	Optima-5ms	
TRB-STEROL			SAC-5								
TRB-5 AMINE			PTA-5	Rtx-5Amine	CP-Si 8 CB MS					Optima-5 Amine	
TRB-G27			G27	Rtx-G27							
MTI-5		HP-5msi	PTE-5	Rxi-5ms							
Meta .X5	95% dimethyl-5%polysilphenylene	HP-5TA,DB-5MS	MDN-5, SLB-5ms	Rxi-5Sil MS	CP-Sil 8 CB Low Bleed/MS VF-5ms	BPX-5	AT-5ms	007-5 MS	ZB-5ms	Optima-5 Accent	
Meta.XLB	Proprietary Bonded Phase	DB-XLB	MDN 12		VF-Xms				ZB-XLB	OPTIMA XLB	
TRB-1301,TRB-624,	6% cyanopropylphenyl-94% dimethyl polysiloxane	HP-1301,HP-624	SPB-1301,OVI-43	Rtx-1301,Rtx-624	CP-Select 624 CB	BPX-624	AT-624		ZB-624	Optima-1301	G43
TRB-G43		DB-1301,DB-624								Optima-624	
TRB-14	14%diphenyl-86%dimethyl polysiloxane				CP-Sil 13 CB						
TRB-20	20%diphenyl-80%dimethyl polysiloxane		SPB-20,VOCOL	Rtx-20			AT-20	007-7			G28,G32
TRB-35	35%diphenyl-65%dimethyl polysiloxane	HP-35,DB-35	SPB-35	Rtx-35		BPX-35,BPX-608	AT-35	007-11	ZB-35		G42

TEKNOKROMA	PHASE COMPOSITION	AGILENT	SUPELCO	RESTEK	VARIAN	SGE	ALLTECH	QUADREX	PHENOMENEX	MACHEREY-NAGEL	USP CODE
TRB-1701	14% cyanopropylphenyl-86% dimethyl polysiloxane	HP-1701,PAS-1701 DB-1701	SPB-1701	Rtx-1701	CP-Sil 19 CB	BP-10	AT-1701	007-1701	ZB-1701	Optima-1701	G46
TRB-225	50% cyanopropylphenyl-50% dimethyl polysiloxane	HP-225, DB-225		Rtx-225	CP-Sil 43 CB	BP-225	AT-225	007-225		Optima-225	G7,G19
TRB-PAG	50% polyethylene-50% poly propylenglycol		PAG								
TRB-FFAP	treated polyethyleneglycol for acidic compounds	HP-FFAP,DB-FFAP	Nukol, SP-1000	Stabilwax-DA	CP-wax 58 CB	BP-21	AT-1000,FFAP	007-FFAP		Permabond FFAP	G25,G35
TRB-50	50%diphenyl-50%dimethyl polysiloxane	HP-50+,DB-17,DB-608	SPB-50, SPB-2250	Rtx-50, Rxi-17	CP-Sil 24 CB		AT-50	007-17	ZB-50	Optima-17	G3
TRB-50ht	50%diphenyl-50%dimethyl polysiloxane	DB17ht		Rtx-65	TAB-CB			007-65HT			G17
TRB-F50	50%trifluoropropylmethyl polysiloxane	DB-210,DB-200		Rtx-200			AT-210	007-210		Optima-210	G6
TRB-WAX	100%polyethyleneglycol	HP-20M,HP-innowax DB-wax,DB-waxetr	Supelcowax-10, Carbowax 20M	Stabilwax	CP-wax 52 CB	BP-20	AT-wax	007-CW	ZB-wax	Permabond CW 20M	G14,G15,G16
SupraWax-280	100%polyethyleneglycol		Supelcowax-10								
TRB-WAX-DB	treated polyethyleneglycol for basic compounds	CAM,HP-Basicwax	Carbowax-Amine	Stabilwax-DB	CP-wax 51 CB						
Meta.Wax	100%polyethyleneglycol	HP-wax,DB-wax			CP-wax 57 CB						
TRB-Wax-Omega	100%polyethyleneglycol		Omegawax	Famewax							
TR-CN100	100%biscyanopropyl polysiloxane		SP-2340	Rt-2340	CP-Sil 88	BPX-70, BPX-90					G48
TR-Cresol	not bonded phase				CP-Cresol						
TRB-17	50%diphenyl-50%dimethyl polysiloxane	HP-17									G3
Meta.VOC	proprietary bonded phase	DB-502.2,HP-VOC	Vocol	Rtx-502.2							
Meta.Blood 1	proprietary bonded phase	DB -ALC1		Rtx-BAC1							
Meta.Blood 2	proprietary bonded phase	DB-ALC2		Rtx-BAC2							
TRB-608	proprietary bonded phase	HP-608	SPB-608			BP-608					
TR-TCEP	1,2,3-tris(cyanoethoxy)propane		TCEP	Rt-TCEP	CP-TCEP						
MetAmine-VOL	proprietary bonded phase				CP-Volamine						
TRB-BIODIESEL	proprietary bonded phase	DB-5ht		Rtx-Biodiesel	Select Biodiesel			400-5ht	ZB-5ht		

TRB-1

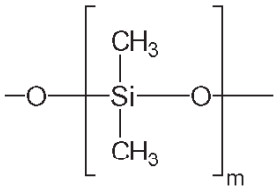
100% Dimethyl polysiloxane, bonded and crosslinked phase

- 100% Dimethylpolysiloxane
- Non-polar phase
- Column for general use
- High thermal stability
- Ideal column for the analysis of petrochemical products and industrial solvents

TRB-1 Equivalent Phase

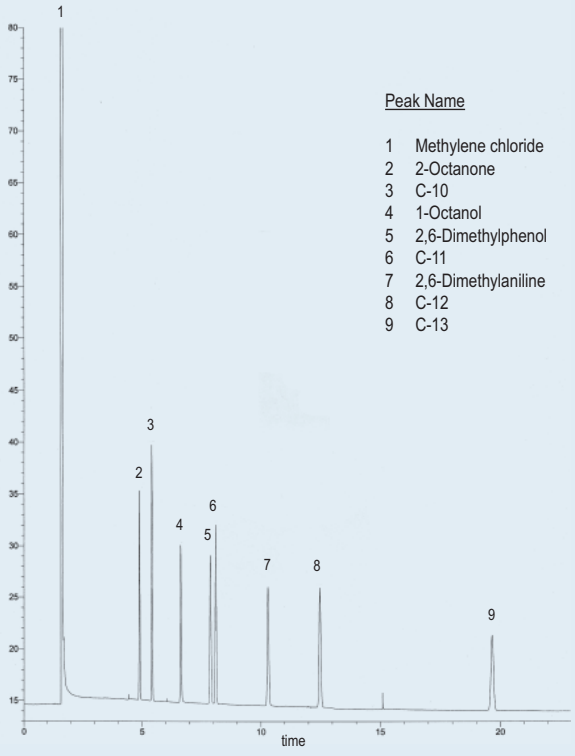
Agilent: HP-1,HP101,ULTRA-1, DB-1
Supelco: SPB-1, EQUITY-1
Restek: Rtx-1, Rtx-2887
Varian: CP-SIL 5 CB
SGE: BP-1.
Alltech: AT-1
Macherey-Nagel: OPTIMA-1

Structure of Poly(dimethyl)siloxane



TRB-1

Column: **TRB-1**, P/N TR-111226
Dimensions: 25m x 0.15mm x 1.2µm
Injection: 1 µL Test SP-4-7300, split 1:100, 280ºC
Carrier gas: H_2, constant pressure 22 psi (151.6 KPa).
Oven program: 145ºC (isothermal)
Detector: FID, 300ºC



Peak Name

1 Methylene chloride
2 2-Octanone
3 C-10
4 1-Octanol
5 2,6-Dimethylphenol
6 C-11
7 2,6-Dimethylaniline
8 C-12
9 C-13

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TRB-1

Internal Diam.(mm)	Length (m)	Film Thickness (µm)	Temp limits (°C)	Part. N°. (P/N)
0,10	5	0,12	-60 to 325/350	**TR-1107A1**
	10	0,10	-60 to 325/350	**TR-110141**
	10	0,40	-60 to 320/340	**TR-110441**
	20	0,10	-60 to 325/350	**TR-110181**
	20	0,40	-60 to 320/340	**TR-110481**
	40	0,20	-60 to 325/350	**TR-1121C1**
	40	0,40	-60 to 320/340	**TR-1104C1**

Internal Diam.(mm)	Length (m)	Film Thickness (µm)	Temp limits (°C)	Part. N°. (P/N)
0,18	10	0,18	-60 to 325/350	**TR-110944**
	10	0,20	-60 to 325/350	**TR-112144**
	10	0,40	-60 to 325/350	**TR-110444**
	20	0,18	-60 to 325/350	**TR-110984**
	20	0,40	-60 to 325/350	**TR-110484**
	40	0,40	-60 to 325/350	**TR-1104C4**

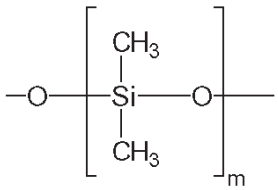
Internal Diam.(mm)	Length (m)	Film Thickness (µm)	Temp limits (°C)	Part. N°. (P/N)
0,20	12	0,33	-60 to 325/350	**TR-1133B9**
	15	0,15	-60 to 325/350	**TR-111319**
	15	0,35	-60 to 325/350	**TR-110319**
	15	0,50	-60 to 325/350	**TR-110519**
	25	0,15	-60 to 325/350	**TR-111329**
	25	0,33	-60 to 325/350	**TR-113329**
	25	0,35	-60 to 325/350	**TR-110329**
	25	0,50	-60 to 325/350	**TR-110529**
	30	0,15	-60 to 325/350	**TR-111339**
	30	0,35	-60 to 325/350	**TR-110339**
	30	0,50	-60 to 325/350	**TR-110539**
	50	0,15	-60 to 325/350	**TR-111359**
	50	0,33	-60 to 325/350	**TR-113359**
	50	0,35	-60 to 325/350	**TR-110359**
	60	0,15	-60 to 325/350	**TR-111369**
	60	0,50	-60 to 325/350	**TR-110569**
0,25	15	0,10	-60 to 325/350	**TR-110112**
	15	0,25	-60 to 325/350	**TR-110212**
	15	0,50	-60 to 325/350	**TR-110512**
	15	1,00	-60 to 325/340	**TR-111012**
	25	0,10	-60 to 325/350	**TR-110122**
	25	0,25	-60 to 325/350	**TR-110222**
	25	0,50	-60 to 325/350	**TR-110522**
	25	1,00	-60 to 320/340	**TR-111022**
	30	0,10	-60 to 325/350	**TR-110132**
	30	0,25	-60 to 325/350	**TR-110232**
	30	0,50	-60 to 325/350	**TR-110532**
	30	1,00	-60 to 320/340	**TR-111032**
	50	0,10	-60 to 325/350	**TR-110152**
	50	0,25	-60 to 325/350	**TR-110252**
	50	0,50	-60 to 325/350	**TR-110552**
	50	1,00	-60 to 320/340	**TR-111052**
	60	0,10	-60 to 325/350	**TR-110162**
	60	0,25	-60 to 325/350	**TR-110262**
	60	0,50	-60 to 325/350	**TR-110562**
	60	1,00	-60 to 325/350	**TR-111062**
	100	1,00	-60 to 325/350	**TR-111092**
	105	1,00	-60 to 325/350	**TR-1110K2**
0,32	15	0,10	-60 to 325/350	**TR-110113**
	15	0,25	-60 to 325/350	**TR-110213**
	15	0,50	-60 to 325/350	**TR-110513**
	15	1,00	-60 to 325/350	**TR-111013**
	15	3,00	-60 to 280/300	**TR-113013**
	25	0,10	-60 to 325/350	**TR-110123**
	25	0,25	-60 to 325/350	**TR-110223**
	25	0,50	-60 to 325/350	**TR-110523**
	25	1,00	-60 to 325/350	**TR-111023**
	25	3,00	-60 to 280/300	**TR-113023**
	30	0,10	-60 to 325/350	**TR-110133**
	30	0,25	-60 to 325/350	**TR-110233**
	30	0,50	-60 to 325/350	**TR-110533**
	30	1,00	-60 to 325/350	**TR-111033**
	30	3,00	-60 to 280/300	**TR-113033**
	50	0,10	-60 to 325/350	**TR-110153**
	50	0,25	-60 to 325/350	**TR-110253**
	50	0,50	-60 to 325/350	**TR-110553**
	50	1,00	-60 to 325/350	**TR-111053**
	50	3,00	-60 to 280/300	**TR-113053**
	60	0,10	-60 to 325/350	**TR-110163**
	60	0,25	-60 to 325/350	**TR-110263**
	60	0,50	-60 to 325/350	**TR-110563**
	60	1,00	-60 to 325/350	**TR-111063**
	60	3,00	-60 to 280/300	**TR-113063**
	60	5,00	-60 to 260/280	**TR-115063**
0,53	10	2,65	-60 to 300/310	**TR-112645**
	15	0,10	-60 to 320/340	**TR-110115**
	15	0,50	-60 to 320/340	**TR-110515**
	15	1,50	-60 to 310/330	**TR-111515**
	15	3,00	-60 to 270/290	**TR-113015**
	15	5,00	-60 to 270/290	**TR-115015**
	15	7,00	-60 to 260/280	**TR-117015**
	25	0,10	-60 to 320/340	**TR-110125**
	25	0,50	-60 to 320/340	**TR-110525**
	25	1,50	-60 to 310/330	**TR-111525**
	25	3,00	-60 to 270/290	**TR-113025**
	25	5,00	-60 to 270/290	**TR-115025**
	30	0,10	-60 to 320/340	**TR-110135**
	30	0,50	-60 to 320/340	**TR-110535**
	30	0,88	-60 to 310/330	**TR-110835**
	30	1,50	-60 to 310/330	**TR-111535**
	30	2,65	-60 to 270/290	**TR-112635**
	30	3,00	-60 to 270/290	**TR-113035**
	30	5,00	-60 to 270/290	**TR-115035**
	30	7,00	-60 to 260/280	**TR-117035**
	50	0,10	-60 to 320/340	**TR-110155**
	50	0,50	-60 to 320/340	**TR-110555**
	50	1,50	-60 to 310/330	**TR-111555**
	50	3,00	-60 to 270/290	**TR-113055**
	50	5,00	-60 to 270/290	**TR-115055**
	60	0,10	-60 to 320/340	**TR-110165**
	60	0,50	-60 to 320/340	**TR-110565**
	60	1,50	-60 to 310/330	**TR-111565**
	60	3,00	-60 to 270/290	**TR-113065**
	60	5,00	-60 to 270/290	**TR-115065**
	60	7,00	-60 to 240/260	**TR-117065**
	100	3,00	-60 to 270/290	**TR-113095**
	105	3,00	-60 to 270/290	**TR-1130K5**

Teknokroma Capillary Columns

TRB-1ht

100% Dimethyl polysiloxane, bonded and crosslinked phase.

- 100% Dimethylpolysiloxane
- Non-polar phase
- Produced specially for high temperature analyses (Max.temp. 400ºC).
- Fused silica tubing with polyimide coating for high temperatures.
- Uses: analysis of compounds with high boiling point, triglycerides, waxes, etc.



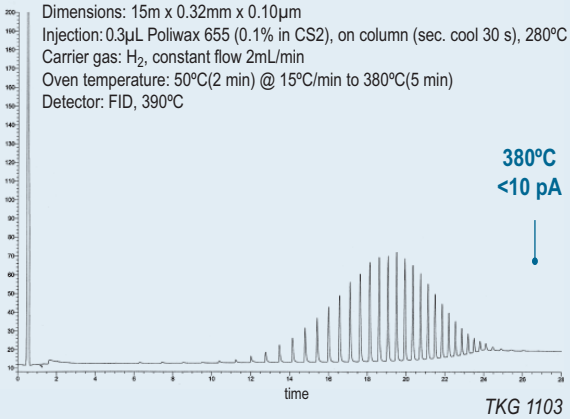
Structure of Poly(dimethyl)siloxane

TRB-1ht Equivalent Phase

Agilent: DB-1ht
Restek: Stx-1HT
Alltech: AT-1 ht

TRB-1ht

Column: Retention Gap (intermediate polarity) 5m x 0.53mm (TR-200055) + **TRB-1ht** (TR-610113)
Dimensions: 15m x 0.32mm x 0.10µm
Injection: 0.3µL Poliwax 655 (0.1% in CS2), on column (sec. cool 30 s), 280ºC
Carrier gas: H_2, constant flow 2mL/min
Oven temperature: 50ºC(2 min) @ 15ºC/min to 380ºC(5 min)
Detector: FID, 390ºC



TKG 1103

TRB-1ht

Internal Diam.(mm)	Length (m)	Film Thickness (µm)	Temp limits (°C)	Part. N°. (P/N)
0,25	15	0,10	-60 to 400	**TR-610112**
	30	0,10	-60 to 400	**TR-610132**
0,32	15	0,10	-60 to 400	**TR-610113**
	30	0,10	-60 to 400	**TR-610133**

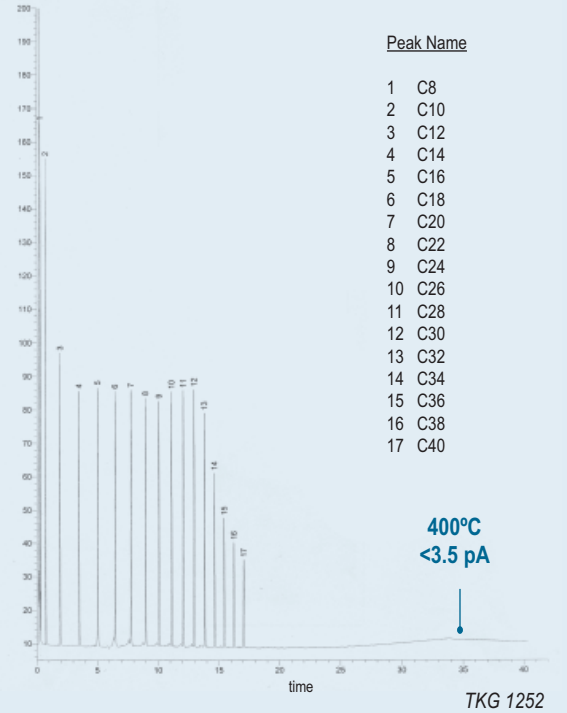
TRB-1ht SimDist

100% Dimethyl polysiloxane, bonded and crosslinked phase.

- 100% Dimethyl polysiloxane, bonded and crosslinked phase
- True methyl silicone polarity
- Unbreakable, specially treated stainless steel
- Maximum temperature 430ºC
- Low bleed at 400ºC (Typical values of 4-6pA)
- Distillation range C6 to C120

TRB-1ht SimDist

Column: **TRB-1ht SimDist**, P/N TR-2301A5 INOX
Dimensions: 5m x 0.53mm x 0.10µm
Injection: 0.4µL Hydrocarbons C8-C40 (500ng/µL), 300ºC, split 1:20 (3mm ID liner)
Carrier gas: H_2, 60 cm/s (40ºC)
Oven temperature: Temperature: 40ºC @ 15ºC/min a 400ºC(15 min)
Detector: FID, 430ºC



TKG 1252

TRB-1ht SimDist

Internal Diam.(mm)	Length (m)	Film Thickness (µm)	Temp limits (°C)	Part. N°. (P/N)
0,53	5	0,10	-60 to 400/430	**TR-2301A5INOX**
	5	0,15	-60 to 400/430	**TR-2313A5INOX**

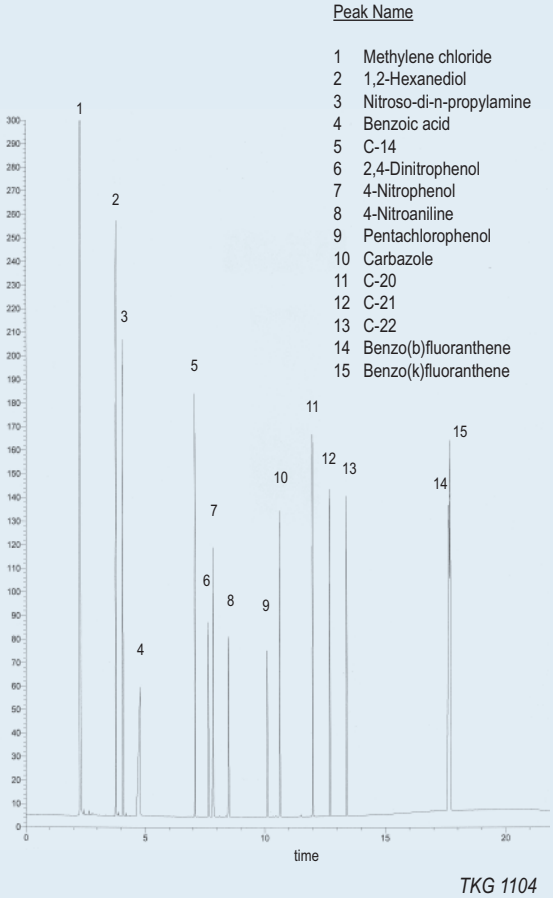
TRB-1ms

100% Dimethyl polysiloxane, bonded and crosslinked phase.

- 100% Dimethylpolysiloxane
- These columns, with a selectivity identical to the TRB-1, fulfil column bleed specifications that make them compatible with analysis of trace components with GC/MS. Therefore, the standard column of 30 m x 0.25 mm x 0.25 µm has a guaranteed maximum bleed of 4 pA at 325 °C
- Great chemical inertness towards active constituents and excellent thermal stability.
- Improved signal/noise ratio, which enables greater sensitivity to be obtained with the MS, ECD, NPD, SCD, etc. detectors and provides greater precision in quantitative analysis at trace levels
- Less column bleed means less detectors contamination and greater speed in conditioning columns

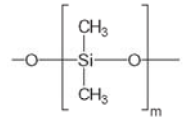
TRB-1ms

Column: **TRB-1ms**, P/N TR-510262
Dimensions: 60m x 0.25mm x 0.25µm
Injection: 1µL Test MX5 (10 to 20 ng/comp. on column), split 1:100, 280ºC
Carrier gas: H_2, constant pressure 25 psi (172 KPa).
Oven temperature: 100ºC @ 6ºC/min to 325ºC(5 min)
Detector: FID, 340ºC



TKG 1104

Structure of Poly(dimethyl)siloxane



TRB-1ms Equivalent Phase

Agilent: HP-1MS, DB-1MS
Restek: Rtx-1ms, Rxi-1ms
Varian: CP-SIL 5 CB MS, VF-1MS
Alltech: AT-1 MS

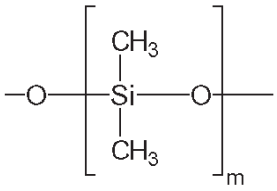
TRB-1ms

Internal Diam.(mm)	Length (m)	Film Thickness (µm)	Temp limits (°C)	Part. N°. (P/N)
0,10	10	0,10	-60 to 325/350	**TR-510141**
	10	0,40	-60 to 325/350	**TR-510441**
	20	0,10	-60 to 325/350	**TR-510181**
	20	0,40	-60 to 325/350	**TR-510481**
0,18	20	0,18	-60 to 325/350	**TR-510984**
	40	0,18	-60 to 325/350	**TR-5109C4**
0,20	12	0,33	-60 to 325/350	**TR-5133B9**
	15	0,33	-60 to 325/350	**TR-513319**
	25	0,33	-60 to 325/350	**TR-513329**
	30	0,33	-60 to 325/350	**TR-513339**
	50	0,33	-60 to 325/350	**TR-513359**
	60	0,33	-60 to 325/350	**TR-513369**
0,25	15	0,10	-60 to 325/350	**TR-510112**
	15	0,25	-60 to 325/350	**TR-510212**
	15	1,00	-60 to 325/350	**TR-511012**
	30	0,10	-60 to 325/350	**TR-510132**
	30	0,25	-60 to 325/350	**TR-510232**
	30	1,00	-60 to 325/350	**TR-511032**
	60	0,10	-60 to 325/350	**TR-510162**
	60	0,25	-60 to 325/350	**TR-510262**
	60	1,00	-60 to 325/350	**TR-511062**
0,32	15	0,10	-60 to 325/350	**TR-510113**
	15	0,25	-60 to 325/350	**TR-510213**
	15	0,50	-60 to 325/350	**TR-510513**
	15	1,00	-60 to 325/350	**TR-511013**
	60	1,00	-60 to 325/350	**TR-511062**
	30	0,10	-60 to 325/350	**TR-510133**
	30	0,25	-60 to 325/350	**TR-510233**
	30	0,50	-60 to 325/350	**TR-510533**
	30	1,00	-60 to 325/350	**TR-511033**
	60	0,10	-60 to 325/350	**TR-510163**
	60	0,25	-60 to 325/350	**TR-510263**
	60	0,50	-60 to 325/350	**TR-510563**
	60	1,00	-60 to 325/350	**TR-511063**
0,53	15	0,50	-60 to 320/340	**TR-510515**
	15	1,00	-60 to 320/340	**TR-511015**
	15	1,50	-60 to 310/330	**TR-511515**
	30	0,50	-60 to 320/340	**TR-510535**
	30	1,00	-60 to 320/340	**TR-511035**
	30	1,50	-60 to 310/330	**TR-511535**

TRB-Sulfur

100% Dimethyl polysiloxane, bonded and crosslinked phase.

- 100% Dimethylpolysiloxane
- Column specially designed for the analysis of sulphurous compounds (in natural gas, petrol derivates, wines, beer, etc.)
- Guaranteed thermal stability, with low column bleed



Structure of Poly(dimethyl)siloxane

TRB-Sulfur Equivalent Phase

Supelco: SPB-1 SULFUR

TRB-Sulfur

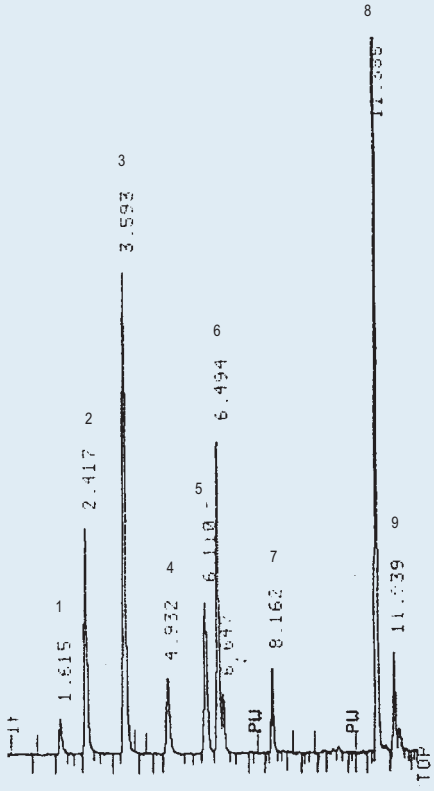
Internal Diam.(mm)	Length (m)	Film Thickness (µm)	Temp limits (°C)	Part. N°. (P/N)
0,32	30	4,00	-60 to 270/290	**TR-974033**

TRB- SULFUR

Column: **TRB-SULFUR**, 30 m x 0.32 mm x 4.0 µm
Mercaptans

Peak Name

1 SH2
2 Methyl mercaptan
3 Ethyl mercaptan
4 2-propylmercaptan
5 Terbutyl mercaptan
6 Methyl ethyl sulfide
7 1-propylmercaptan
8 2-butyl mercaptan
9 T.H.T.

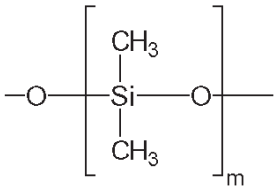


TKG 1105

TRB-Petrol

100% Dimethyl polysiloxane, bonded and crosslinked phase.

- 100% Dimethylpolysiloxane
- Column for analyzing complex mixtures of hydrocarbons according to the ASTM regulations (American Society for Testing and Materials)
- Sufficient resolution power to undertake PNA, PONA and PIANO analysis



Structure of Poly(dimethyl)siloxane

TRB-Petrol Equivalent Phase

Agilent: DB-Petro
Supelco: Petrocol DH

TRB-Petrol

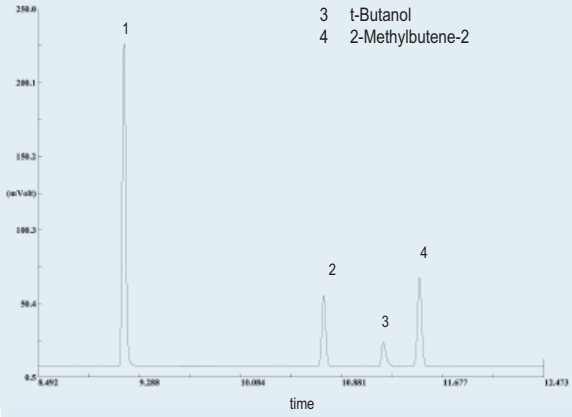
Internal Diam.(mm)	Length (m)	Film Thickness (µm)	Temp limits (°C)	Part. N°. (P/N)
0,25	100	0,50	-60 to 300/320	**TR-110592**

TRB-PETROL (PONA column) meets all ASTM specifications

	ASTM D-6730 Specifications
C5 efficiency (total theoretical plates) : 618.503	450.000-550.000
K(C5) : 0.47	0.45-0.50
t-Butanol skewness : 1.62	>1.00 - < 5.00
Resolution t-Butanol/2-Methylbutene-2 : 4.41	3.25-5.25

Peak Name

1 Ethanol
2 C5
3 t-Butanol
4 2-Methylbutene-2

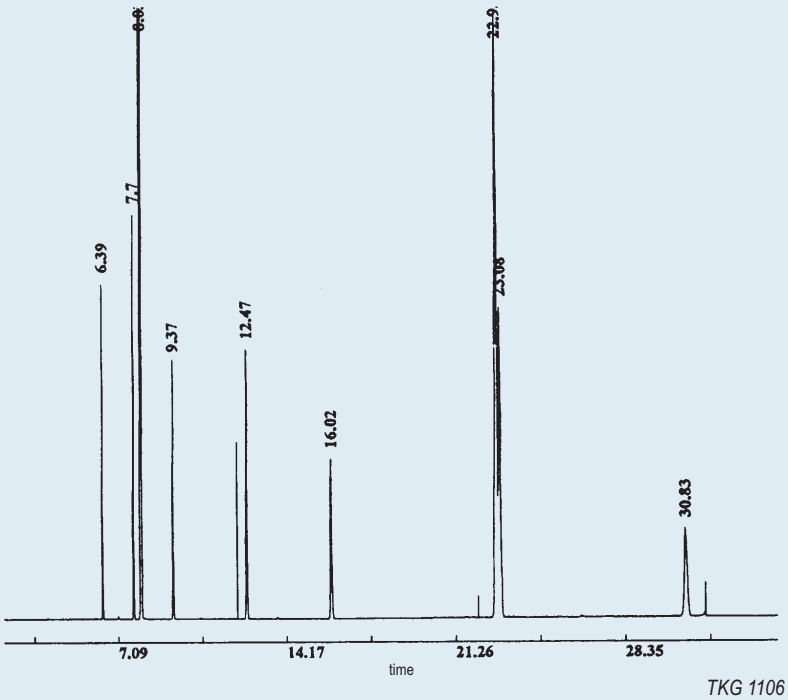


TKG 1254

TRB-PETROL

Column: **TRB-PETROL**, 100m x 0.25mm x 0.50µm P/N TR 110592
Temperature: 60ºC (isothermal)
Injector: 260ºC
Carrier gas: H_2, 34 psi
Injection: Test for hydrocarbons, split (1:100)
Detector: FID, 260º

tr (min.)	Compound
6.39	n-Hexane
7.70	Benzene
8.03	Cyclohexane
9.37	n-Heptane
12.47	Toluene
16.02	n-Octane
22.93	m-Xylene
23.08	p-Xylene
30.83	n-Nonane

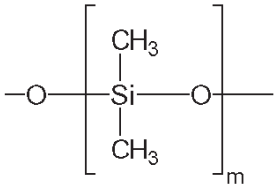


TKG 1106

TRB-Petro.150

100% Dimethyl polysiloxane, bonded and crosslinked phase.

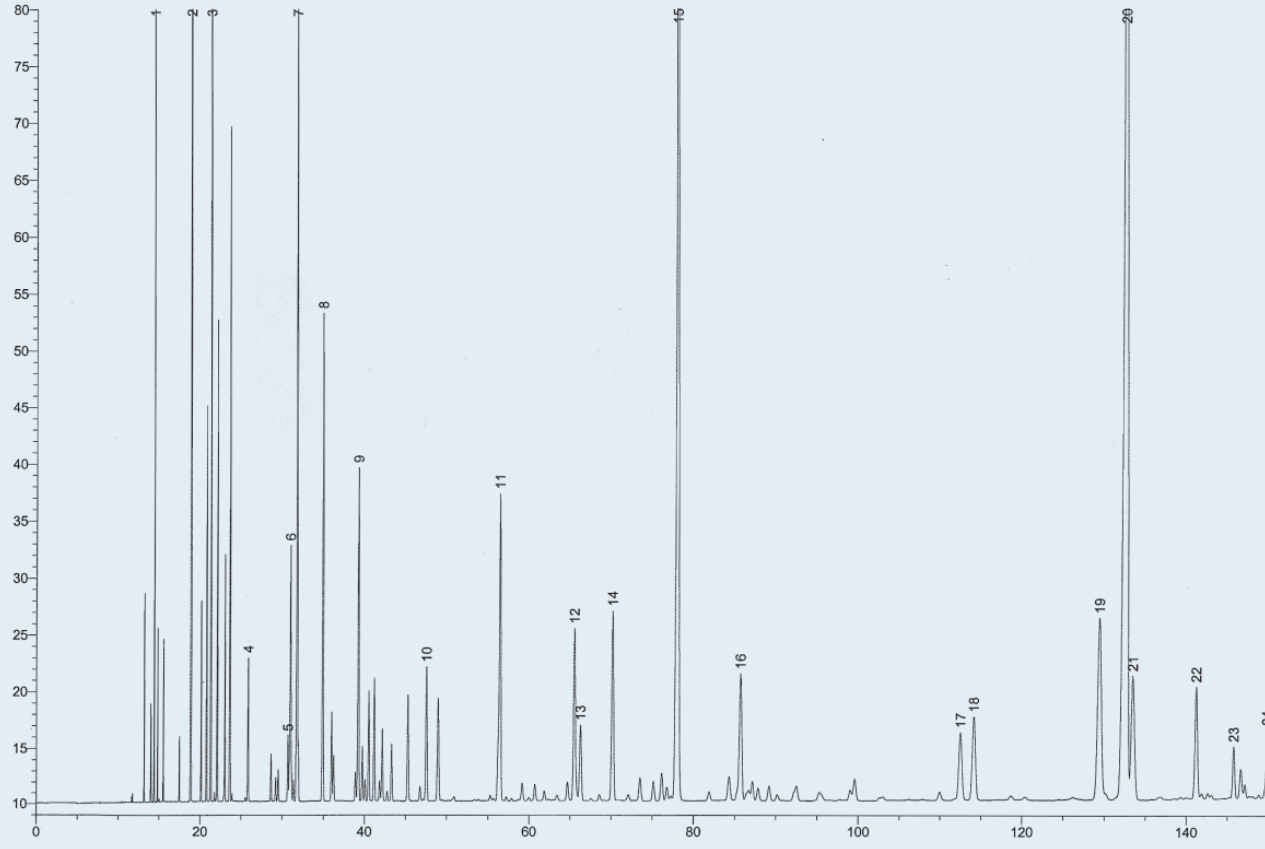
- 100% Dimethylpolysiloxane
- Maximum resolution for hydrocarbon analysis



Structure of Poly(dimethyl)siloxane

TRB-PETRO.150

Column: **TRB-PETRO.150**, P/N TR-1110G2
Dimensions: 150m x 0.25mm x 1.0µm
Injection: 0.1µ1 unleaded gasoline,split 100:1 @ 280°C
Carrier gas: He, 75psi (517 kPa) @ 35°C
Oven program: 35°C(hold 135 min.) to 200°C @ 2°C/min. (hold 20 min)
Detector: FID @ 280°C



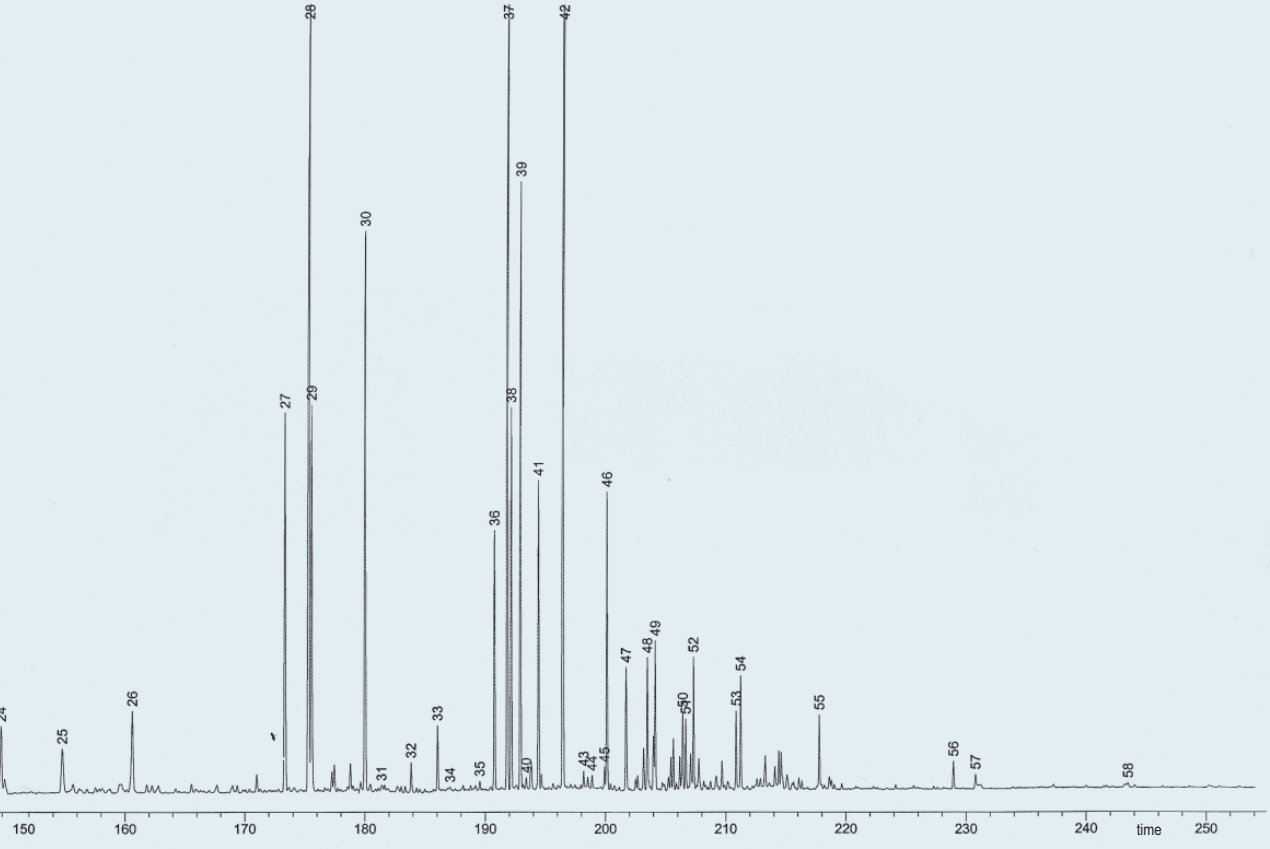
1	n-Butane	11	Benzene	21	2,3,3- Trimethylpentane
2	Isopentane	12	2-Methylhexane	22	2,3-Dimethylhexane
3	n-Pentane	13	2,3-Dimethylpentane	23	2-Methylheptane
4	2,2-Dimethylbutane	14	3-Methylhexane	24	3-Methylheptane
5	Cyclopentane	15	2,2,4- Trimethylpentane	25	2-Methyl-1-heptene
6	2,3-Dimethylbutane	16	n-Heptane	26	n-Octane
7	2-Methylpentane	17	2,5-Dimethylhexane	27	Ethylbencene
8	3-Methylpentane	18	2,4-Dimethylhexane	28	m-Xylene
9	n-Hexane	19	2,3,4-Trimethylpentane	29	p-Xylene
10	2,4-Dimethylpentane	20	Toluene	30	o-Xylene

TRB-Petro.150 Equivalent Phase

Supelco: Petrocol DH 150.

TRB-Petro.150

Internal Diam.(mm)	Length (m)	Film Thickness (µm)	Temp limits (°C)	Part. N°. (P/N)
0,25	150	1,00	-60 to 300/320	**TR-1110G2**



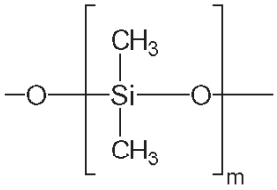
31 1-Nonene
32 n-Nonane
33 Isopropylbenzene
34 3,3,5- Trimethylheptane
35 2,4,5- Trimethylheptane
36 n-propylbenzene
37 1-Methyl-3-ethylbenzene
38 1-Methyl-4-ethylbenzene
39 1,3,5-Trimethylbenzene
40 3,3,4- Trimethylheptane
41 1-Methyl-2-ethylbenzene
42 1,2,4- Trimethylbenzene
43 Isobuthylbenzene
44 sec-Buthylbenzene
45 n-Decane
46 1,2,3- Trimethylbenzene
47 Indane
48 1,3-Diethylbenzene
49 n-Butylbenzene
50 1,4-Dimethyl-2-ethylbenzene
51 1,3- Dimethyl-4-ethylbenzene
52 1,2-Dimethyl-4-ethylbenzene
53 1,2,4,5- Tetramethylbenzene
54 1,2,3,5-Tetramethylbenzene
55 Naphthalene
56 2-Methylnaphthalene
57 1-Methylnaphthalene
58 Dimethylnaphthalenes

TKG 1107

TRB-50.2PONA

100% Dimethyl polysiloxane, bonded and crosslinked phase.

- 100% Dimethylpolysiloxane
- Column designed for the complete analysis of PONA hydrocarbons (P-Paraffins, O-Olefins, N-Naphthenes and A-Aromatics) in petrol-derived products according to the ASTM regulations, method D5134



Structure of Poly(dimethyl)siloxane

TRB-50.2PONA. Equivalent Phase

Agilent: HP-PONA
Supelco: Petrocol DH 50.2
Restek: Rtx-1 PONA
Varian: CP-SIL PONA CB
SGE: BP-1 PONA

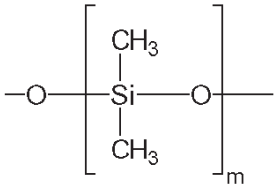
TRB-50.2PONA

Internal Diam.(mm)	Length (m)	Film Thickness (µm)	Temp limits (°C)	Part. N°. (P/N)
0,20	50	0,50	-60 to 320/340	**TR-110559**

TRB-2887

100% Dimethyl polysiloxane, bonded and crosslinked phase.

- 100% Dimethylpolysiloxane
- Designed specifically for simulated distillation according to the ASTM method D2887



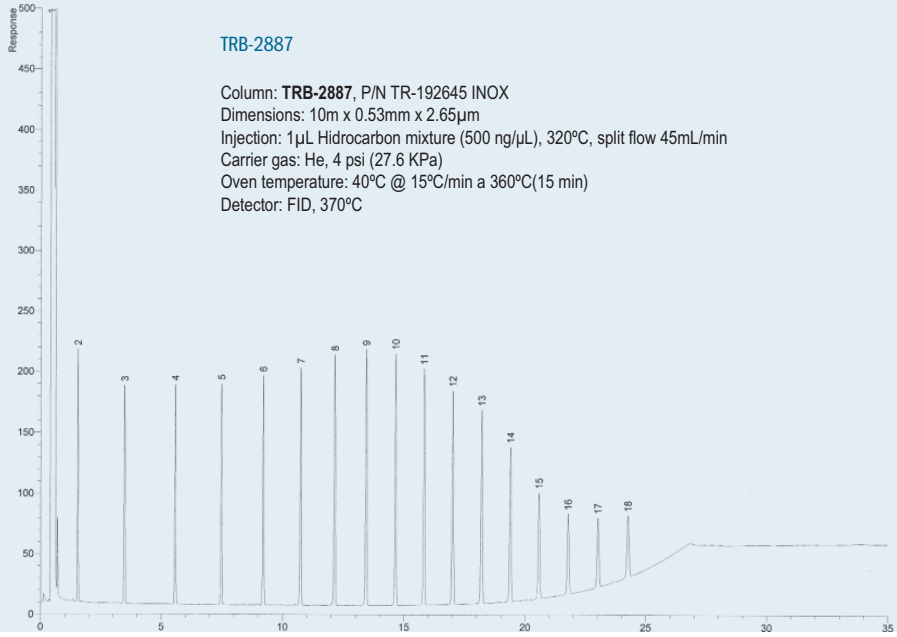
Structure of Poly(dimethyl)siloxane

TRB-2887 Equivalent Phase

Agilent: DB-2887
Supelco: PETROCOL-2887
Restek: Rtx-2887

TRB-2887

Internal Diam.(mm)	Length (m)	Film Thickness (µm)	Temp limits (°C)	Part. N°. (P/N)
0,53	10	2,65	-60 to 340/360	**TR-192645**



TRB-2887

Column: **TRB-2887**, P/N TR-192645 INOX
Dimensions: 10m x 0.53mm x 2.65µm
Injection: 1µL Hidrocarbon mixture (500 ng/µL), 320ºC, split flow 45mL/min
Carrier gas: He, 4 psi (27.6 KPa)
Oven temperature: 40ºC @ 15ºC/min a 360ºC(15 min)
Detector: FID, 370ºC

Peak Name

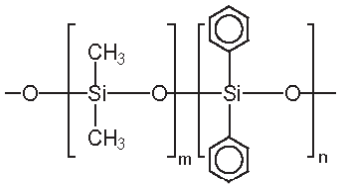
1 n-hexane
2 C-8
3 C-10
4 C-12
5 C-14
6 C-16
7 C-18
8 C-20
9 C-22
10 C-24
11 C-26
12 C-28
13 C-30
14 C-32
15 C-34
16 C-36
17 C-38
18 C-40

TKG 1108

TRB-5

(95%) Dimethyl-(5%) diphenylpolysiloxane, bonded and crosslinked phase.

- It is the most versatile and universal stationary phase in the gas chromatography analysis field
- The low percentage of phenyl in the polymer structure gives it a characteristic affinity towards the compounds with aromatic rings. This phase, the most popular one, due to its great thermal stability and chemical inertness is the stationary phase of choice for any type of analysis
- It allows the analysis of acidic and basic compounds
- It is ideal for the analysis in the environmental field. Analysis of dioxines, PCB´s, PCT´s, polyaromatic compounds, phenols, herbicides, organochlorinated and organophosphorus pesticides, aromatic hydrocarbons, solvents, drugs, oils, etc...



Structure of Poly(dimethyldiphenyl)siloxane

TRB-5 Equivalent Phase

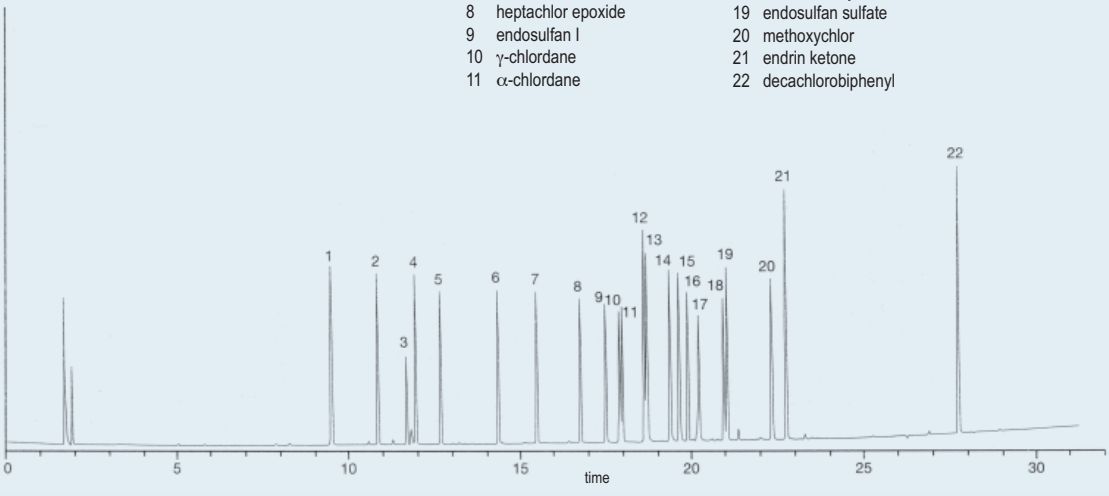
Restek: Rtx-5
Agilent/JW: HP-5, Ultra-2, DB-5, DB-5.625
Supelco: SPB-5, PTE-5, SAC-5, Equity-5
Chromapack/Varian: CP-SIL8CB
Alltech: AT-5
Macherey-Nagel: OPTIMA-5
Quadrex: 007-2
SGE: BP-5

TRB-5

Column: **TRB-5**, P/N TR-120232
Dimensions: 30m x 0.25mm x 0.25µm
Injection: 1µL chlorinated pesticides mixture, splitless @230ºC (25-270 ppb on column)
Carrier gas: H_2, constant pressure 12 psi (87.7 KPa) 150ºC
Oven temperature: 150ºC to 225ºC@ 2ºC/min (10 min.)
Detector: ECD, 310ºC

Peak Name

1	2,4,5,6-tetrachloro-*m*-xylene	12	4,4´- DDE
2	γ-BHC	13	dieldrin
3	δ-BHC	14	endrin
4	heptachlor	15	4,4´- DDD
5	aldrin	16	endosulfan II
6	β-BHC	17	4,4´- DDT
7	δ-BHC	18	endrin aldehyde
8	heptachlor epoxide	19	endosulfan sulfate
9	endosulfan I	20	methoxychlor
10	γ-chlordane	21	endrin ketone
11	α-chlordane	22	decachlorobiphenyl



TKG 1109

Tk Teknokroma Capillary Columns

TRB-5

Internal Diam.(mm)	Length (m)	Film Thickness (µm)	Temp limits (°C)	Part. N°. (P/N)
0,10	10	0,10	-60 to 325/350	**TR-120141**
	10	0,17	-60 to 320/350	**TR-121941**
	10	0,33	-60 to 320/350	**TR-123341**
	10	0,40	-60 to 320/350	**TR-120441**
	20	0,10	-60 to 325/350	**TR-120181**
	20	0,40	-60 to 320/350	**TR-120481**
0,18	10	0,18	-60 to 325/350	**TR-120944**
	10	0,40	-60 to 325/350	**TR-120444**
	20	0,18	-60 to 325/350	**TR-120984**
	20	0,40	-60 to 325/350	**TR-120484**
	40	0,18	-60 to 325/350	**TR-1209C4**
0,20	12	0,18	-60 to 325/350	**TR-1233B9**
	15	0,15	-60 to 325/350	**TR-121319**
	15	0,35	-60 to 325/350	**TR-120319**
	15	0,50	-60 to 325/350	**TR-120519**
	25	0,15	-60 to 325/350	**TR-121329**
	25	0,33	-60 to 325/350	**TR-123329**
	25	0,35	-60 to 325/350	**TR-120329**
	25	0,50	-60 to 325/350	**TR-120529**
	30	0,15	-60 to 325/350	**TR-121339**
	30	0,35	-60 to 325/350	**TR-120339**
	30	0,50	-60 to 325/350	**TR-120539**
	50	0,15	-60 to 325/350	**TR-121359**
	50	0,33	-60 to 325/350	**TR-123359**
	50	0,35	-60 to 325/350	**TR-120359**
	50	0,50	-60 to 325/350	**TR-120559**
	60	0,15	-60 to 325/350	**TR-121369**
	60	0,35	-60 to 325/350	**TR-120369**
	60	0,50	-60 to 325/350	**TR-120569**
0,25	15	0,10	-60 to 325/350	**TR-120112**
	15	0,25	-60 to 325/350	**TR-120212**
	15	0,50	-60 to 325/350	**TR-120512**
	15	1,00	-60 to 320/350	**TR-121012**
	25	0,10	-60 to 325/350	**TR-120122**
	25	0,25	-60 to 325/350	**TR-120222**
	25	0,50	-60 to 325/350	**TR-120522**
	25	1,00	-60 to 320/350	**TR-121022**
	30	0,10	-60 to 325/350	**TR-120132**
	30	0,25	-60 to 325/350	**TR-120232**
	30	0,50	-60 to 325/350	**TR-120532**
	30	1,00	-60 to 320/350	**TR-121032**
	50	0,10	-60 to 325/350	**TR-120152**
	50	0,25	-60 to 325/350	**TR-120252**
	50	0,50	-60 to 325/350	**TR-120552**
	50	1,00	-60 to 320/350	**TR-121052**
	60	0,10	-60 to 325/350	**TR-120162**
	60	0,25	-60 to 325/350	**TR-120262**
	60	0,50	-60 to 325/350	**TR-120562**
	60	1,00	-60 to 325/350	**TR-121062**
0,32	15	0,10	-60 to 325/350	**TR-120113**
	15	0,25	-60 to 325/350	**TR-120213**

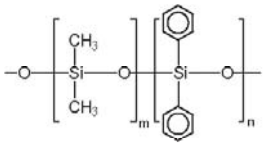
TRB-5

Internal Diam.(mm)	Length (m)	Film Thickness (µm)	Temp limits (°C)	Part. N°. (P/N)
0,32	15	0,50	-60 to 325/350	**TR-120513**
	15	1,00	-60 to 325/350	**TR-121013**
	15	3,00	-60 to 280/350	**TR-123013**
	25	0.10	-60 to 325/350	**TR-120123**
	25	0,25	-60 to 325/350	**TR-120223**
	25	0,50	-60 to 325/350	**TR-120523**
	25	1,00	-60 to 325/350	**TR-121023**
	25	3,00	-60 to 280/350	**TR-123023**
	30	0,10	-60 to 325/350	**TR-120133**
	30	0,25	-60 to 325/350	**TR-120233**
	30	0,50	-60 to 325/350	**TR-120533**
	30	1,00	-60 to 325/350	**TR-121033**
	30	3,00	-60 to 280/350	**TR-123033**
	50	0,10	-60 to 325/350	**TR-120153**
	50	0,25	-60 to 325/350	**TR-120253**
	50	0,50	-60 to 325/350	**TR-120553**
	50	1,00	-60 to 325/350	**TR-121053**
	50	3,00	-60 to 280/350	**TR-123053**
	60	0,10	-60 to 325/350	**TR-120163**
	60	0,25	-60 to 325/350	**TR-120263**
	60	0,50	-60 to 325/350	**TR-120563**
	60	1,00	-60 to 325/350	**TR-121063**
	60	3,00	-60 to 280/350	**TR-123063**
0,53	10	2,65	-60 to 270/290	**TR-122645**
	15	0,10	-60 to 320/340	**TR-120115**
	15	0,50	-60 to 320/340	**TR-120515**
	15	1,50	-60 to 310/330	**TR-121515**
	15	3,00	-60 to 270/290	**TR-123015**
	15	5,00	-60 to 270/290	**TR-125015**
	25	0,10	-60 to 320/340	**TR-120125**
	25	0,50	-60 to 320/340	**TR-120525**
	25	1,50	-60 to 310/330	**TR-121525**
	25	3,00	-60 to 270/290	**TR-123025**
	25	5,00	-60 to 270/290	**TR-125025**
	30	0,10	-60 to 320/340	**TR-120135**
	30	0,50	-60 to 320/340	**TR-120535**
	30	0,88	-60 to 310/330	**TR-120835**
	30	1,50	-60 to 310/330	**TR-121535**
	30	2,65	-60 to 270/290	**TR-122635**
	30	3,00	-60 to 270/290	**TR-123035**
	30	5,00	-60 to 270/290	**TR-125035**
	50	0,10	-60 to 320/340	**TR-120155**
	50	0,50	-60 to 320/340	**TR-120555**
	50	1,50	-60 to 310/330	**TR-121555**
	50	3,00	-60 to 270/290	**TR-123055**
	50	5,00	-60 to 270/290	**TR-125055**
	60	0,10	-60 to 320/340	**TR-120165**
	60	0,50	-60 to 320/340	**TR-120565**
	60	1,50	-60 to 310/330	**TR-121565**
	60	3,00	-60 to 270/290	**TR-123065**
	60	5,00	-60 to 270/290	**TR-125065**

TRB-5ht

(95%) Dimethyl-(5%) diphenylpolysiloxane, bonded and crosslinked phase.

- Produced specially for analysis at high temperature up to 400ºC
- Fused silica tube covered with polyimide, resistant to high temperatures, or stainless steel tube (specially deactivated)
- Excellent symmetry for compounds with high boiling points
- Preferably used for the analysis of waxes, triglycerides, sterol esters, polyoxyethylenated alcohols, etc.



Structure of Poly(dimethyldiphenyl)siloxane

TRB-5ht Equivalent Phase

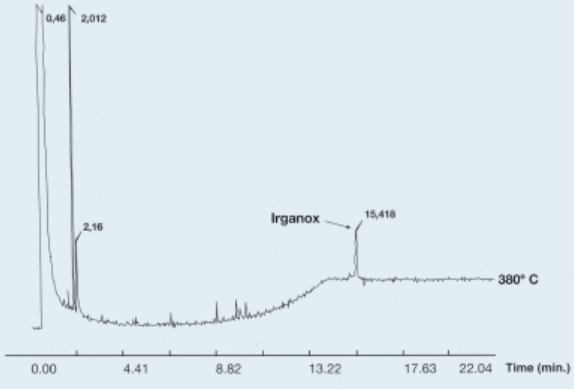
Agilent: DB-5t
Phenomenex: ZB-5ht

TRB-5ht

Internal Diam.(mm)	Length (m)	Film Thickness (µm)	Temp limits (°C)	Part. N°. (P/N)
0,25	15	0,10	-60 to 400	**TR-620112**
	30	0,10	-60 to 400	**TR-620132**
0,32	15	0,10	-60 to 400	**TR-620113**
	30	0,10	-60 to 400	**TR-620133**

IRGANOX 1010

Column: **TRB-5ht,** 15m X 0,25 mm X 0,10 µm, P/N TR-620112
Injection: 1µL (Irganox 1010, 12mg/ml chloroform), split (1:60), 370ºC
Carrier gas: H2, 6psi (41,3 kPa)
Oven temp.: 150°C to 380ºC (10 min.) @ 30°C/min.
Detector: FID to 390°C

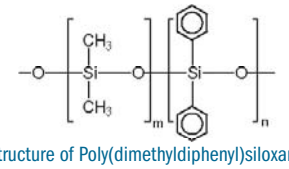


TKG 1110

TRB-Sterol

(95%) Dimethyl-(5%) diphenylpolysiloxane, bonded and crosslinked phase.

- Column specifically designed for the analysis of complex mixtures of sterols, from either animal or plant origin
- Deactivation method of the capillary tube wall, developed by Teknokroma, that guarantees a high chemical inertness a low bleeding level and allows the analysis of sterols without derivatization
- The column is specifically tested for sterols



Structure of Poly(dimethyldiphenyl)siloxane

TRB-Sterol Equivalent Phase

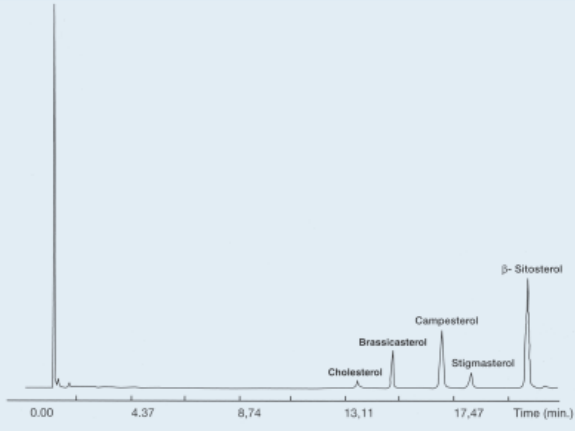
Supelco: SAC-5

TRB-Sterol

Internal Diam.(mm)	Length (m)	Film Thickness (µm)	Temp limits (°C)	Part. N°. (P/N)
0,22	30	0,22	-60 to 325-350	**TR-182238**
	30	0,12	-60 to 325-350	**TR-180738**

Sterols

Column: **TRB-Sterol,** 30m X 0,22 mm X 0,22 µm, P/N TR-182238
Oven Temp.: 265ºC
Injector: 280ºC
Carrier gas: H2, 18 psi (124 kPa)
Injection: 0,5 µl sterols standard, (25 mg/ml.) split(1:100)
Detector: FID 300°C



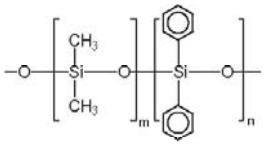
TKG 1111

Teknokroma Capillary Columns

TRB-5ms

(95%) Dimethyl-(5%) diphenylpolysiloxane, bonded and crosslinked phase.

- The TRB-5ms Column uses the same stationary phase as TRB-5, but the polymer synthesis process, the capillary deactivation technique and the bonding and crosslinking procedures have been optimized to obtain the minimum possible bleeding level and an exceptional chemical inertness
- The bleeding specifications for a column of 30m x 0,25 mm x 0,25 µm (P/N 520232) inidcate that it is lower than 4 pA at 325ºC
- Column recommended to work with any selective detector
- Ideal column to connect with a mass detector. Its ultra-low bleeding joined to its high chemical inertness allows for a better signal/noise ratio (higher sensitivity level), and therefore better detection and quantification of sample components at low concentrations.



Structure of Poly(dimethyldiphenyl)siloxane

TRB-5ms Equivalent Phase

Restek: Rtx 5ms, Rxi-5ms
Aglilent/JW: HP-5MS
Supelco: PTE-5, Equity-5
Macherey-Nagel: OPTIMA-5ms
Varian: CP-Sil8-MS

TRB-5ms

Internal Diam.(mm)	Length (m)	Film Thickness (µm)	Temp limits (°C)	Part. N°. (P/N)
0,10	10	0,10	-60 to 325-350	**TR-520141**
	10	0,40	-60 to 325-350	**TR-520441**
	20	0,10	-60 to 325-350	**TR-520181**
	20	0,40	-60 to 325-350	**TR-520481**
0,18	20	0,18	-60 to 325-350	**TR-520984**
	40	0,18	-60 to 325-350	**TR-5209C4**
0,20	12	0,33	-60 to 325-350	**TR-5233B9**
	15	0,33	-60 to 325-350	**TR-523319**
	25	0,33	-60 to 325-350	**TR-523329**
	30	0,33	-60 to 325-350	**TR-523339**
	50	0,33	-60 to 325-350	**TR-523359**
	60	0,33	-60 to 325-350	**TR-523369**
0,25	15	0,10	-60 to 325-350	**TR-520112**
	15	0,25	-60 to 325-350	**TR-520212**
	15	1,00	-60 to 325-350	**TR-521012**
	30	0,10	-60 to 325-350	**TR-520132**
	30	0,25	-60 to 325-350	**TR-520232**
	30	1,00	-60 to 325-350	**TR-521032**
	60	0,10	-60 to 325-350	**TR-520162**
	60	0,25	-60 to 325-350	**TR-520262**
	60	1,00	-60 to 325-350	**TR-521062**
0,32	15	0,10	-60 to 325-350	**TR-520113**
	15	0,25	-60 to 325-350	**TR-520213**
	15	0,50	-60 to 325-350	**TR-520513**
	15	1,00	-60 to 325-350	**TR-521013**
	30	0,10	-60 to 325-350	**TR-520133**
	30	0,25	-60 to 325-350	**TR-520233**
	30	0,50	-60 to 325-350	**TR-520533**
	30	1,00	-60 to 325-350	**TR-521033**
	60	0,10	-60 to 325-350	**TR-520163**
	60	0,25	-60 to 325-350	**TR-520263**
	60	0,50	-60 to 325-350	**TR-520563**
	60	1,00	-60 to 325-350	**TR-521063**
0,53	15	0,50	-60 to 320-340	**TR-520515**
	15	1,00	-60 to 320-340	**TR-521015**
	15	1,50	-60 to 310-330	**TR-521515**
	30	0,50	-60 to 320-340	**TR-520535**
	30	1,00	-60 to 320-340	**TR-521035**
	30	1,50	-60 to 310-330	**TR-521535**

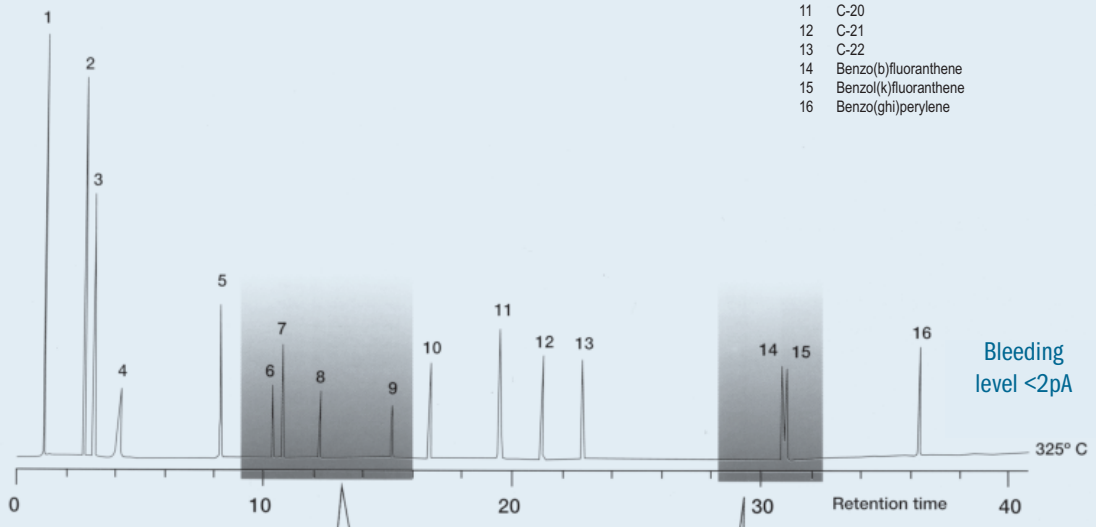
The TRB-5MS column has an excellent resolution and symmetry in all its polarity range, for neutral, acid and basic compounds. All these substances that appear in the analysis of semivolatile traces (for example, EPA official methods) can be analyzed in only one column.

Test MX5

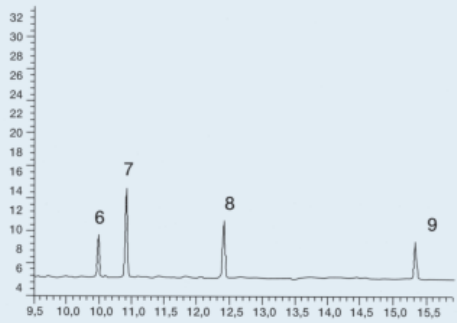
Column: **TRB-5ms,** P/N TR-520232
Dimensions: 30 m x 0,25 mm x 0,25 µm
Injection: 1µ1, split (1:100), 5 to 10 ng/comp. on column, 280ºC
Carrier gas: H2, 12 psi (87,7 kPa)
Oven temp.: 100°C to 325ºC (5 min.) @ 6°C/min.
Detector: FID to 300°C
Sample: Test MX5

Peak Name

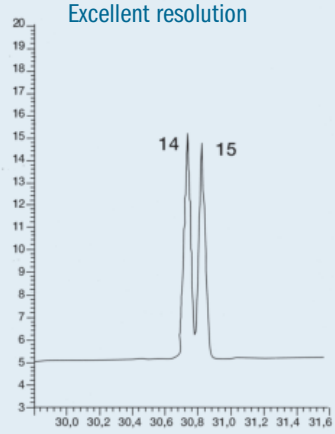
1 Methylene chloride
2 1,2-Hexanediol
3 Nitroso-di-n-propylamine
4 Benzoic acid
5 C-14
6 2,4-Dinitrophenol
7 4-Nitrophenol
8 4-Nitroaniline
9 Pentachlorophenol
10 Carbazole
11 C-20
12 C-21
13 C-22
14 Benzo(b)fluoranthene
15 Benzol(k)fluoranthene
16 Benzo(ghi)perylene



Injection of 1ng/peak on column
Exceptional symmetry



Excellent resolution

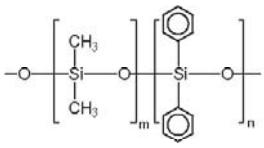


TKG 1112

TRB-5Amine

95% Dimethyl-(5%) diphenylpolysiloxane, bonded and crosslinked phase.

- Column specially designed for the analysis of amines
- Basic deactivation of the column surface with reagents synthetized in our laboratories, that jointly with the crosslinking method have permitted the minimization of the absorption level and tailing of basic compounds, like the alkylamines, alcoholamines, basic pharmaceuticals, aromatic amines, etc.
- Selectivity and thermal stability equivalent to the TRB-5 columns



Structure of Poly(dimethyldiphenyl)siloxane

TRB-5Amine Equivalent Phase

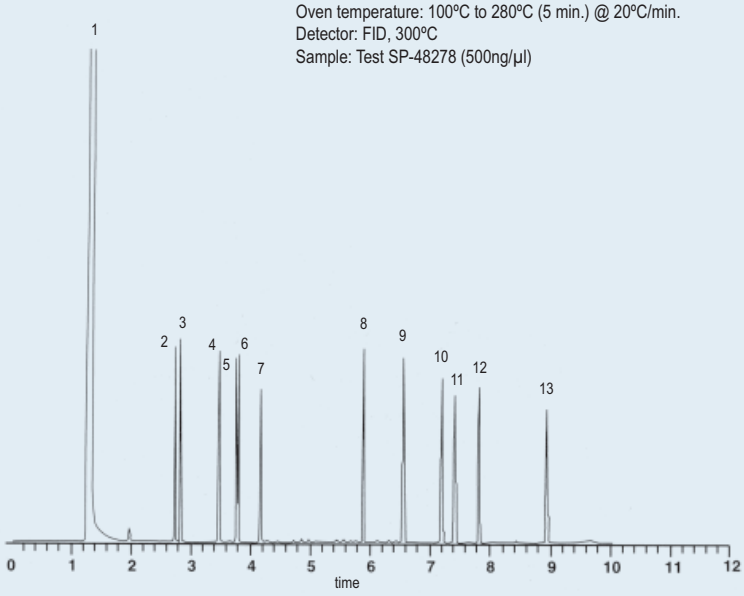
Restek: Rtx-5Amine
Supelco: PTA-5
Macherey-Nagel: OPTIMA-5A

TRB-5Amine

Internal Diam.(mm)	Length (m)	Film Thickness (µm)	Temp limits (°C)	Part. N°. (P/N)
0,25	15	0,50	-60 to 300/315	**TR-210512**
	15	1,00	-60 to 300/315	**TR-211012**
	30	0,50	-60 to 300/315	**TR-210532**
	30	1,00	-60 to 300/315	**TR-211032**
	60	0,50	-60 to 300/315	**TR-210562**
	60	1,00	-60 to 300/315	**TR-211062**
0,32	15	0,50	-60 to 300/315	**TR-210513**
	15	1,00	-60 to 300/315	**TR-211013**
	15	1,50	-60 to 290/305	**TR-211513**
	30	0,50	-60 to 300/315	**TR-210533**
	30	1,00	-60 to 300/315	**TR-211033**
	30	1,50	-60 to 290/305	**TR-211533**
	60	0,50	-60 to 300/315	**TR-210563**
	60	1,00	-60 to 300/315	**TR-211063**
	60	1,50	-60 to 290/305	**TR-211563**
0,53	15	1,00	-60 to 290/305	**TR-211015**
	15	3,00	-60 to 280/295	**TR-213015**
	30	1,00	-60 to 290/305	**TR-211035**
	30	3,00	-60 to 280/295	**TR-213035**
	60	1,00	-60 to 290/305	**TR-211065**
	60	3,00	-60 to 280/295	**TR-213065**

Amines Test

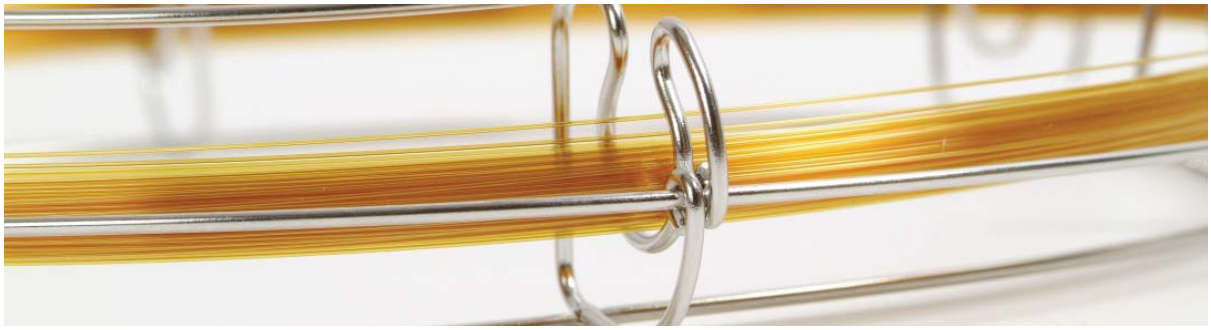
Column: **TRB-5Amine**, P/N TR-210532
Dimensions: 30 m x 0.25 mm x 0.50 µm
Injection: 1 µL (split 1:50), 280ºC
Carrier gas: H2, 12 psi (87.7 kPa).
Oven temperature: 100ºC to 280ºC (5 min.) @ 20ºC/min.
Detector: FID, 300ºC
Sample: Test SP-48278 (500ng/µl)



Peak Name

1 Methyl tert-butyl ether
2 Benzylamine
3 n-Octylamine
4 n-Nonylamine
5 2,4-Dimethylaniline
6 2,6-Dimethylaniline
7 n-Decylamine
8 C-15
9 C-16
10 C-17
11 Tri-n-hexylamine
12 C-18
13 C-20

TKG 1113



MetAmine-VOL

- For separation of volatile amines (optimized separation)
- Fully compatible with water samples
- High temperature stability
- Good peak shape for volatile alcohols

This column is one of the best options for separation of volatile amines and alcohols. High retention, selectivity and inertness to amines (optimal peak shape).

Base line separation of Mono-Methylamine (MMA), di-Methylamine (DMA) and tri-Methylamine (TMA)

MetAmine-VOL Equivalent Phase

Varian: CP-Volamine

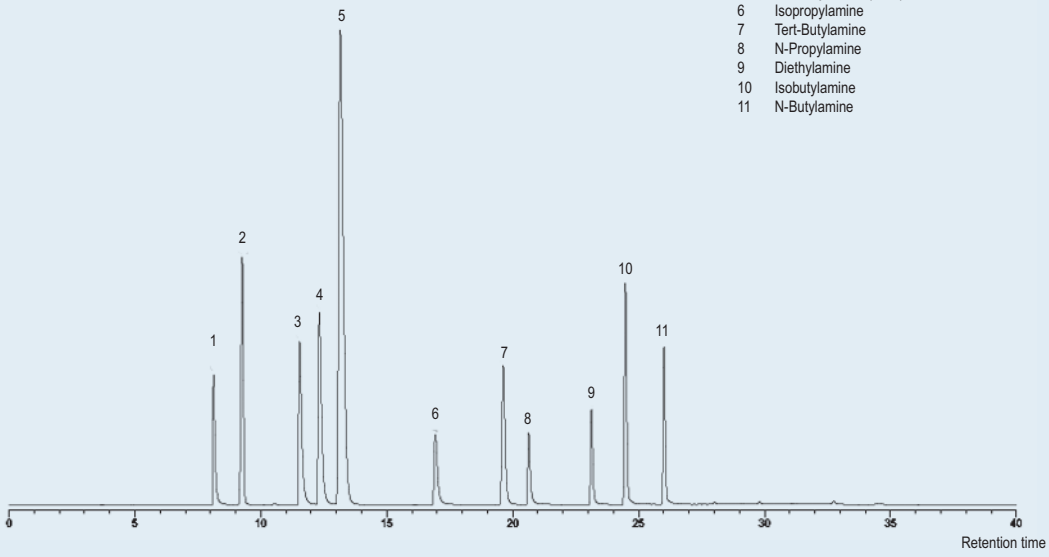
MetAmine-VOL

Internal Diam.(mm)	Length (m)	Film Thickness (µm)	Temp limits (°C)	Part. N°. (P/N)
0,32	15	Optimized	260 to 280	**TR-635013**
	30	Optimized	260 to 280	**TR-635033**
	60	Optimized	260 to 280	**TR-635063**

Column: **MetAmine-VOL**, P/N TR-635063
Dimensions: 60 m x 0.32 mm
Injection: 100 µL Head Space (2t,75º) split 1:15, 180ºC
Sample: mix of amines in water
Carrier gas: He, 14 psi (96.5 kPa).
Program temperature: 40ºC (10 min) @ 10ºC/min. to 200ºC
Detector: FID, 225ºC

Peak Name

1 Methylamine (MMA)
2 Methanol
3 Dimethylamine (DMA)
4 Ethylamine
5 Trimethylamine (TMA)
6 Isopropylamine
7 Tert-Butylamine
8 N-Propylamine
9 Diethylamine
10 Isobutylamine
11 N-Butylamine

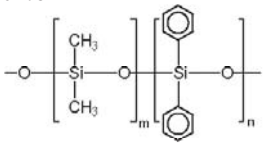


TKG 1256

TRB-5.625

95% Dimethyl-(5%) diphenylpolysiloxane, bonded and crosslinked phase.

- Specially manufactured column to fulfil the level of inertness required by the EPA methods for the analysis of semivolatile compounds, designed for methods 625, 1625, 8270 and CLP protocols
- Inertness and minimum absorption for acidic, basic and neutral compounds



Structure of Poly(dimethyldiphenyl)siloxane

TRB-5.625 Equivalent Phase

Supelco: PTE-5
Agilent: DB.5.625

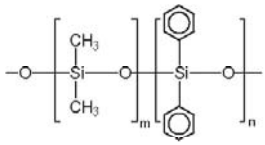
TRB-5.625

Internal Diam.(mm)	Length (m)	Film Thickness (µm)	Temp limits (°C)	Part. N°. (P/N)
0,18	20	0,18	-60 to 325/350	**TR-260984**
	20	0,36	-60 to 325/350	**TR-263484**
0,20	12	0,33	-60 to 325/350	**TR-2633B9**
	25	0,33	-60 to 325/350	**TR-263329**
	50	0,33	-60 to 325/350	**TR-263359**
0,25	15	0,10	-60 to 325/350	**TR-260112**
	15	0,25	-60 to 325/350	**TR-260212**
	15	0,50	-60 to 325/350	**TR-260512**
	15	1,00	-60 to 325/350	**TR-261012**
	30	0,10	-60 to 325/350	**TR-260132**
	30	0,25	-60 to 325/350	**TR-260232**
	30	0,50	-60 to 325/350	**TR-260532**
	30	1,00	-60 to 325/350	**TR-261032**
	60	0,10	-60 to 325/350	**TR-260162**
	60	0,25	-60 to 325/350	**TR-260262**
0,32	15	0,10	-60 to 325/350	**TR-260113**
	15	0,25	-60 to 325/350	**TR-260213**
	15	0,50	-60 to 325/350	**TR-260513**
	15	1,00	-60 to 325/350	**TR-261013**
	30	0,10	-60 to 325/350	**TR-260133**
	30	0,25	-60 to 325/350	**TR-260233**
	30	0,50	-60 to 325/350	**TR-260533**
	30	1,00	-60 to 325/350	**TR-261033**
	60	0,10	-60 to 325/350	**TR-260163**
0,53	15	1,50	-60 to 320/340	**TR-261515**
	30	0,50	-60 to 320/340	**TR-260535**
	30	1,00	-60 to 310/330	**TR-261035**
	60	0,25	-60 to 325/350	**TR-260265**

TRB-G27

95% Dimethyl-(5%) diphenylpolysiloxane, bonded and crosslinked phase.

- Column which fulfils the specifications of the American Pharmacopea (USP), for the test of organic volatile impurities (OVI) in pharmaceutical products. Methods <USP 467>



Structure of Poly(dimethyldiphenyl)siloxane

TRB-G27 Equivalent Phase

Restek: Rtx-G27
Supelco: G27

TRB-G27

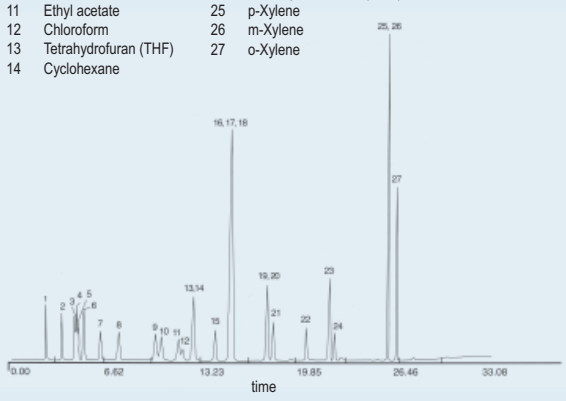
Internal Diam.(mm)	Length (m)	Film Thickness (µm)	Temp limits (°C)	Part. N°. (P/N)
0,53	30	5,00	-60 to 270/290	**TR-175035**

Residual solvents in Pharmaceutical Products

Column: **TRB-G27**, 30 m x 0,53 mm x 5,0 µm, P/N TR-175035
Injection: 220ºC, (split 1:80), 5 m phenylmethyl deactivated retention gap
Carrier Gas: He, 4,5 psi (31kPa), 35 cm/s. to 35ºC
Oven Temp: 35ºC (10 min.) to 100ºC @ 5º C/min. to 240ºC (5 min.) @ 25ºC/min.
Detector: FID@ 250ºC
Sample: 0,02 µl solvent mixture

Peak Name

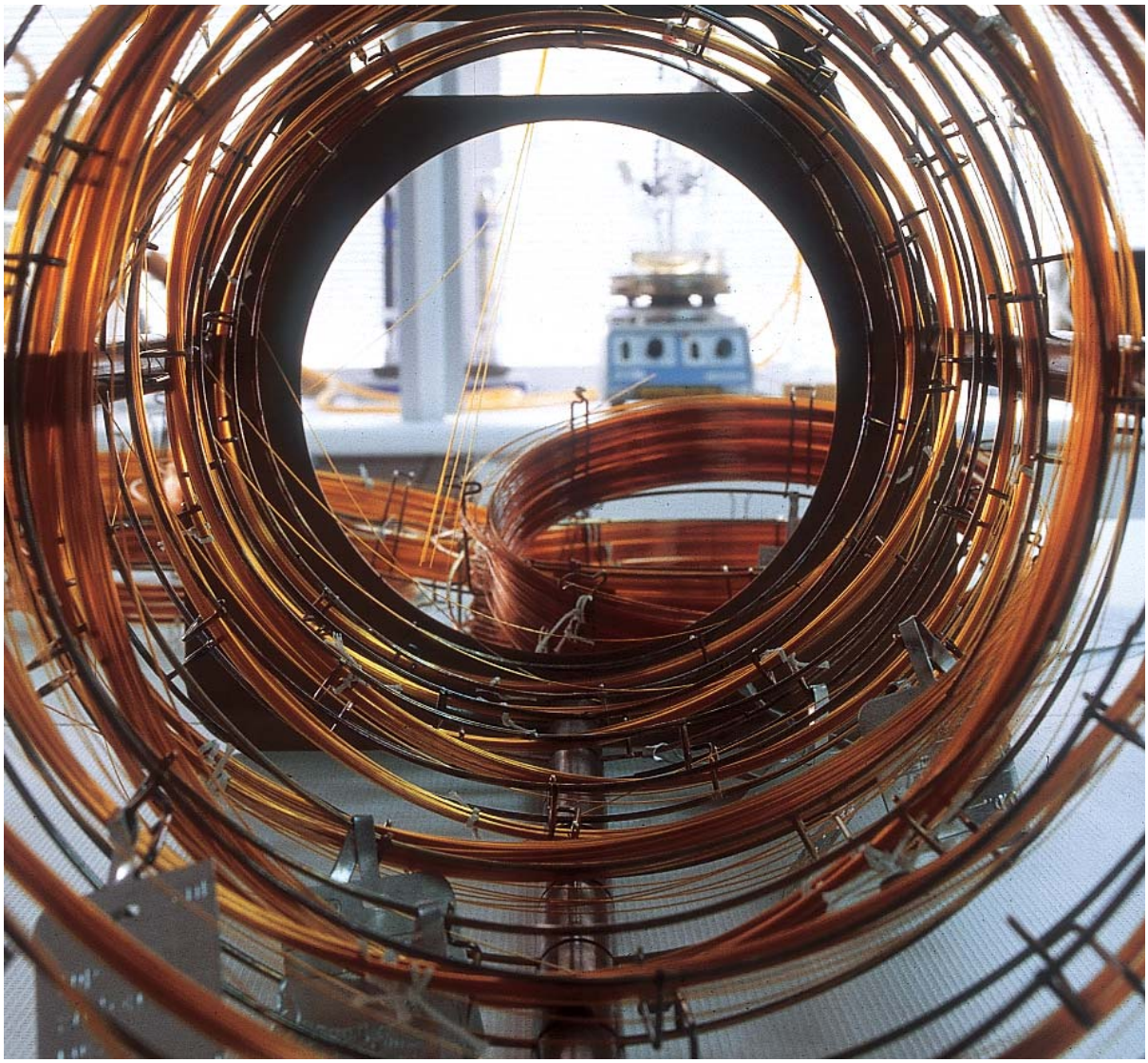
1	Methanol	15	1,2-Dicholoroethane
2	Ethanol	16	Benzene
3	Acetonitrile	17	Carbon tetrachloride
4	Acetone	18	n-Butanol
5	Isopropanol	19	n-Heptane
6	Ethyl ether	20	Trichloroethylene
7	Methylene chloride	21	1,4-Dioxane
8	n-Propanol	22	Pyridine
9	Methyl ethyl ketone (MEK)	23	Toluene
10	n-Hexane	24	Dimethylformamide (DMF)
11	Ethyl acetate	25	p-Xylene
12	Chloroform	26	m-Xylene
13	Tetrahydrofuran (THF)	27	o-Xylene
14	Cyclohexane		



TKG 1114

MTI-5

5% Phenyl-(95%) methylpolysiloxane, bonded and crosslinked phase.



- Polarity equivalent to Supelco PTE-5 and Agilent HP-5Msi columns
- Non polar column maximum inertness and ultra low bleeding.
- Column contrasted for analyses of semivolatil contaminant agents (EPA 625, 1625, 8770)
- Maximum thermal stability (360º)

MTI-5 Equivalent Phase

Supelco: PTE-5
Agilent: HP-5Msi

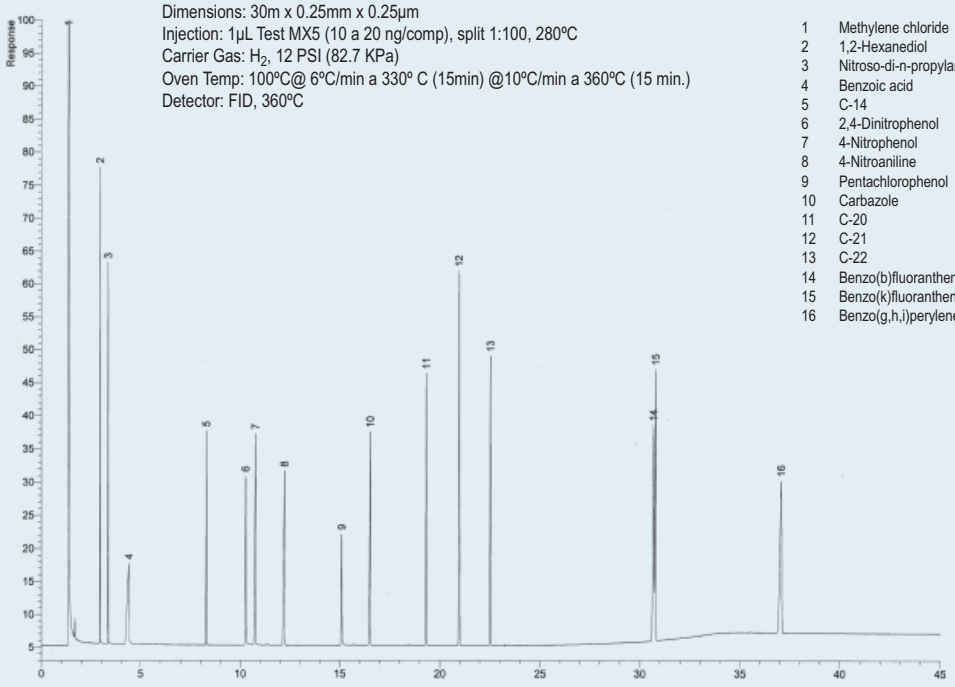
MTI-5

Internal Diam.(mm)	Length (m)	Film Thickness (µm)	Temp limits (°C)	Part. N°. (P/N)
0,25	30	0,25	-60 to 360	**TR-910232**
0,32	30	0,25	-60 to 360	**TR-910233**
0,53	15	0,50	-60 to 330/360	**TR-910515**

Column: **MTI-5**, P/N TR-910232
Dimensions: 30m x 0.25mm x 0.25µm
Injection: 1µL Test MX5 (10 a 20 ng/comp), split 1:100, 280ºC
Carrier Gas: H_2, 12 PSI (82.7 KPa)
Oven Temp: 100ºC@ 6ºC/min a 330º C (15min) @10ºC/min a 360ºC (15 min.)
Detector: FID, 360ºC

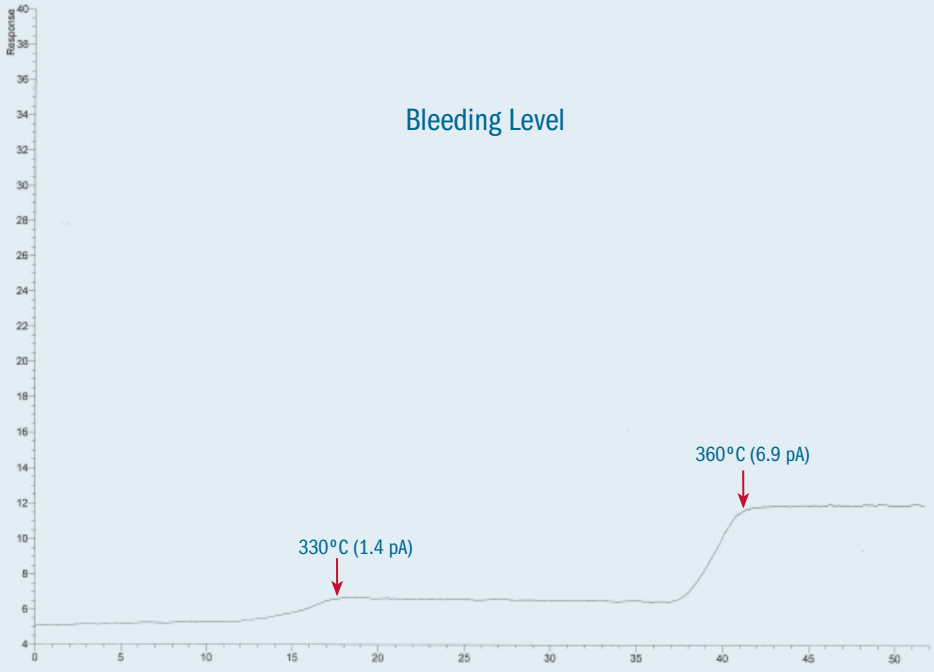
Peak Name

1 Methylene chloride
2 1,2-Hexanediol
3 Nitroso-di-n-propylamine
4 Benzoic acid
5 C-14
6 2,4-Dinitrophenol
7 4-Nitrophenol
8 4-Nitroaniline
9 Pentachlorophenol
10 Carbazole
11 C-20
12 C-21
13 C-22
14 Benzo(b)fluoranthene
15 Benzo(k)fluoranthene
16 Benzo(g,h,i)perylene



TKG 1207

Bleeding Level

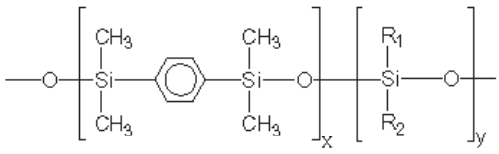


TKG 1208

Meta.X5

Silphenylene phase, selectivity similar to TRB-5, bonded and crosslinked phase.

- Choice column for the analysis of semivolatile compounds with GC-MS
- Polymer synthesis designed and developed by scientists at Teknokroma
- Selectivity similar to TRB-5
- New generation of column incorporates arylene groups in the polymer structure, and this improves the thermal stability, reduces the bleeding level and provides optimal resolution for aromatic compounds
- Manufacturing procedures of this Teknokroma column guarantees maximal inertness and minimal bleeding level
- Quality control test (MX5) that guarantees total inertness and optimal signal/noise ratio (S/N) for the more active compounds that normally suffer adsorption problems, like 2,4-dinitropherol, 4 nitroaniline and pentachlorophenol



Structure of Polysiloxane containing p-silphenylene

Meta.X5 Equivalent Phase

Restek: Rxi-5Sil MS
Agilent/JW: DB.5 MS, HP-5TA
Supelco: MDN-5, SLB-5MS
Chromopack/Varian: CP-SIL8CB MS, VF-5MS
Alltech: AT-5ms
Quadrex: 007-5MS
SGE: BPX-5
Phenomenex: ZB-5MS

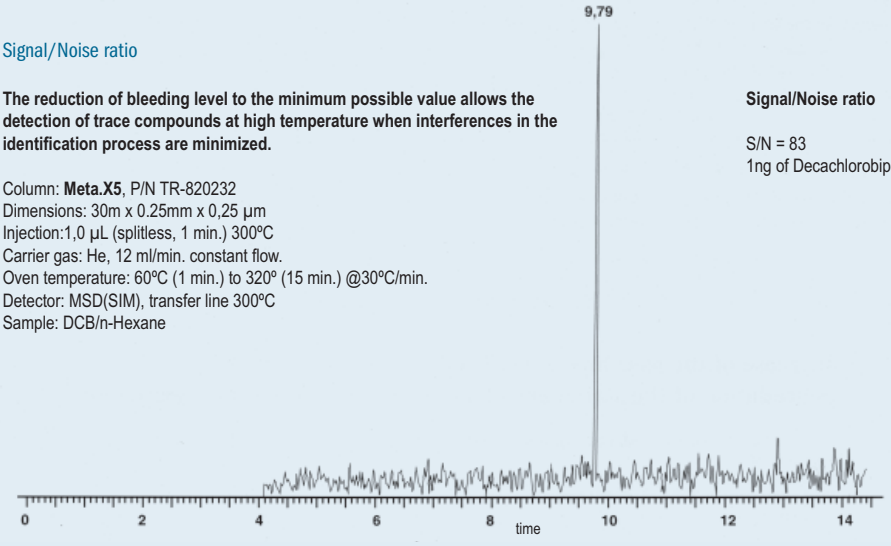
Meta.X5

Internal Diam.(mm)	Length (m)	Film Thickness (µm)	Temp limits (°C)	Part. N°. (P/N)
0,18	20	0,18	-60 to 325/350	**TR-820984**
	20	0,36	-60 to 325/350	**TR-823484**
	40	0,18	-60 to 325/350	**TR-8209C4**
0,20	12	0,33	-60 to 325/350	**TR-8233B9**
	25	0,33	-60 to 325/350	**TR-823329**
	50	0,33	-60 to 325/350	**TR-823359**
0,25	15	0,10	-60 to 325/350	**TR-820112**
	15	0,25	-60 to 325/350	**TR-820212**
	15	0,50	-60 to 325/350	**TR-820512**
	15	1,00	-60 to 325/350	**TR-821012**
	30	0,10	-60 to 325/350	**TR-820132**
	30	0,25	-60 to 325/350	**TR-820232**
	30	0,50	-60 to 325/350	**TR-820532**
	30	1,00	-60 to 325/350	**TR-821032**
	60	0,10	-60 to 325/350	**TR-820162**
	60	0,25	-60 to 325/350	**TR-820262**
0,32	15	0,10	-60 to 325/350	**TR-820113**
	15	0,25	-60 to 325/350	**TR-820213**
	15	0,50	-60 to 325/350	**TR-820513**
	15	1,00	-60 to 325/350	**TR-821013**
	30	0,10	-60 to 325/350	**TR-820133**
	30	0,25	-60 to 325/350	**TR-820233**
	30	0,50	-60 to 325/350	**TR-820533**
	30	1,00	-60 to 325/350	**TR-821033**
	60	0,10	-60 to 325/350	**TR-820163**
	60	0,25	-60 to 325/350	**TR-820263**
0,53	15	0,50	-60 to 320/340	**TR-820515**
	15	1,00	-60 to 320/340	**TR-821015**
	15	1,50	-60 to 320/340	**TR-821515**
	30	0,50	-60 to 320/340	**TR-820535**
	30	1,00	-60 to 320/340	**TR-821035**
	30	1,50	-60 to 310/330	**TR-821535**

Signal/Noise ratio

The reduction of bleeding level to the minimum possible value allows the detection of trace compounds at high temperature when interferences in the identification process are minimized.

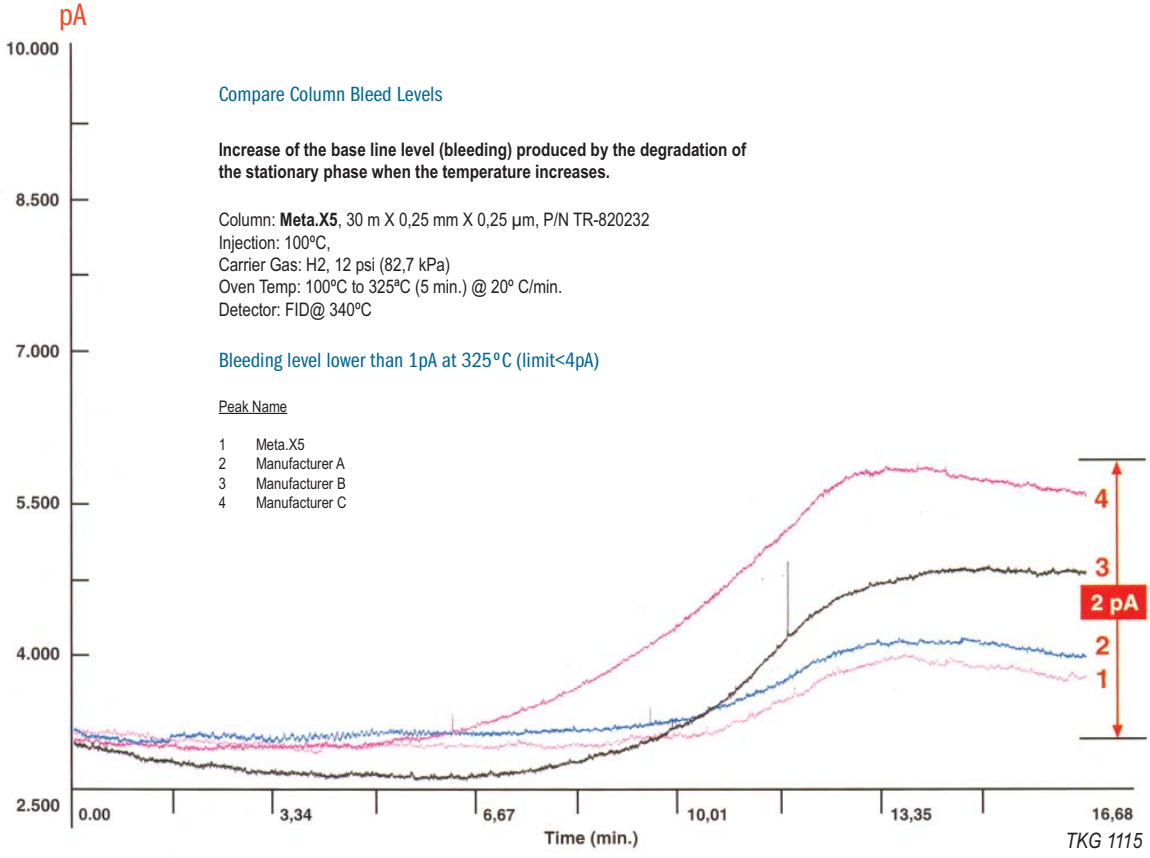
Column: **Meta.X5**, P/N TR-820232
Dimensions: 30m x 0.25mm x 0,25 µm
Injection:1,0 µL (splitless, 1 min.) 300ºC
Carrier gas: He, 12 ml/min. constant flow.
Oven temperature: 60ºC (1 min.) to 320º (15 min.) @30ºC/min.
Detector: MSD(SIM), transfer line 300ºC
Sample: DCB/n-Hexane



Signal/Noise ratio

S/N = 83
1ng of Decachlorobiphenyl (DCB)

TKG 1116



Compare Column Bleed Levels

Increase of the base line level (bleeding) produced by the degradation of the stationary phase when the temperature increases.

Column: **Meta.X5**, 30 m X 0,25 mm X 0,25 µm, P/N TR-820232
Injection: 100ºC,
Carrier Gas: H2, 12 psi (82,7 kPa)
Oven Temp: 100ºC to 325ºC (5 min.) @ 20º C/min.
Detector: FID@ 340ºC

Bleeding level lower than 1pA at 325°C (limit<4pA)

Peak Name

1 Meta.X5
2 Manufacturer A
3 Manufacturer B
4 Manufacturer C

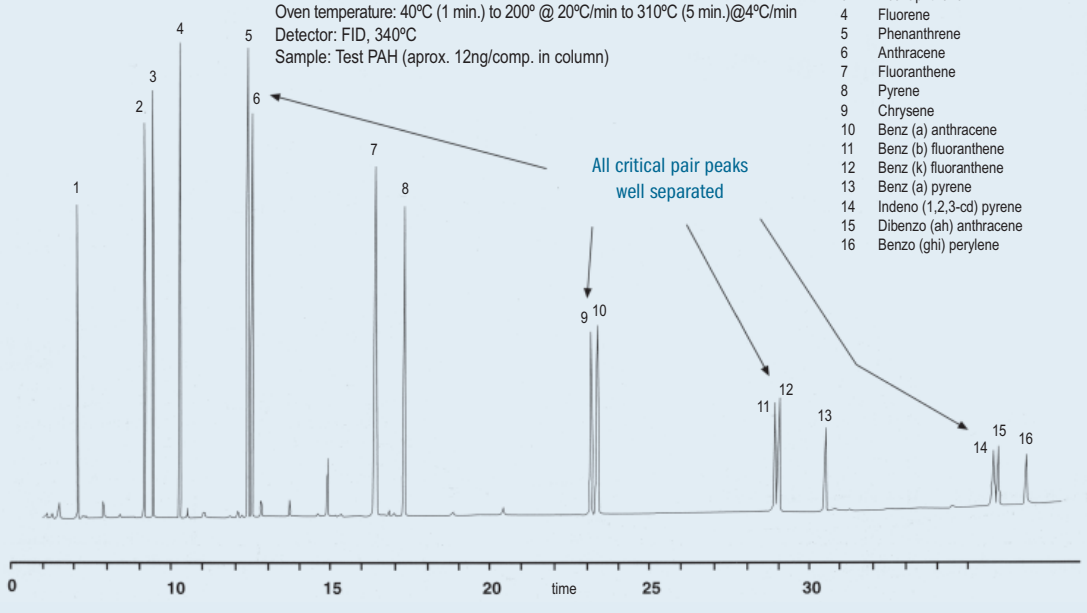
TKG 1115

Separation of aromatic polycyclic hydrocarbons (EPA Method 610)

Column: **Meta.X5**, P/N TR-820532
Dimensions: 30m x 0.25mm x 0,50 µm
Injection:0,3 µL (splitless, 1´) 300ºC
Carrier gas: H2, 16 PSI (110,2 kPa). Cte.
Oven temperature: 40ºC (1 min.) to 200º @ 20ºC/min to 310ºC (5 min.)@4ºC/min
Detector: FID, 340ºC
Sample: Test PAH (aprox. 12ng/comp. in column)

Peak Name

1 Naphathalene
2 Acenaphthylene
3 Acenaphthene
4 Fluorene
5 Phenanthrene
6 Anthracene
7 Fluoranthene
8 Pyrene
9 Chrysene
10 Benz (a) anthracene
11 Benz (b) fluoranthene
12 Benz (k) fluoranthene
13 Benz (a) pyrene
14 Indeno (1,2,3-cd) pyrene
15 Dibenzo (ah) anthracene
16 Benzo (ghi) perylene



TKG 1117

Meta.X5 Triazine (proprietary phase)

Silphenylene phase, selectivity similar to TRB-5, bonded and crosslinked phase.

- New formulation for Meta.X5 stationary phase. Ideal for separation of Triazine Herbicides from EPA 609 method.
- Low bleed and excelent inertness for the analysis of traces of herbicides by GC/MS.
- General purpose column for pesticides.

Meta.X5 Triazine

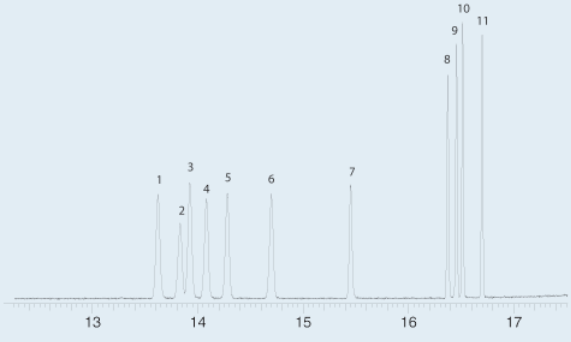
Internal Diam.(mm)	Length (m)	Film Thickness (µm)	Temp limits (°C)	Part. N°. (P/N)
0,30	30	0,25	325 to 350ºC	**TR-410232**

Triazine Herbicides

Column: **Meta.X5 Triazine**, P/N TR-410232
Dimensions: 30m x 0.25mm x 0,25 µm
Injection: split 1:25; T=250ºC
Carrier gas: Helium, constant flow @ 1.0ml/min.
Oven temperature: 80ºC(0.5 min.) to 160ºC(7 min.) @ 30ºC/min. to 195ºC(0min) @ 7ºC/min to 290ºC (3min) @ 45ºC/min
Transfer Line temp: 290ºC
Ionization mode: EI
Scan range: 50-450amu
Sample: Triazine herbicides EPA 619 2ng/compound on column

Peak Name

1 Atraton
2 Simazine
3 Prometon
4 Atrazine
5 Propazine
6 Terbutylazine
7 Secbumeton
8 Simetryn
9 Ametryn
10 Prometryn
11 Terbutryn



TKG 1262

Meta.XLB (proprietary phase)

Silphenylene phase, bonded and crosslinked

- Low polarity phase with Extreme Low Bleed.
- Directly replace for DB-XLB
- General purpose column with extended temperature range (30 to 340/360ºC)
- Ideal column for GC-MS analysis
- Unique selectivity for aromatic compounds (PCBs,PAHs,PBDEs)
- Excellent column for pesticides and herbicides

Meta.XLB Equivalent Phase

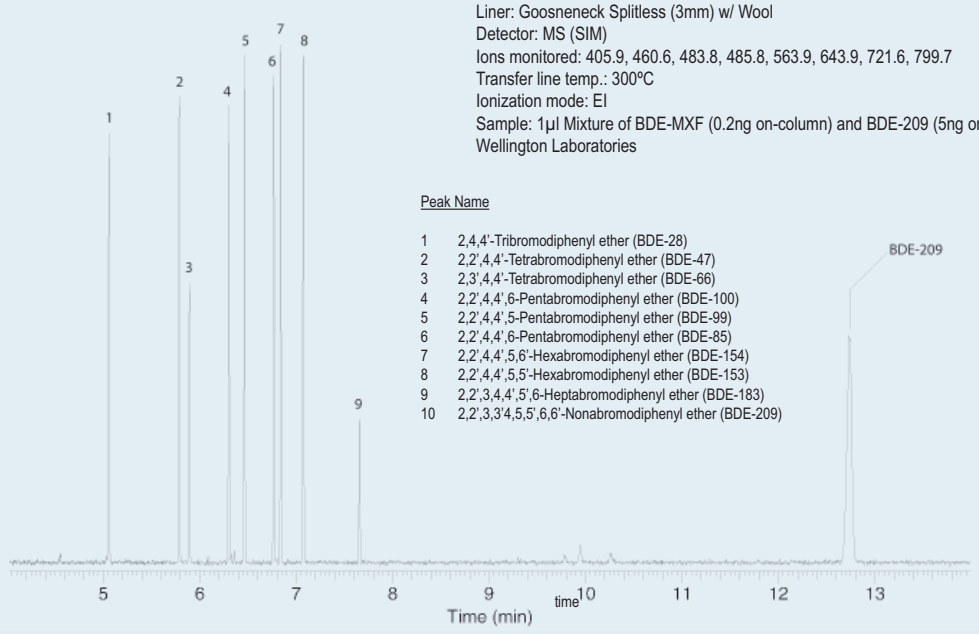
Restek: Rxi-XLB
Agilent/JW: DB-XLB
Supelco: MDN 12
Varian: VF-Xms
Phenomenex: ZB-XLB
Macherey-Nagel: OPTIMA XLB

Meta.XLB

Internal Diam.(mm)	Length (m)	Film Thickness (µm)	Temp limits (°C)	Part. N°. (P/N)
0,10	10	0,10	30 to 340/360ºC	**TR-330141**
0,18	20	0,18	30 to 340/360ºC	**TR-330984**
	30	0,18	30 to 340/360ºC	**TR-330934**
	60	0,18	30 to 340/360ºC	**TR-330964**
0,25	15	0,10	30 to 340/360ºC	**TR-330112**
	15	0,25	30 to 340/360ºC	**TR-330212**
	15	1,00	30 to 340/360ºC	**TR-331012**
	30	0,10	30 to 340/360ºC	**TR-330132**
	30	0,25	30 to 340/360ºC	**TR-330232**
	30	0,50	30 to 340/360ºC	**TR-330532**
	30	1,00	30 to 340/360ºC	**TR-331032**
	60	0,25	30 to 340/360ºC	**TR-330262**
0,32	15	0,25	30 to 340/360ºC	**TR-330213**
	15	1,00	30 to 340/360ºC	**TR-331013**
	30	0,10	30 to 340/360ºC	**TR-330133**
	30	0,25	30 to 340/360ºC	**TR-330233**
	30	0,50	30 to 340/360ºC	**TR-330533**
	30	1,00	30 to 340/360ºC	**TR-331033**
	60	0,25	30 to 340/360ºC	**TR-330263**
0,53	15	1,50	30 to 320/340ºC	**TR-331515**
	30	1,50	30 to 320/340ºC	**TR-331535**

ANALYSIS OF BROMINATED FLAME RETARDANTS (POLYBROMINATED DIPHENYL ETHERS , PBDEs)

Column: **Meta.XLB**, 15m x 0.18mm x 0.072um (P/N: TR-332414)
Injection: 280ºC, Splitless w/ Surge: Pulse 40psi @ 0.30min, 50ml/min @ 0.4min
Oven temperature: 100ºC (0.5min) to 320ºC (7min) @ 30ºC/min
Carrier gas: Helium, Constant flow @ 2ml/min
Liner: Goosneneck Splitless (3mm) w/ Wool
Detector: MS (SIM)
Ions monitored: 405.9, 460.6, 483.8, 485.8, 563.9, 643.9, 721.6, 799.7
Transfer line temp.: 300ºC
Ionization mode: EI
Sample: 1µl Mixture of BDE-MXF (0.2ng on-column) and BDE-209 (5ng on-column) from Wellington Laboratories



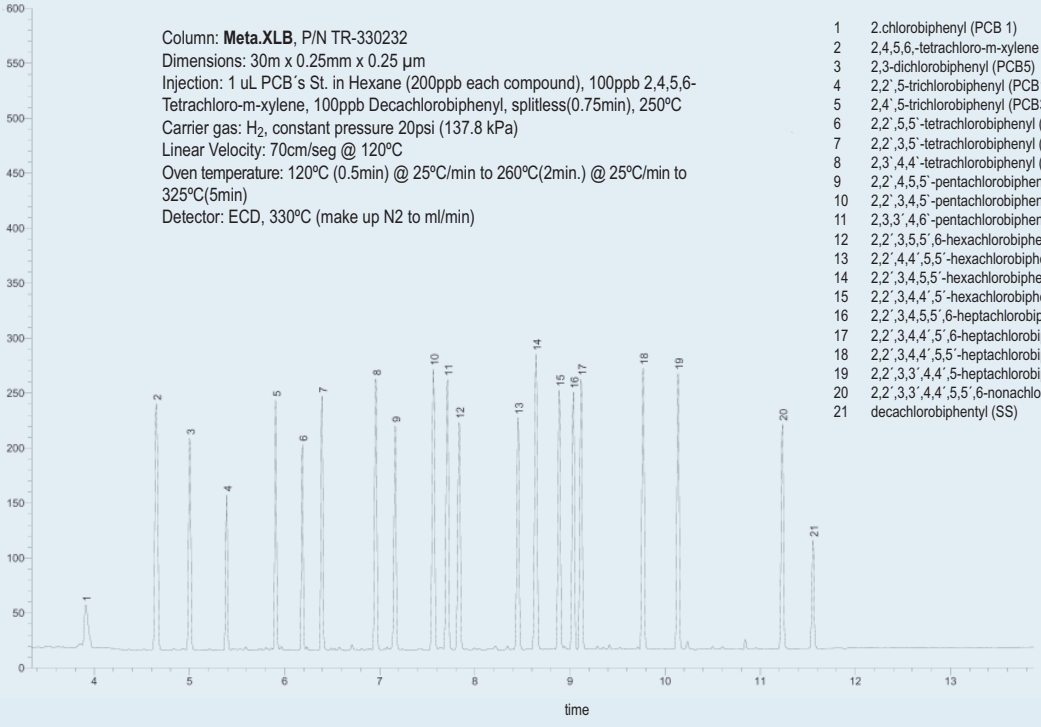
Peak Name

1	2,4,4'-Tribromodiphenyl ether (BDE-28)
2	2,2',4,4'-Tetrabromodiphenyl ether (BDE-47)
3	2,3',4,4'-Tetrabromodiphenyl ether (BDE-66)
4	2,2',4,4',6-Pentabromodiphenyl ether (BDE-100)
5	2,2',4,4',5-Pentabromodiphenyl ether (BDE-99)
6	2,2',4,4',6-Pentabromodiphenyl ether (BDE-85)
7	2,2',4,4',5,6'-Hexabromodiphenyl ether (BDE-154)
8	2,2',4,4',5,5'-Hexabromodiphenyl ether (BDE-153)
9	2,2',3,4,4',5',6-Heptabromodiphenyl ether (BDE-183)
10	2,2',3,3'4,5,5',6,6'-Nonabromodiphenyl ether (BDE-209)

TKG 1272

PCB´S

Column: **Meta.XLB**, P/N TR-330232
Dimensions: 30m x 0.25mm x 0.25 µm
Injection: 1 uL PCB´s St. in Hexane (200ppb each compound), 100ppb 2,4,5,6-Tetrachloro-m-xylene, 100ppb Decachlorobiphenyl, splitless(0.75min), 250ºC
Carrier gas: H_2, constant pressure 20psi (137.8 kPa)
Linear Velocity: 70cm/seg @ 120ºC
Oven temperature: 120ºC (0.5min) @ 25ºC/min to 260ºC(2min.) @ 25ºC/min to 325ºC(5min)
Detector: ECD, 330ºC (make up N2 to ml/min)



Peak Name

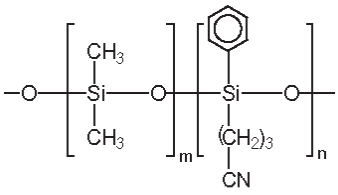
1	2.chlorobiphenyl (PCB 1)
2	2,4,5,6,-tetrachloro-m-xylene (SS)
3	2,3-dichlorobiphenyl (PCB5)
4	2,2`,5-trichlorobiphenyl (PCB18)
5	2,4`,5-trichlorobiphenyl (PCB31)
6	2,2`,5,5`-tetrachlorobiphenyl (PCB52)
7	2,2`,3,5`-tetrachlorobiphenyl (PCB44)
8	2,3`,4,4`-tetrachlorobiphenyl (PCB66)
9	2,2`,4,5,5`-pentachlorobiphenyl (PCB101)
10	2,2`,3,4,5`-pentachlorobiphenyl (PCB87)
11	2,3,3´,4,6`-pentachlorobiphenyl (PCB110)
12	2,2´,3,5,5`,6-hexachlorobiphenyl (PCB151)
13	2,2´,4,4´,5,5´-hexachlorobiphenyl (PCB153)
14	2,2´,3,4,5,5´-hexachlorobiphenyl (PCB141)
15	2,2´,3,4,4´,5´-hexachlorobiphenyl (PCB136)
16	2,2´,3,4,5,5´,6-heptachlorobiphenyl (PCB187)
17	2,2´,3,4,4´,5´,6-heptachlorobiphenyl (PCB183)
18	2,2´,3,4,4´,5,5´-heptachlorobiphenyl (PCB180)
19	2,2´,3,3´,4,4´,5-heptachlorobiphenyl (PCB170)
20	2,2´,3,3´,4,4´,5,5´,6-nonachlorobiphenyl (PCB26)
21	decachlorobiphentyl (SS)

TKG 1265

TRB-1301

94% Dimethyl-(6%) cyanopropylphenyl polysiloxane, bonded and crosslinked phase.

- (6%)Cyanopropyl-phenyl-(94%)dimethylpolysiloxane
- Ideal column for analyzing mixtures of acidic and basic compounds with a wide range of polarity
- This column of intermediate polarity is very useful for analyzing pesticides and herbicides



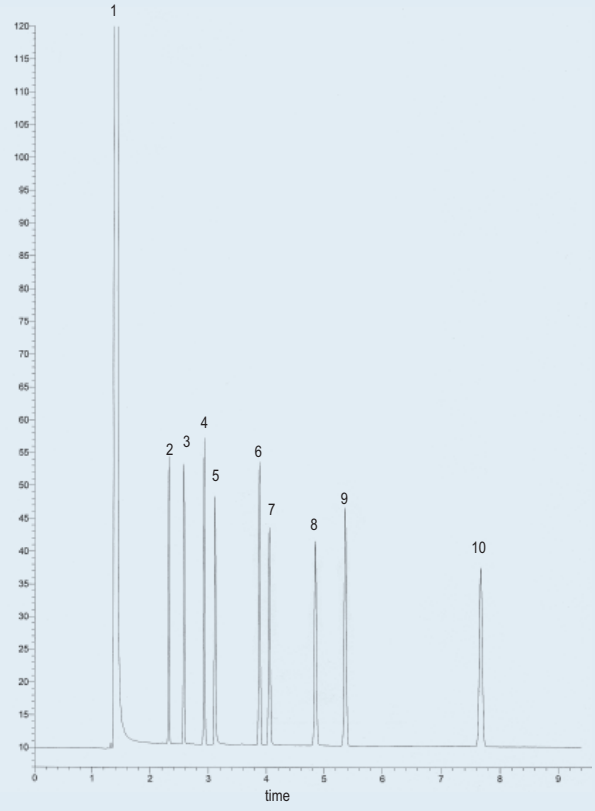
Structure of Poly(dimethylcyanopropylphenyl)siloxane

TRB-1301 Equivalent Phase

Agilent: HP-1301, HP-624, DB-1301, DB-624
Supelco: SPB-1301, OVI-G43
Restek: Rtx-1301, Rtx-624
SGE: BPX-624
Alltech: AT-624

TRB-1301

Internal Diam.(mm)	Length (m)	Film Thickness (µm)	Temp limits (°C)	Part. N°. (P/N)
0,18	10	0,40	-20 to 280/300	**TR-640444**
0,25	15	0,25	-20 to 280/300	**TR-640212**
	15	1,00	-20 to 260/280	**TR-641012**
	30	0,25	-20 to 280/300	**TR-640232**
	30	1,00	-20 to 260/280	**TR-641032**
	60	0,25	-20 to 280/300	**TR-640262**
	60	1,00	-20 to 260/280	**TR-641062**
0,32	15	0,25	-20 to 280/300	**TR-640213**
	15	1 00	-20 to 260/280	**TR-641013**
	30	0,25	-20 to 280/300	**TR-640233**
	30	1,00	-20 to 260/280	**TR-641033**
	60	0,25	-20 to 280/300	**TR-640263**
	60	1,00	-20 to 260/280	**TR-641063**
0,53	15	1,00	-20 to 260/280	**TR-641015**
	30	1,00	-20 to 260/280	**TR-641035**
	60	1,00	-20 to 260/280	**TR-641065**



TRB-1301

Column: **TRB-1301**, P/N TR-641032
Dimensions: 30m x 0.25mm x 1.0 µm
Injection: 0.5 µL standard SP-4-7301 (500 ng/mL), split 1:50, 260ºC
Carrier gas: H2, constant pressure 12 psi (82.7 KPa).
Oven temperature: 165ºC
Detector: FID, 280ºC

Peak Name

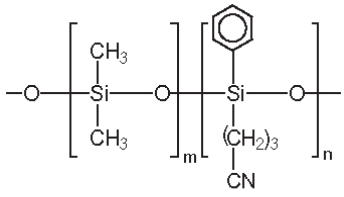
1 Methylene chloride
2 C-10
3 2-Octanone
4 C-11
5 1-Octanol
6 C-12
7 2,6-Dimethylphenol
8 2,6-Dimethylaniline
9 C-13
10 C-14

TKG 1118

TRB-624

94% Dimethyl-(6%) cyanopropylphenyl polysiloxane, bonded and crosslinked phase.

- (6%) Cyanopropyl-phenyl - (94%) dimethylpolysiloxane
- Column developed specially for environmental analysis of volatile compounds ("Volatile Priority Pollutants")
- Column perfectly compatible with EPA methods 501.3, 502.2, 524.2, 601, 602, 8010, 8015, 8020, 8221, 8240 and 8260.
- Excellent inertness against active compounds



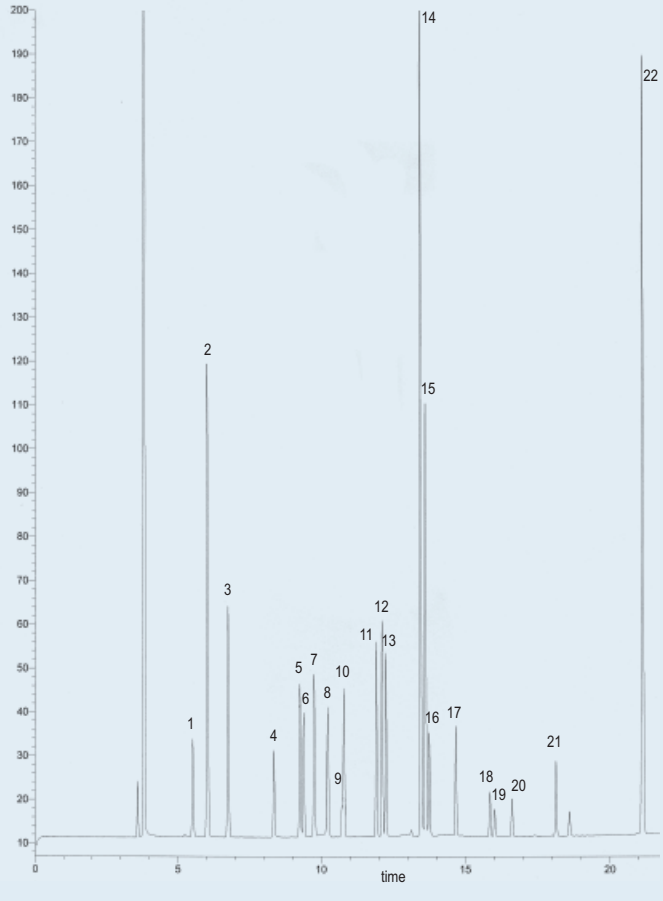
Structure of Poly(dimethylcyanopropylphenyl)siloxane

TRB-624 Equivalent Phase

Agilent: HP-1301, HP-624, DB-1301, DB-624
Supelco: SPB-1301, OVI-G43
Restek: Rtx-1301, Rtx-624
SGE: BPX-624
Alltech: AT-624

TRB-624

Internal Diam.(mm)	Length (m)	Film Thickness (µm)	Temp limits (°C)	Part. N°. (P/N)
0,18	20	1,00	-20 to 240/260	**TR-601084**
0,20	25	1,12	-20 to 240/260	**TR-601129**
0,25	30	1,40	-20 to 240/260	**TR-601432**
	60	1,40	-20 to 240/260	**TR-601462**
0,32	30	1,80	-20 to 240/260	**TR-601833**
	60	1,80	-20 to 240/260	**TR-601863**
0,53	30	3,00	-20 to 240/260	**TR-603035**
	60	3,00	-20 to 240/260	**TR-603065**
	75	3,00	-20 to 240/260	**TR-603075**
	105	3,00	-20 to 240/260	**TR-6030K5**



TRB-624

Column: **TRB-624**, P/N TR-601462
Dimensions: 60m x 0.25mm x 1.4 µm
Injection: 1 µL solvents mixture, split 1:100 (20-600 ng/comp.), 260ºC
Carrier gas: H2, constant pressure 25 psi (172.3 KPa).
Oven temperature: 50ºC(5min) @ 6ºC/min to 220ºC
Detector: FID, 280ºC

Peak Name

1 Diethylether
2 Acetone
3 Methyl acetate
4 Vinyl acetate
5 MEK
6 Ethyl acetate
7 Tetrahydrofuran
8 Cyclohexane
9 Benzene
10 Isopropyl acetate
11 2-Pentanone
12 3-Pentanone
13 Propyl acetate
14 Pyridine
15 Toluene
16 Isobutyl acetate
17 Butyl acetate
18 Ethyl benzene
19 m-Xylene/p-Xylene
20 o-Xylene
21 Diisobutylketone
22 Nitrobenzene

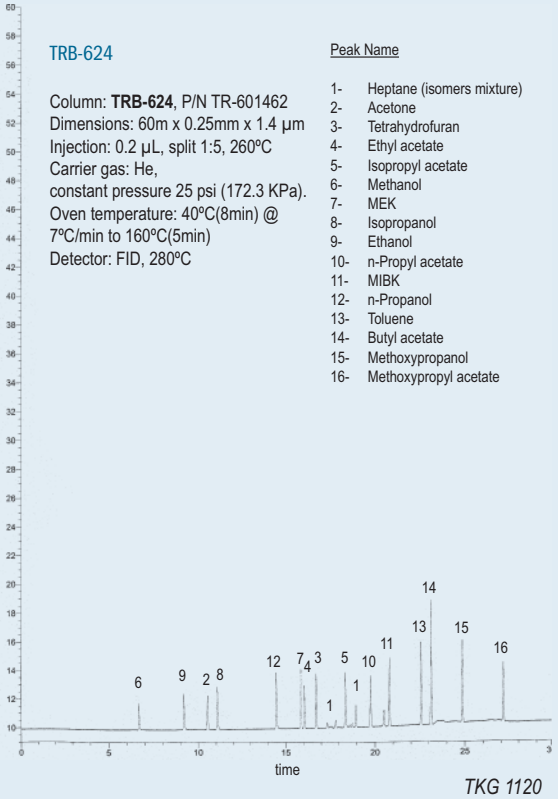
TKG 1119

TRB-624

Column: **TRB-624**, P/N TR-601462
Dimensions: 60m x 0.25mm x 1.4 µm
Injection: 0.2 µL, split 1:5, 260ºC
Carrier gas: He,
constant pressure 25 psi (172.3 KPa).
Oven temperature: 40ºC(8min) @ 7ºC/min to 160ºC(5min)
Detector: FID, 280ºC

Peak Name

1- Heptane (isomers mixture)
2- Acetone
3- Tetrahydrofuran
4- Ethyl acetate
5- Isopropyl acetate
6- Methanol
7- MEK
8- Isopropanol
9- Ethanol
10- n-Propyl acetate
11- MIBK
12- n-Propanol
13- Toluene
14- Butyl acetate
15- Methoxypropanol
16- Methoxypropyl acetate

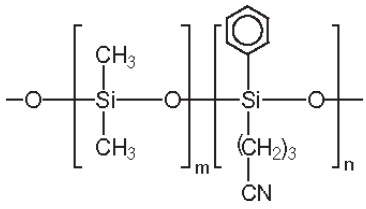


TKG 1120

TRB-G43

94% Dimethyl-(6%) cyanopropylphenyl polysiloxane, bonded and crosslinked phase.

- (6%) Cyanopropyl-phenyl - (94%) dimethylpolysiloxane (USP G43)
- Fulfils the specifications of the American (USP) and European (EP) pharmacopoeia for the analysis of residual solvents (OVI) in pharmaceutical products, USP method <467> and EP method 2.4.24
- Column with chemical inertness and low bleed guaranteed
- Specially tested for complete separation of the five solvents regulated by USP Method 467
- For this analysis, pharmacopoeia recommends the use of a guard column of 5m (P/N TR-200055) to trap the non-volatile impurities in the sample



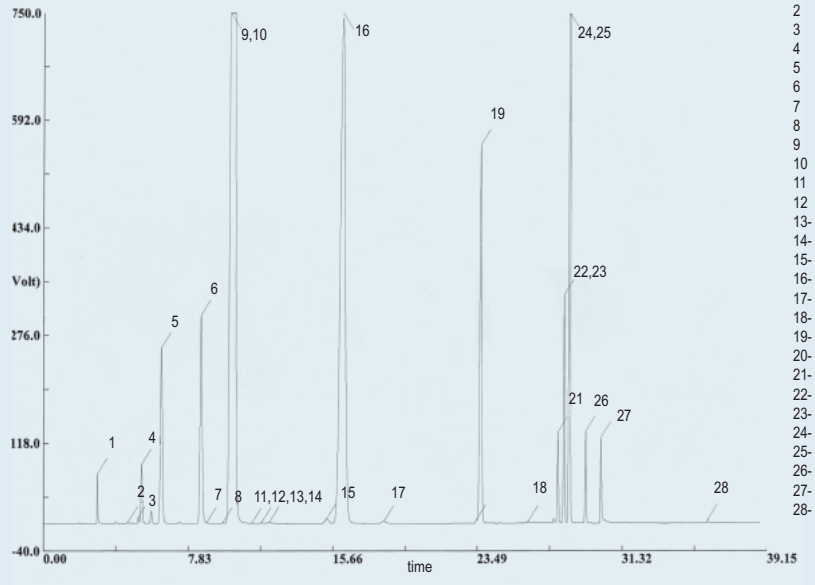
Structure of Poly(dimethylcyanopropylphenyl)siloxane

TRB-G43

Column: **TRB-G43**, P/N TR-163035
Dimensions: 30m x 0.53mm x 3.0 µm
Injection:, split 1:2, 250ºC, 5m x 0.53mm intermediate polarity column (TR-200055)
Sample: 0.5 mL headspace 80ºC (2t static head space sampler) 28 Class 1 Mix and Class 2 Mix A, Mix B residual solvents at the regulatory limit concentration.
Carrier gas: He, constant pressure 4.8 psi (33.1 KPa), 35 cm/s (40ºC)
Oven temperature: 40ºC(20min) @ 10ºC/min to 240ºC(10min)
Detector: FID, 250ºC

Peak Name

1 Methanol
2 1,2-Dichloroethene
3 Acetonitrile
4 Methylene chloride
5 n-Hexane
6 Cis-1,2-dichloroethene
7 Nitromethane
8 Chloroform
9 Cyclohexane
10 1,1,1-Trichloroethane
11 Carbon tetrachloride
12 Benzene
13- 1,2-Dimethoxyethane
14- 1,2-Dichloroethane
15- Trichloroethylene
16- Methylcyclohexane
17- 1,4-Dioxane
18- Pyridine
19- Toluene
20- 2-Hexanone
21- Chlorobenzene
22- Dimethylformamide
23- Ethylbenzene
24- m-Xylene
25- p-Xylene
26- o-Xylene
27- N,N-dimethylacetamide
28- 1,2,3,4-Tetrahydronaphthalene



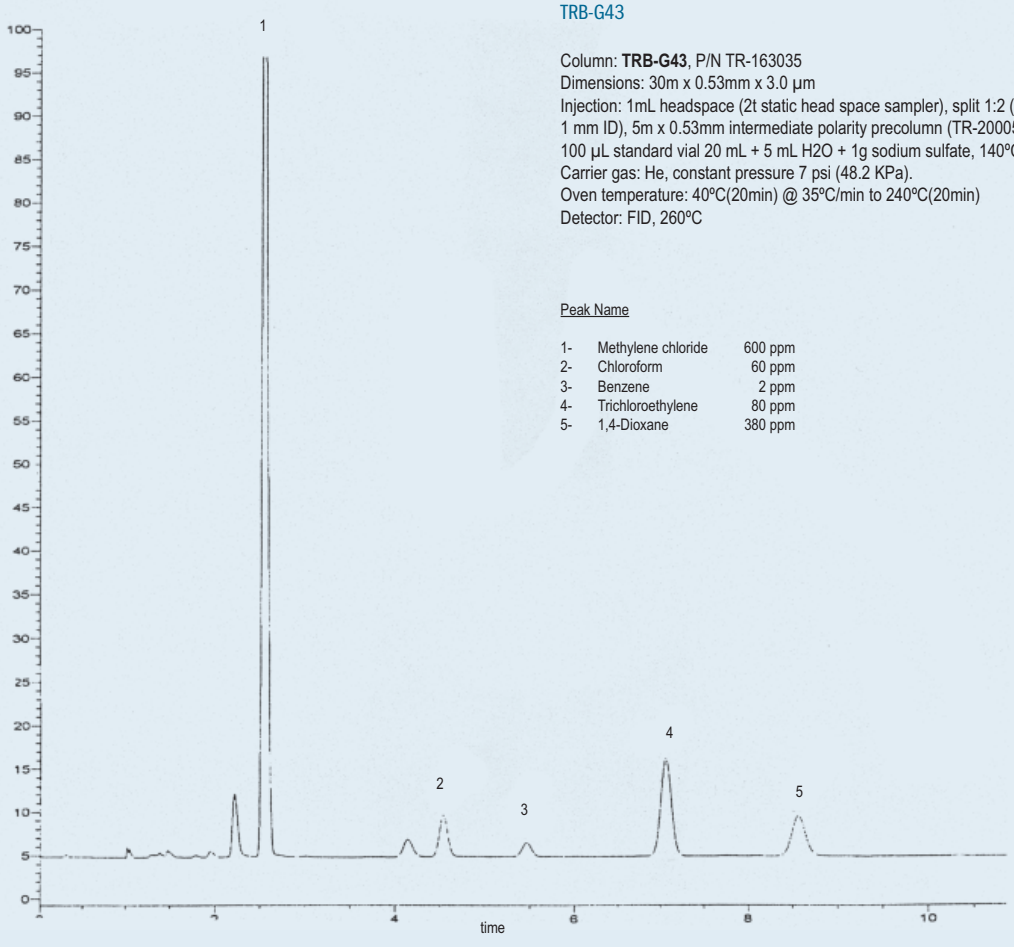
TKG 1121

TRB-G43

Internal Diam.(mm)	Length (m)	Film Thickness (µm)	Temp limits (°C)	Part. N°. (P/N)
0,53	30	3,00	-20 to 240/260	**TR-163035**

TRB-G43 Equivalent Phase

Agilent: HP-1301, HP-624, DB-1301, DB-624
Supelco: SPB-1301, OVI-G43
Restek: Rtx-1301, Rtx-624
SGE: BPX-624
Alltech: AT-624
USP Nomenclature: G43



TRB-G43

Column: **TRB-G43**, P/N TR-163035
Dimensions: 30m x 0.53mm x 3.0 µm
Injection: 1mL headspace (2t static head space sampler), split 1:2 (liner 1 mm ID), 5m x 0.53mm intermediate polarity precolumn (TR-200055), 100 µL standard vial 20 mL + 5 mL H2O + 1g sodium sulfate, 140ºC
Carrier gas: He, constant pressure 7 psi (48.2 KPa).
Oven temperature: 40ºC(20min) @ 35ºC/min to 240ºC(20min)
Detector: FID, 260ºC

Peak Name

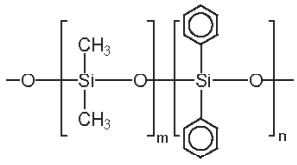
1-	Methylene chloride	600 ppm
2-	Chloroform	60 ppm
3-	Benzene	2 ppm
4-	Trichloroethylene	80 ppm
5-	1,4-Dioxane	380 ppm

TKG 1122

TRB-14

(14%) Diphenyl -(86%) dimethylpolysiloxane, bonded and crosslinked phase.

- (14%) Diphenyl- (86%) dimethylpolysiloxane
- Column of intermediate polarity without cyanopropyl groups in its structure
- Chemical inertness and low bleed guaranteed
- Confirmation column alongside TRB-1 and TRB-5



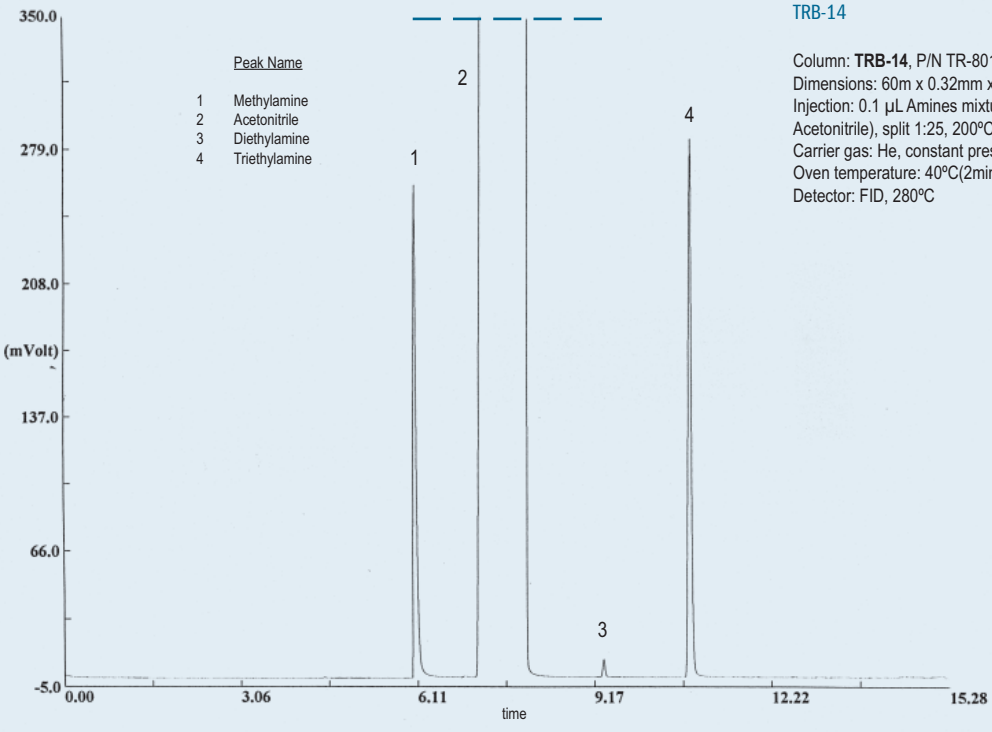
Structure of Poly(dimethyldiphenyl)siloxane

TRB-14 Equivalent Phase

Varian: CP-SIL 13 CB

TRB-14

Internal Diam.(mm)	Length (m)	Film Thickness (µm)	Temp limits (°C)	Part. N°. (P/N)
0,25	15	0,20	-20 to 300/330	**TR-802112**
	15	0,40	-20 to 300/330	**TR-800412**
	15	1,20	-20 to 300/330	**TR-801212**
	30	0,20	-20 to 300/330	**TR-802132**
	30	0,40	-20 to 300/330	**TR-800432**
	30	1,20	-20 to 300/330	**TR-801232**
	60	0,20	-20 to 300/330	**TR-802162**
	60	0,40	-20 to 300/330	**TR-800462**
	60	1,20	-20 to 300/330	**TR-801262**
0,32	15	0,20	-20 to 300/330	**TR-802113**
	15	0,40	-20 to 300/330	**TR-800413**
	15	1,20	-20 to 300/330	**TR-801213**
	30	0,20	-20 to 300/330	**TR-802133**
	30	0,40	-20 to 300/330	**TR-800433**
	30	1,20	-20 to 300/330	**TR-801233**
	60	0,20	-20 to 300/330	**TR-802163**
	60	0,40	-20 to 300/330	**TR-800463**
	60	1,20	-20 to 300/330	**TR-801263**
0,53	15	1,00	-20 to 300/330	**TR-801015**
	15	2,00	-20 to 300/330	**TR-802015**
	30	1,00	-20 to 300/330	**TR-801035**
	30	2,00	-20 to 300/330	**TR-802035**
	60	1,00	-20 to 300/330	**TR-801065**
	60	2,00	-20 to 300/330	**TR-802065**



TRB-14

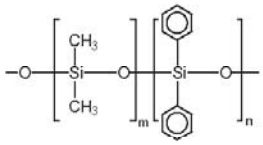
Column: **TRB-14**, P/N TR-801263
Dimensions: 60m x 0.32mm x 1.2 µm
Injection: 0.1 µL Amines mixture (0.02-0.2% in Acetonitrile), split 1:25, 200ºC
Carrier gas: He, constant pressure 14 psi (96.5 Kpa)
Oven temperature: 40ºC(2min) @ 10ºC/min to 250ºC
Detector: FID, 280ºC

TKG 1123

TRB-20

(20%) Diphenyl-(80%) Dimethylpolysilioxane, bonded and crosslinked phase.

- (20%) Diphenyl-(80%) dimethylpolysiloxane
- Column of intermediate polarity without cyanopropyl groups in its structure
- Excellent confirmation column



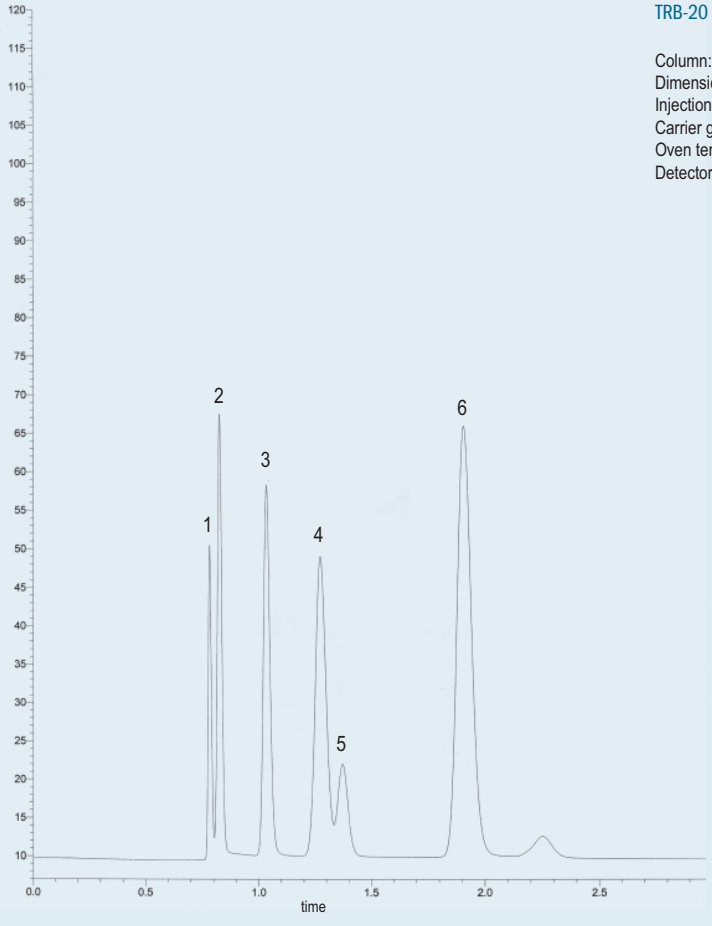
Structure of Poly(dimethyldiphenyl)siloxane

TRB-20 Equivalent Phase

Varian: CP-SIL 13 CB
Supelco: SPB-20
Alltech: AT-20
Quadrex: 007-502

TRB-20

Internal Diam.(mm)	Length (m)	Film Thickness (µm)	Temp limits (°C)	Part. N°. (P/N)
0,25	15	0,25	-20 to 300/320	**TR-200212**
	15	1,00	-20 to 280/300	**TR-201012**
	30	0,25	-20 to 300/320	**TR-200232**
	30	1,00	-20 to 280/300	**TR-201032**
	60	0,25	-20 to 300/320	**TR-200262**
	60	1,00	-20 to 280/300	**TR-201062**
0,32	15	0,25	-20 to 300/320	**TR-200213**
	15	1,00	-20 to 280/300	**TR-201013**
	30	0,25	-20 to 300/320	**TR-200233**
	30	1,00	-20 to 280/300	**TR-201033**
	60	0,25	-20 to 300/320	**TR-200263**
	60	1,00	-20 to 280/300	**TR-201063**
0,53	15	0,50	-20 to 260/280	**TR-200515**
	15	1,00	-20 to 260/280	**TR-201015**
	30	0,50	-20 to 260/280	**TR-200535**
	30	1,00	-20 to 260/280	**TR-201035**
	60	0,50	-20 to 260/280	**TR-200565**
	60	1,00	-20 to 260/280	**TR-201065**



TRB-20

Column: **TRB-20**, P/N TR-203035
Dimensions: 30m x 0.53mm x 3.0 µm
Injection: Alcohols in blood, 0.5 µL Head Space, split 5:1, 200ºC
Carrier gas: He, constant pressure 10 psi (69Kpa)
Oven temperature: 40ºC (isothermal)
Detector: FID, 200ºC

Peak Name

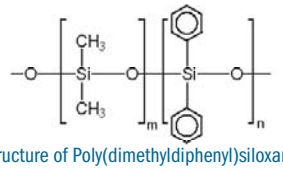
1- Methanol
2- Acetaldehyde
3- Ethanol
4- Isopropanol
5- Acetone
6- n-Propanol

TKG 1124

TRB-35

(35%) Diphenyl (65%) Dimethylpolysilioxane, bonded and crosslinked phase.

- (35%) Diphenyl-(65%) dimethylpolysiloxane
- Column of intermediate polarity without cyanopropyl groups in its structure
- Excellent confirmation column



Structure of Poly(dimethyldiphenyl)siloxane

TRB-35 Equivalent Phase

Agilent: HP-35, DB-35
Supelco: SPB-35
Restek: Rtx-35
SGE: BPX-35
Alltech: AT-35
Quadrex: 007-11

TRB-35

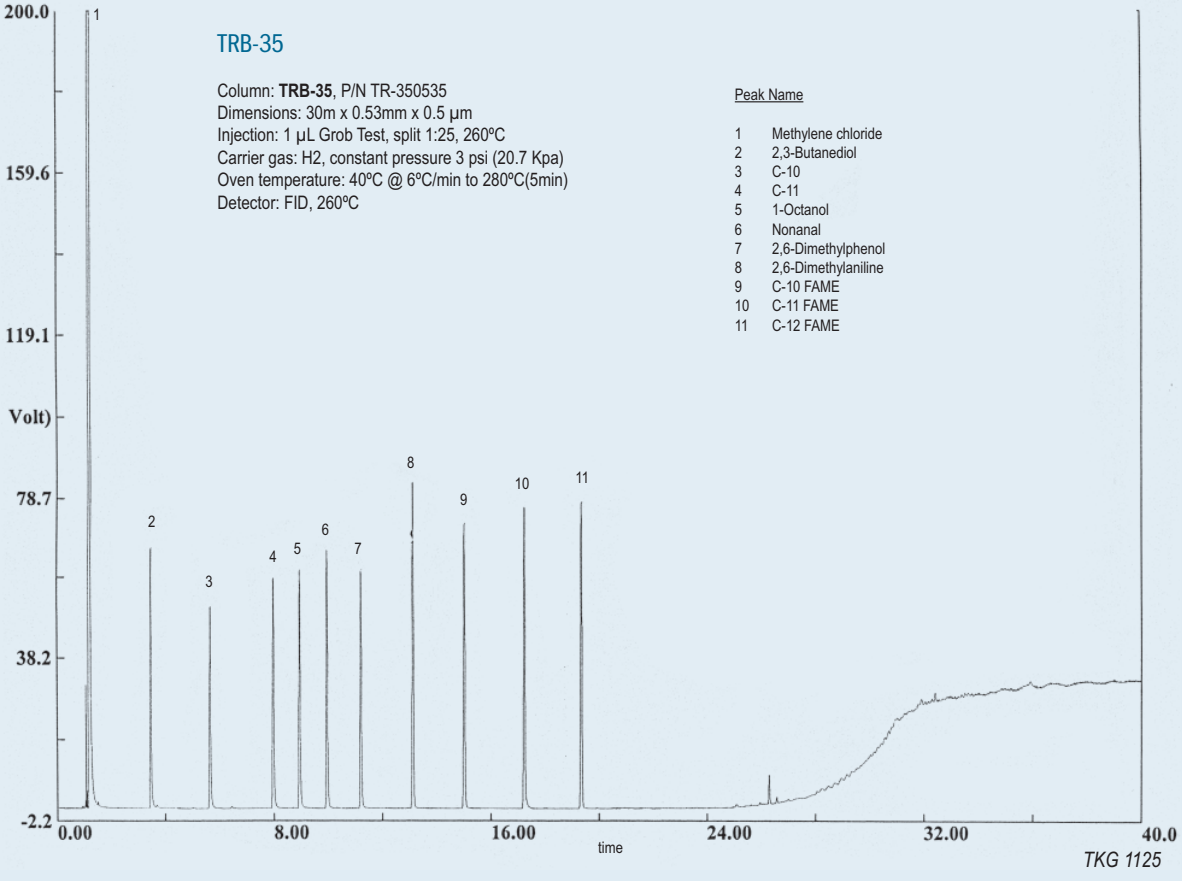
Internal Diam.(mm)	Length (m)	Film Thickness (µm)	Temp limits (°C)	Part. N°. (P/N)
0,25	15	0,15	-20 to 300/320	**TR-351312**
	15	0,25	-20 to 300/320	**TR-350212**
	30	0,15	-20 to 300/320	**TR-351332**
	30	0,25	-20 to 300/320	**TR-350232**
	60	0,15	-20 to 300/320	**TR-351362**
	60	0,25	-20 to 300/320	**TR-350262**
0,32	15	0,15	-20 to 300/320	**TR-351313**
	15	0,25	-20 to 300/320	**TR-350213**
	15	0,50	-20 to 290/310	**TR-350513**
	30	0,15	-20 to 300/320	**TR-351333**
	30	0,25	-20 to 300/320	**TR-350233**
	30	0,50	-20 to 290/310	**TR-350533**
	60	0,15	-20 to 300/320	**TR-351363**
	60	0,25	-20 to 300/320	**TR-350263**
	60	0,50	-20 to 290/310	**TR-350563**
0,53	15	0,50	-20 to 260/280	**TR-350515**
	15	1,00	-20 to 260/280	**TR-351015**
	30	0,50	-20 to 260/280	**TR-350535**
	30	1,00	-20 to 260/280	**TR-351035**
	60	0,50	-20 to 260/280	**TR-350565**
	60	1,00	-20 to 260/280	**TR-351065**

TRB-35

Column: **TRB-35**, P/N TR-350535
Dimensions: 30m x 0.53mm x 0.5 µm
Injection: 1 µL Grob Test, split 1:25, 260ºC
Carrier gas: H2, constant pressure 3 psi (20.7 Kpa)
Oven temperature: 40ºC @ 6ºC/min to 280ºC(5min)
Detector: FID, 260ºC

Peak Name

1 Methylene chloride
2 2,3-Butanediol
3 C-10
4 C-11
5 1-Octanol
6 Nonanal
7 2,6-Dimethylphenol
8 2,6-Dimethylaniline
9 C-10 FAME
10 C-11 FAME
11 C-12 FAME

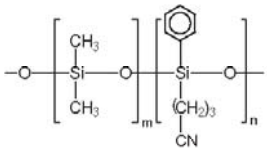


TKG 1125

TRB-1701

(14%) Cyanopropyphenyl-(86%) dimethyl polysiloxane, bonded and crosslinked phase.

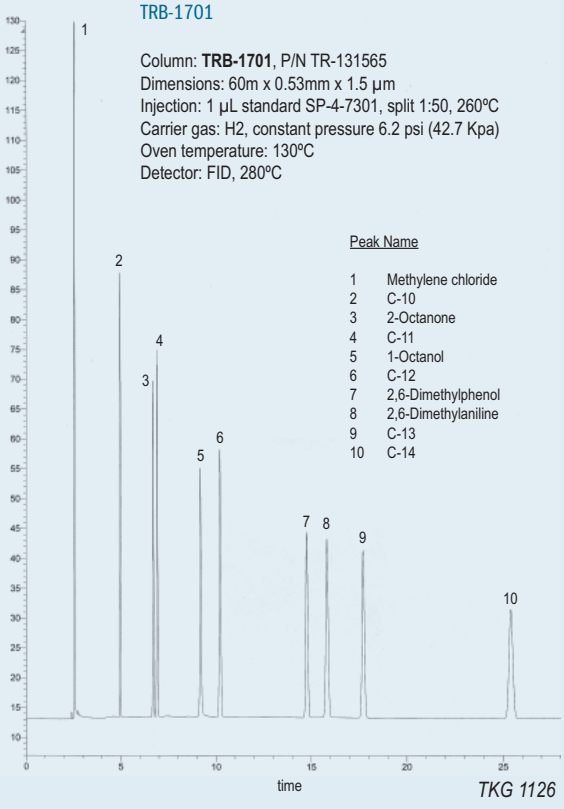
- (14%) Cyanopropyl-phenyl- (86%)dimethylpolysiloxane
- Intermediate polarity column of wide use
- Historically used in the analysis of pesticides.



Structure of Poly(dimethylcyanopropylphenyl)siloxane

TRB-1701 Equivalent Phase

Agilent: HP-1701, PAS-1701, DB-1701
Supelco: SPB-1701
Restek: Rtx-1701
Varian: CP-SIL 19 CB
SGE: BP-10
Alltech: AT-1701
Quadrex: 007-1701



TRB-1701

Internal Diam.(mm)	Length (m)	Film Thickness (µm)	Temp limits (°C)	Part. N°. (P/N)
0,10	20	0,10	-20 to 280/280	**TR-130181**
	20	0,40	-20 to 280/280	**TR-130481**
0,18	10	0,40	-20 to 280/280	**TR-130444**
	20	0,18	-20 to 280/280	**TR-130984**
0,20	15	0,20	-20 to 280/280	**TR-132119**
	30	0,20	-20 to 280/280	**TR-132139**
	60	0,20	-20 to 280/280	**TR-132169**
0,25	15	0,25	-20 to 280/280	**TR-130212**
	15	0,50	-20 to 270/280	**TR-130512**
	15	1,00	-20 to 260/280	**TR-131012**
	30	0,10	-20 to 280/280	**TR-130132**
	30	0,25	-20 to 280/280	**TR-130232**
	30	0,50	-20 to 270/280	**TR-130532**
	30	1,00	-20 to 260/280	**TR-131032**
	60	0,10	-20 to 280/280	**TR-130162**
	60	0,25	-20 to 280/280	**TR-130262**
	60	0,50	-20 to 270/280	**TR-130562**
	60	1,00	-20 to 260/280	**TR-131062**
0,32	15	0,10	-20 to 280/280	**TR-130113**
	15	0,25	-20 to 280/280	**TR-130213**
	15	0,50	-20 to 270/280	**TR-130513**
	15	1,00	-20 to 260/280	**TR-131013**
	30	0,10	-20 to 280/280	**TR-130133**
	30	0,25	-20 to 280/280	**TR-130233**
	30	0,50	-20 to 270/280	**TR-130533**
	30	1,00	-20 to 260/280	**TR-131033**
	60	0,10	20 to 280/280	**TR-130163**
	60	0,25	-20 to 280/280	**TR-130263**
	60	0,50	-20 to 270/280	**TR-130563**
	60	1,00	-20 to 260/280	**TR-131063**
0,53	15	0,10	-20 to 270/280	**TR-130115**
	15	0,50	-20 to 260/270	**TR-130515**
	15	1,00	-20 to 250/270	**TR-131015**
	15	1,50	-20 to 240/260	**TR-131515**
	30	0,10	-20 to 270/280	**TR-130135**
	30	0,50	-20 to 260/270	**TR-130535**
	30	1,00	-20 to 250/270	**TR-131035**
	30	1,50	-20 to 240/260	**TR-131535**
	60	0,10	-20 to 270/280	**TR-130165**
	60	0,50	-20 to 260/270	**TR-130565**
	60	1,00	-20 to 250/270	**TR-131065**
	60	1,50	-20 to 240/260	**TR-131565**

TRB-225

(50%) Cyanopropylphenyl - (50%) dimethyl polysiloxane, bonded and crosslinked phase.

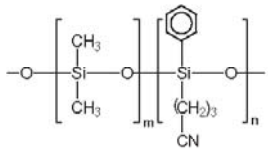
- (50%) Cyanopropylphenyl - (50%) dimethyl polysiloxane
- Medium/high polarity column
- Excellent for separating cis-trans isomers of FAMES and sugar derivatives.

TRB-225 Equivalent Phase

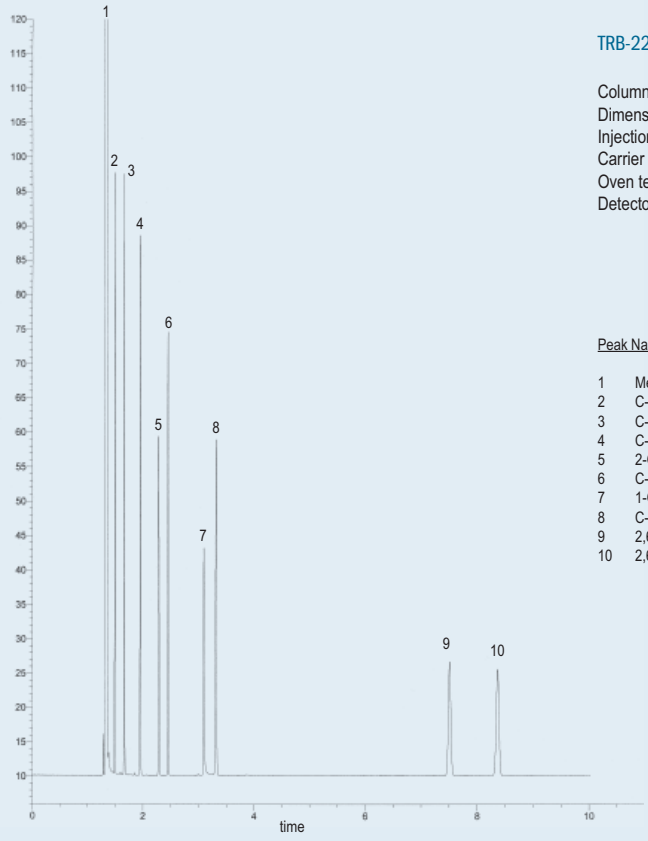
Agilent: HP-225, DB-225
Restek: Rtx-225
Varian: CP-SIL 43 CB
SGE: BP-225
Alltech: AT-225
Quadrex: 007-225

TRB-225

Internal Diam.(mm)	Length (m)	Film Thickness (µm)	Temp limits (°C)	Part. N°. (P/N)
0,10	20	0,10	40 to 220/240	**TR-250181**
0,18	20	0,18	40 to 220/240	**TR-252184**
0,20	15	0,20	40 to 220/240	**TR-252119**
	30	0,20	40 to 220/240	**TR-252139**
0,25	15	0,15	40 to 220/240	**TR-251312**
	15	0,25	40 to 220/240	**TR-250212**
	30	0,15	40 to 220/240	**TR-251332**
	30	0,25	40 to 220/240	**TR-250232**
0,32	15	0,15	40 to 220/240	**TR-251313**
	15	0,25	40 to 220/240	**TR-250213**
	30	0,15	40 to 220/240	**TR-251333**
	30	0,25	40 to 220/240	**TR-250233**
0,53	15	1,00	40 to 200/220	**TR-251015**
	30	1,00	40 to 200/220	**TR-251035**



Structure of Poly(dimethylcyanopropylphenyl)siloxane



TRB-225

Column: **TRB-225**, P/N TR-251332
Dimensions: 30m x 0.25mm x 0.15 µm
Injection: 1 µL standard SP-4-7301, split 1:50, 260ºC
Carrier gas: H2, constant pressure 12 psi (82.7 Kpa)
Oven temperature: 110ºC
Detector: FID, 280ºC

Peak Name

1 Methylene chloride
2 C-10
3 C-11
4 C-12
5 2-Octanone
6 C-13
7 1-Octanol
8 C-14
9 2,6-Dimethylphenol
10 2,6-Dimethylaniline

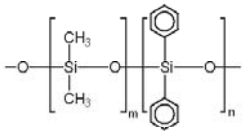
TKG 1127

TRB-50

(50%) Diphenyl-(50%) dimethyl polysiloxane, bonded and crosslinked phase.

- (50%) Diphenyl-(50%) dimethyl polysiloxane
- Medium polarity column
- Excellent column for confirmation of TRB-5 analyses

Structure of Poly(dimethyldiphenyl)siloxane



TRB-50 Equivalent Phase

Agilent: HP-50, +DB-17, DB-608
Supelco: SPB-50, SPB-2250
Restek: Rtx-50, Rxi-17
Varian: CP-SIL 24 CB
Alltech: AT-50
Quadrex: 007-17

TRB-50

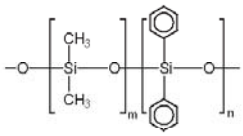
Internal Diam.(mm)	Length (m)	Film Thickness (µm)	Temp limits (°C)	Part. N°. (P/N)
0,10	10	0,10	40 to 280/300	**TR-500141**
	10	0,20	40 to 280/300	**TR-502141**
	20	0,10	40 to 280/300	**TR-500181**
0,18	20	0,18	40 to 280/300	**TR-500984**
	20	0,30	40 to 280/300	**TR-502984**
0,25	15	0,15	40 to 280/300	**TR-501312**
	15	0,25	40 to 280/300	**TR-500212**
	15	0,50	40 to 280/300	**TR-500512**
	30	0,15	40 to 280/300	**TR-501332**
	30	0,25	40 to 280/300	**TR-500232**
	30	0,50	40 to 280/300	**TR-500532**
	60	0,15	40 to 280/300	**TR-501362**
	60	0,25	40 to 280/300	**TR-500262**
	60	0,50	40 to 280/300	**TR-500562**
0,32	15	0,15	40 to 280/300	**TR-501313**
	15	0,25	40 to 280/300	**TR-500213**
	15	0,50	40 to 280/300	**TR-500513**
	30	0,15	40 to 280/300	**TR-501333**
	30	0,25	40 to 280/300	**TR-500233**
	30	0,50	40 to 280/300	**TR-500533**
	60	0,15	40 to 280/300	**TR-501363**
	60	0,25	40 to 280/300	**TR-500263**
	60	0,50	40 to 280/300	**TR-500563**
0,53	15	0,50	40 to 260/280	**TR-500515**
	15	1,00	40 to 260/280	**TR-501015**
	30	0,50	40 to 260/280	**TR-500535**
	30	1,00	40 to 260/280	**TR-501035**
	60	0,50	40 to 260/280	**TR-500565**
	60	1,00	40 to 260/280	**TR-501065**

TRB-50ht

(50%) Diphenyl-(50%) dimethylpolysiloxane, bonded and crosslinked phase.

- (50%) Diphenyl-(50%) dimethylpolysiloxane
- Medium polarity column with high thermal stability
- Best column for triglycerides analysis

Structure of Poly(dimethyldiphenyl)siloxane



TRB-50ht Equivalent Phase

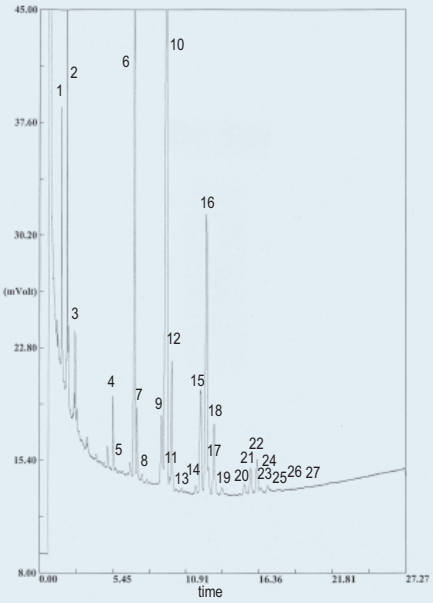
Agilent: DB17ht
Restek: Rtx-65
Varian: TAB-CB
Quadrex: 007-65HT

TRB-50ht

Internal Diam.(mm)	Length (m)	Film Thickness (µm)	Temp limits (°C)	Part. N°. (P/N)
0,25	15	0,10	50 to 370	**TR-530112**
	15	0,15	50 to 370	**TR-531312**
	30	0,10	50 to 370	**TR-530132**
	30	0,15	50 to 370	**TR-531332**

TRB-50ht

Column: **TRB-50ht**, P/N TR-531312
Dimensions: 15m x 0.25mm x 0.15 µm
Injection: 0.2mL Triglycerides Palm Oil in Isooctane(50 mg/mL), split 1:12
Carrier gas: H2, constant pressure, 9psi (56 KPa)
Oven temperature: 340ºC(1min)@0.5ºC/min to 355ºC(5min)
Injector: 380ºC (high temperature septum)
Detector: FID, 380ºC



Peak	Name
1	D32
2	D34
3	D36
4	MPP
5	MOM
6	PPP
7	MOP
8	MLP
9	PPS
10	POP
11	MOO
12	PLP
13	MLO
14	PSS
15	POS
16	POO
17	PLS
18	PLO
19	PLL
20	SOS
21	SOO
22	OOO
23	SLO
24	OLO
25	OLL
26	SOA
27	AOO

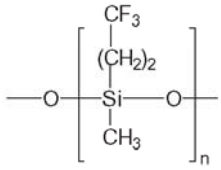
TKG 1128

TRB-F50

(50%) Trifluoropropyl-(50%) Methylpolysiloxane, bonded and crosslinked phase.

- (50%) Trifluoropropyl-(50%) Methylpolysiloxane
- High polarity column
- Column designed for the EPA 609 and 8140 methods

Structure of Poly(methyltrifluoroproyl)siloxane



TRB-F50 Equivalent Phase

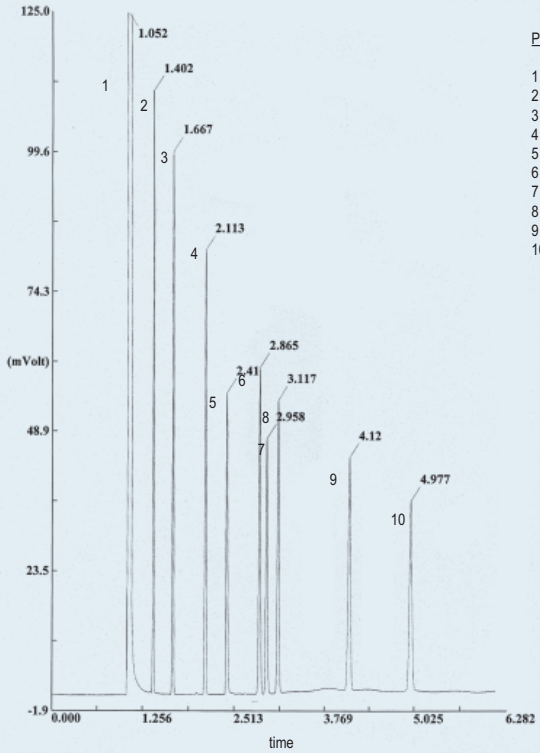
Agilent: DB-210, DB-200
Restek: Rtx-200
Alltech: AT-210
Quadrex: 007-210

TRB-F50

Internal Diam.(mm)	Length (m)	Film Thickness (µm)	Temp limits (°C)	Part. N°. (P/N)
0,18	20	0,20	45 to 240/260	**TR-572184**
0,25	15	0,15	45 to 240/260	**TR-571312**
	15	0,25	45 to 240/260	**TR-570212**
	15	0,50	45 to 240/260	**TR-570512**
	30	0,15	45 to 240/260	**TR-571332**
	30	0,25	45 to 240/260	**TR-570232**
	30	0,50	45 to 240/260	**TR-570532**
0,32	15	0,15	45 to 240/260	**TR-571313**
	15	0,25	45 to 240/260	**TR-570213**
	15	0,50	45 to 240/260	**TR-570513**
	30	0,15	45 to 240/260	**TR-571333**
	30	0,25	45 to 240/260	**TR-570233**
	30	0,50	45 to 240/260	**TR-570533**
0,53	15	1,00	45 to 220/240	**TR-571015**
	30	1,00	45 to 220/240	**TR-571035**

TRB-F50

Column: **TRB-F50**, P/N TR-570533
Dimensions: 30m x 0.32mm x 0.5 µm
Injection: 1 µL standard SP-4-7301 (500 ng/mL comp), split 1:50, 260ºC
Carrier gas: H2, constant pressure, 7psi (48.2 KPa)
Oven temperature: 100ºC
Detector: FID, 280ºC



Peak Name

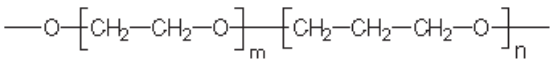
1	Methylene chloride
2	C-10
3	C-11
4	C-12
5	1-Octanol
6	C-13
7	2-Octanone
8	2,6-Dimethylphenol
9	C-14
10	2,6-Dimethylaniline

TKG 1129

TRB-PAG

50% Polyethylene -50% polypropylene glycol, bonded and crosslinked phase.

- (50%) Polyethylene-(50%) polypropylene glycol
- Phase polarity slightly lower than TRB-WAX due to the inclusion of groups of propylene oxide
- Polarity similar to UCON phase



Structure of Poly(ethylenepropylene)glycol

TRB-PAG Equivalent Phase

Supelco: PAG

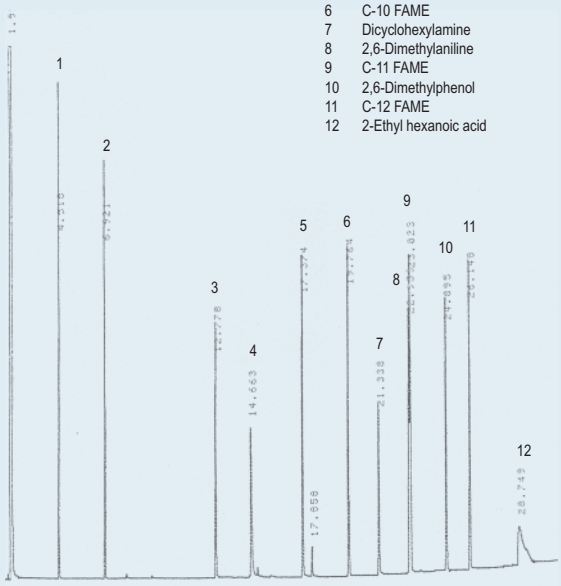
TRB-PAG

Internal Diam.(mm)	Length (m)	Film Thickness (µm)	Temp limits (°C)	Part. N°. (P/N)
0,25	15	0,25	30 to 220/230	**TR-550212**
	30	0,25	30 to 220/230	**TR-550232**
	60	0,25	30 to 220/230	**TR-550262**
0,32	15	0,25	30 to 220/230	**TR-550213**
	30	0,25	30 to 220/230	**TR-550233**
	60	0,25	30 to 220/230	**TR-550263**
0,53	15	0,50	30 to 220/230	**TR-550515**
	30	0,50	30 to 220/230	**TR-550535**
	60	0,50	30 to 220/230	**TR-550565**

TRB-PAG

Column: **TRB-PAG**, P/N TR-550232
Dimensions: 30m x 0.25mm x 0.25 µm
Injection: 1 µL Test Grob, split 1:25, 260ºC
Carrier gas: H2, constant pressure 11 psi (75.8 Kpa)
Oven temperature: 40ºC @ 6ºC/min to 230ºC(5min)
Detector: FID, 260ºC

Peak Name	
1	C-10
2	C-11
3	Nonanal
4	2,3-Butanediol
5	1-Octanol
6	C-10 FAME
7	Dicyclohexylamine
8	2,6-Dimethylaniline
9	C-11 FAME
10	2,6-Dimethylphenol
11	C-12 FAME
12	2-Ethyl hexanoic acid



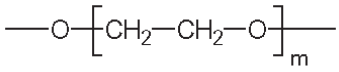
TKG 1130

SupraWax-280

Column totally equivalent to the SUPELCOWAX™ 10. Based in the popular phase Carbowax 20M.

Extended use for the analysis of methyl esters of fatty acids (FAMEs) and analysis of solvents, fragrances, alcohols and aromatic compounds in the alimentary and flavor and fragrance industry.

- 100 % Poliethyleneglycol (PEG), bonded cross-linked phase
- Column of high polarity
- Phase practically equivalent to the USP G16 phase
- Ample range of operating temperatures and high thermal
- stability (35ºC-280ºC)
- Compatible with water and methanol injections, providing that these solvents be completely vaporized when they enter into the column.
- Reproducibility among columns guaranteed



Structure of Polyethyleneglycol

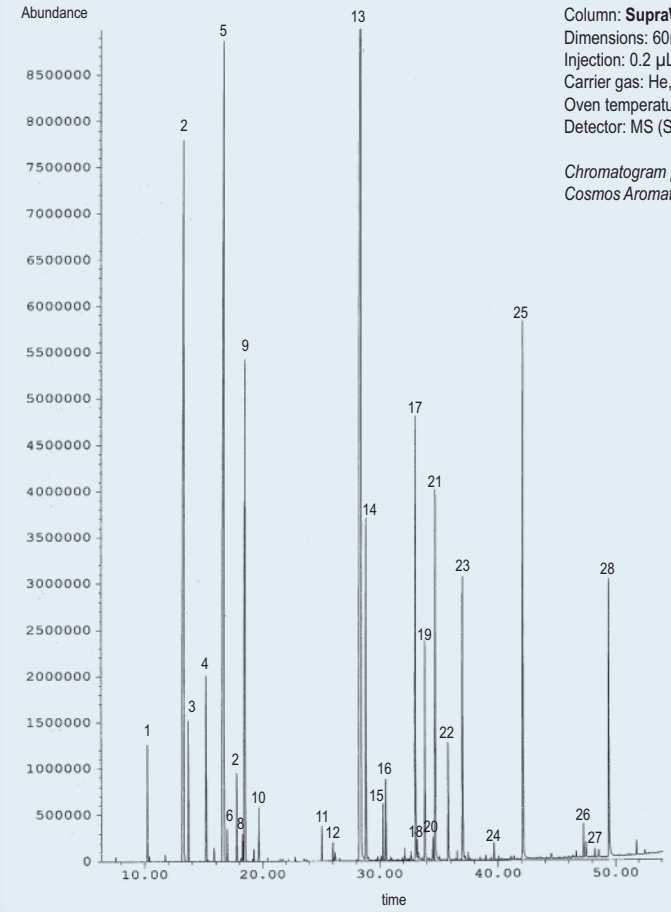
SupraWax-280 Equivalent Phase

Supelco: Supelcowax™ 10.

SupraWax-280

Internal Diam.(mm)	Length (m)	Film Thickness (µm)	Temp limits (°C)	Part. N°. (P/N)
0,10	10	0,10	35 to 280	**TR-830141**
	15	0,10	35 to 280	**TR-830111**
	20	0,10	35 to 280	**TR-830181**
	20	0,20	35 to 280	**TR-832181**
	15	0,20	35 to 280	**TR-832111**
0,18	10	0,18	35 to 280	**TR-830944**
	20	0,18	35 to 280	**TR-830984**
	20	0,30	35 to 280	**TR-832984**
	40	0,30	35 to 280	**TR-8329C4**
0,20	30	0,20	35 to 280	**TR-832139**
	60	0,20	35 to 280	**TR-832169**
	60	0,40	35 to 280	**TR-830469**
0,25	15	0,25	35 to 280	**TR-830212**
	15	0,50	35 to 280	**TR-830512**
	30	0,25	35 to 280	**TR-830232**
	30	0,50	35 to 280	**TR-830532**
	60	0,25	35 to 280	**TR-830262**
	60	0,50	35 to 280	**TR-830562**
0,32	15	0,25	35 to 280	**TR-830213**
	15	0,50	35 to 280	**TR-830513**
	30	0,25	35 to 280	**TR-830233**
	30	0,50	35 to 280	**TR-830533**
	30	1,00	35 to 280	**TR-831033**
	60	0,25	35 to 280	**TR-830263**
	60	0,50	35 to 280	**TR-830563**
	60	1,00	35 to 280	**TR-831063**
0,53	15	0.50	35 to 280	**TR-830515**
	15	1,00	35 to 280	**TR-831015**
	30	0.50	35 to 280	**TR-830535**
	30	1,00	35 to 280	**TR-831035**
	30	2,00	35 to 280	**TR-832035**
	60	1,00	35 to 280	**TR-831065**
	60	2,00	35 to 280	**TR-832065**

Essential Oil of Flower of Orange Tree (Neroli)



Column: **SupraWax-280**, P/N TR-832169
Dimensions: 60m x 0.20mm x 0.20 µm
Injection: 0.2 µL, split 1:75, 260ºC
Carrier gas: He, 34.7 psi
Oven temperature: 50ºC(4min) @ 4ºC/min to 265ºC(10min)
Detector: MS (Solvent delay, mass range 29:350 m/z) 280ºC

Chromatogram proveded by Antonio González from Cosmos Aromatica Internacional

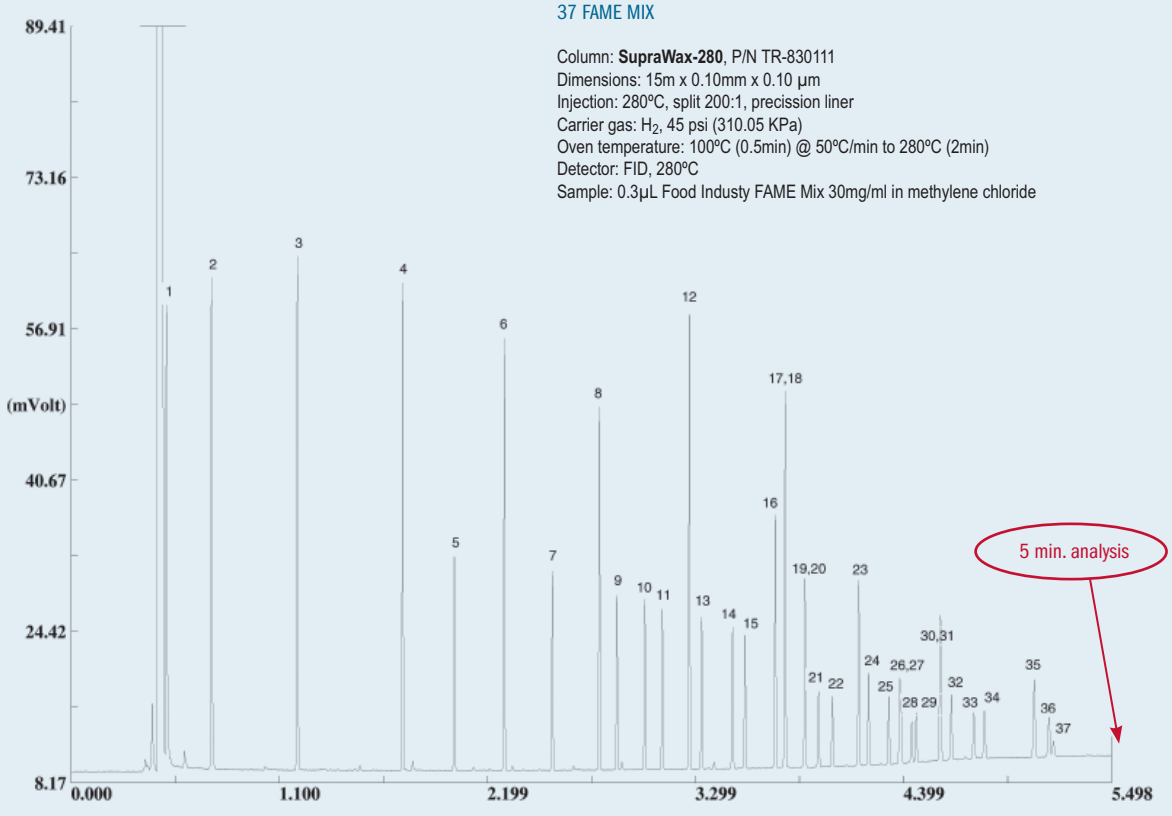
Peak Name

1. α-Pynene
2. β-Pynene
3. Sabynene
4. β-Myrcene
5. Limonene
6. β-Phellandrene
7. Cis-b-ocymene
8. γ-Terpynene
9. Trans-b-ocymene
10. α-Terpynolene
11. Cis-linalool oxide
12. Trans-linalool oxide
13. Linalool
14. Linalyl acetate
15. Terpinen-4-ol
16. Trans-caryophyllene
17. α-Terpyneol
18. α-Terpenyl
19. Neryl acetate
20. Cyclogermacrene
21. Geranyl acetate
22. Cis-geranyol
23. Trans-geranyol
24. Phenyl acetonitrile
25. Nerolydol
26. Methylanthranilate
27. Trans, trans-farnesyl acetate
28. Trans, trans-farnesol

TKG 1202

37 FAME MIX

Column: **SupraWax-280**, P/N TR-830111
Dimensions: 15m x 0.10mm x 0.10 µm
Injection: 280ºC, split 200:1, precission liner
Carrier gas: H_2, 45 psi (310.05 KPa)
Oven temperature: 100ºC (0.5min) @ 50ºC/min to 280ºC (2min)
Detector: FID, 280ºC
Sample: 0.3µL Food Industy FAME Mix 30mg/ml in methylene chloride



Peak Name

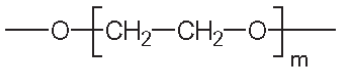
1	C4:0	20	C18:2 (all-*cis*-9,12)
2	C6:0	21	C18:3 C18:2 (all-*cis*-6,9,12)
3	C8:0	22	C18:3 (all-*cis*-9,12,15)
4	C10:0	23	C20:0
5	C11:0	24	C20:1(*cis*-11)
6	C12:0	25	C20:2 (all-*cis*-11,14)
7	C13:0	26	C20:3 (all-*cis*-8,11,14)
8	C14:0	27	C21:0
9	C14:1 (*cis*-9)	28	C20:3 (all-*cis*-11,14,17)
10	C15:0	29	C20:4 (all-*cis*-5,8,11,14)
11	C15:1 (*cis*-10)	30	C20:5 (all-*cis*-5,8,11,14,17)
12	C18:0	31	C22:0
13	C16:1 (*cis*-9)	32	C22:1 (*cis*-13)
14	C17:0	33	C22:2 (all-*cis*-13,16)
15	C17:1 (*cis*-10)	34	C23:0
16	C18:0	35	C24:0
17	C18:1 (*trans*-9)	36	C22:6 (all-*cis*-4,7,10,13,16,19)
18	C18:1 (*cis*-9)	37	C24:1 (*cis*-15)
19	C18:2 (all-*trans*-9,12)		

TKG 1247

TRB-WAX

(100%) polyethylene glycol, bonded and cross-linked phase.

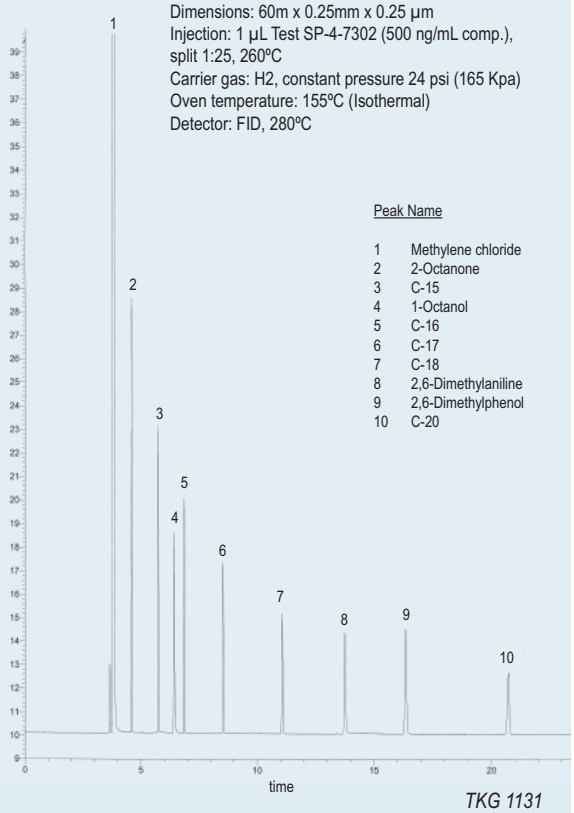
- 100% Polyethylene glycol (PEG)
- High polarity column
- Wide range of working temperatures and high thermal stability (270º C)
- Ideal for separating alcohols, aldehydes, ketones and aromatic isomers (BTX)



Structure of Polyethylene glycol

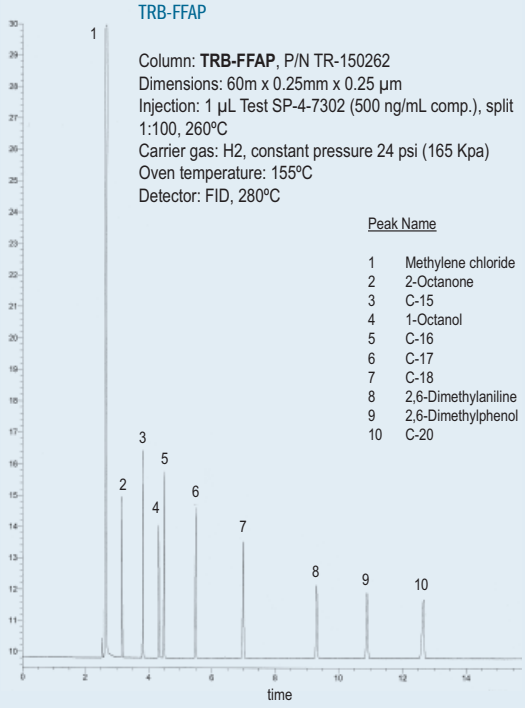
TRB-WAX Equivalent Phase

Agilent: HP-20M, INNOWAX, DB-WAX, DBWAXetr
Supelco: SUPELCOWAX-10, Carbowax 20M
Restek: STABILWAX
Varian: CP-WAX 52CB
SGE: BP-20
Alltech: AT-WAX



TRB-WAX

Internal Diam.(mm)	Length (m)	Film Thickness (µm)	Temp limits (°C)	Part. N°. (P/N)
0,10	10	0,10	40 to 260/270	**TR-140141**
	10	0,20	40 to 260/270	**TR-142141**
	20	0,10	40 to 260/270	**TR-140181**
	20	0,20	40 to 260/270	**TR-142181**
0,20	15	0,20	40 to 260/270	**TR-142119**
	15	0,40	40 to 260/270	**TR-140419**
	30	0,20	40 to 260/270	**TR-142139**
	30	0,40	40 to 260/270	**TR-140439**
	60	0,20	40 to 260/270	**TR-142169**
	60	0,40	40 to 260/270	**TR-140469**
0,25	15	0,10	40 to 260/270	**TR-140112**
	15	0,25	40 to 260/270	**TR-140212**
	15	0,50	40 to 260/270	**TR-140512**
	30	0,10	40 to 260/270	**TR-140132**
	30	0,25	40 to 260/270	**TR-140232**
	30	0,50	40 to 260/270	**TR-140532**
	30	1,00	40 to 260/270	**TR-141032**
	60	0,10	40 to 260/270	**TR-140162**
	60	0,25	40 to 260/270	**TR-140262**
	60	0,50	40 to 260/270	**TR-140562**
0,32	15	0,10	40 to 260/270	**TR-140113**
	15	0,25	40 to 260/270	**TR-140213**
	15	0,50	40 to 260/270	**TR-140513**
	30	0,10	40 to 260/270	**TR-140133**
	30	0,25	40 to 260/270	**TR-140233**
	30	0,50	40 to 260/270	**TR-140533**
	50	1,20	40 to 230/240	**TR-141253**
	60	0,10	40 to 260/270	**TR-140163**
	60	0,25	40 to 260/270	**TR-140263**
	60	0,50	40 to 260/270	**TR-140563**
	60	1,00	40 to 230/240	**TR-141063**
	60	1,20	40 to 230/240	**TR-141263**
	100	1,00	40 to 230/240	**TR-141093**
0,53	10	1,00	40 to 240/250	**TR-141045**
	15	1,00	40 to 240/250	**TR-141015**
	30	1,00	40 to 240/250	**TR-141035**
	30	1,33	40 to 240/250	**TR-141735**
	30	2,00	40 to 240/250	**TR-142035**
	60	1,00	40 to 240/250	**TR-141065**
	60	2,00	40 to 240/250	**TR-142065**

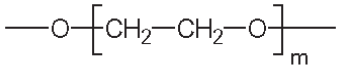


TKG 1132

TRB-FFAP

Polyethylene glycol esterified with nitroterephtalic acid, bonded and crosslinked phase.

- 100% Polyethylene glycol (PEG) esterified with nitroterephthalic acid
- Ideal for analysis of free acids (without derivatization), phenols and glycols
- High thermal stability (250ºC)



Structure of Polyethylene glycol

TRB-FFAP Equivalent Phase

Agilent: HP-FFAP, DB-FFAP
Supelco: NUKOL, SP-1000
Restek: STABILWAX-DA
Varian: CP-WAX 58 CB
SGE: BP-21
Alltech: AT-1000, FFAP
Quadrex: 007-FFAP

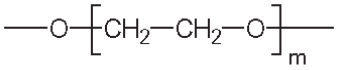
TRB-FFAP

Internal Diam.(mm)	Length (m)	Film Thickness (µm)	Temp limits (°C)	Part. N°. (P/N)
0,10	10	0,10	40 to 240/250	**TR-150141**
	10	0,20	40 to 240/250	**TR-152141**
	15	0,10	40 to 240/250	**TR-150111**
	20	0,10	40 to 240/250	**TR-150181**
0,20	15	0,30	40 to 240/250	**TR-152119**
	30	0,30	40 to 240/250	**TR-152139**
	60	0,30	40 to 240/250	**TR-152169**
0,25	15	0,25	40 to 240/250	**TR-150212**
	30	0,25	40 to 240/250	**TR-150232**
	60	0,25	40 to 240/250	**TR-150262**
0,32	15	0,25	40 to 240/250	**TR-150213**
	15	0,50	40 to 240/250	**TR-150513**
	30	0,25	40 to 240/250	**TR-150233**
	30	0,50	40 to 240/250	**TR-150533**
	60	0,25	40 to 240/250	**TR-150263**
	60	0,50	40 to 240/250	**TR-150563**
0,53	15	0,50	40 to 240/250	**TR-150515**
	15	1,00	40 to 230/240	**TR-151015**
	30	0,50	40 to 240/250	**TR-150535**

TR-WAX. DB

(100%) Polyethylene glycol, nonbonded phase.

- 100% basic deactivated Polyethylene glycol (PEG)
- Excellent for analysing basic nonderivatized compounds
- Ideal for separating amines and nitrosamines



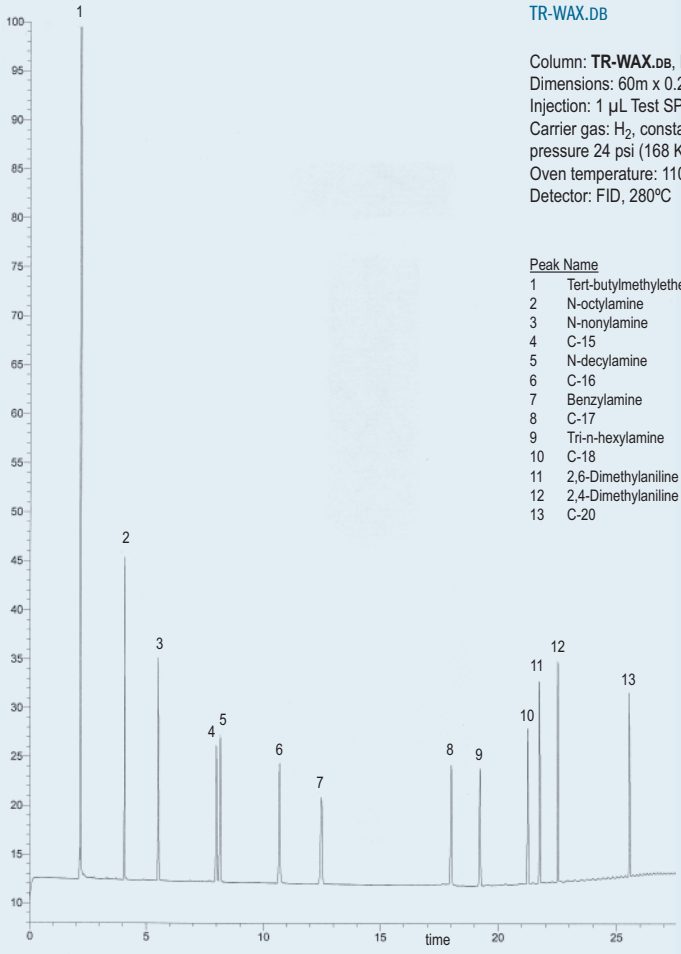
Structure of Polyethylene glycol

TR-WAX.DB Equivalent Phase

Agilent: CAM, HP-BasicWax
Varian: CP-WAX 51
Supelco: Carbowax-Amine
Restek: Stabilwax-DB

TR-WAX.DB

Internal Diam.(mm)	Length (m)	Film Thickness (µm)	Temp limits (°C)	Part. N°. (P/N)
0,25	15	0,20	60 to 210/220	**TR-932112**
	15	0,25	60 to 210/220	**TR-930212**
	30	0,20	60 to 210/220	**TR-932132**
	30	0,25	60 to 210/220	**TR-930232**
	30	0,50	60 to 210/220	**TR-930532**
	60	0,20	60 to 210/220	**TR-932162**
0,32	15	0,25	60 to 210/220	**TR-930213**
	30	0,25	60 to 210/220	**TR-930233**
	30	0,50	60 to 210/220	**TR-930533**
	30	1,00	60 to 210/220	**TR-931033**
	60	1,00	60 to 210/220	**TR-931063**
0,53	15	1,00	60 to 210/220	**TR-931015**
	30	0,50	60 to 210/220	**TR-930535**
	30	1,00	60 to 210/220	**TR-931035**
	30	1,50	60 to 210/220	**TR-931535**
	60	1,00	60 to 210/220	**TR-931065**



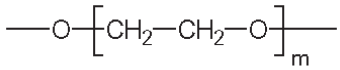
TR-WAX.DB

Column: **TR-WAX.DB**, P/N TR-932162
Dimensions: 60m x 0.25mm x 0.20 µm
Injection: 1 µL Test SP-4-8278 (500 ng/mL comp.), split 1:50, 260ºC
Carrier gas: H_2, constant
pressure 24 psi (168 Kpa)
Oven temperature: 110ºC(15´) @ 8ºC/min to 200ºC (10´)
Detector: FID, 280ºC

Peak Name

1	Tert-butylmethylether
2	N-octylamine
3	N-nonylamine
4	C-15
5	N-decylamine
6	C-16
7	Benzylamine
8	C-17
9	Tri-n-hexylamine
10	C-18
11	2,6-Dimethylaniline
12	2,4-Dimethylaniline
13	C-20

TKG 1133



Structure of Polyethylene glycol

TRB-WAXOmega Equivalent Phase

Supelco: Omegawax
Restek: Famewax

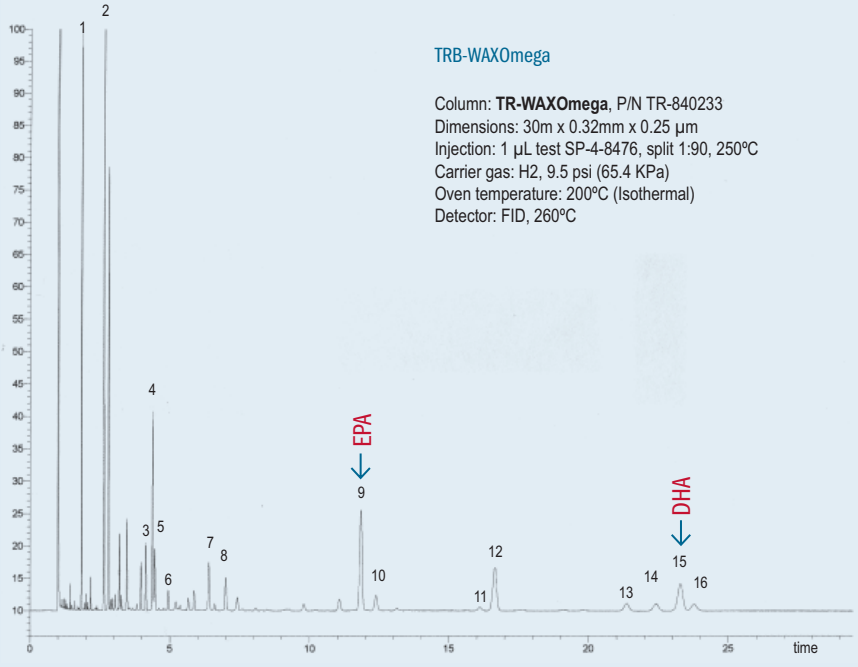
TRB-WAXOmega

Internal Diam.(mm)	Length (m)	Film Thickness (µm)	Temp limits (°C)	Part. N°. (P/N)
0,25	30	0,25	40 to 260/270	**TR-840232**
0,32	30	0,25	40 to 260/270	**TR-840233**
0,53	30	0,50	40 to 260/270	**TR-840535**

TRB-WAXOmega

(100%) Polyethylene glycol, bonded and crosslinked phase.

- 100% Polyethylene glycol (PEG)
- High polarity column
- Specially designed for analysis of Omega 3 and Omega 6 fatty acids methyl esters



TRB-WAXOmega

Column: **TR-WAXOmega**, P/N TR-840233
Dimensions: 30m x 0.32mm x 0.25 µm
Injection: 1 µL test SP-4-8476, split 1:90, 250ºC
Carrier gas: H2, 9.5 psi (65.4 KPa)
Oven temperature: 200ºC (Isothermal)
Detector: FID, 260ºC

Peak Name

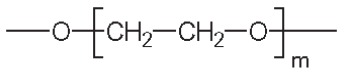
1- C14:0
2- C16:0
3- C18:0
4- C18:1n9
5- C18:1n7
6- C18:2n6
7- C18:4n3
8- C20:0
9- C20:5n3 (EPA)
10- C22:0
11- C21:5n3
12- C23:0
13- C22:5n3
14- C24:0
15- C22:6n3 (DHA)
16- C24:1n9

TKG 1134

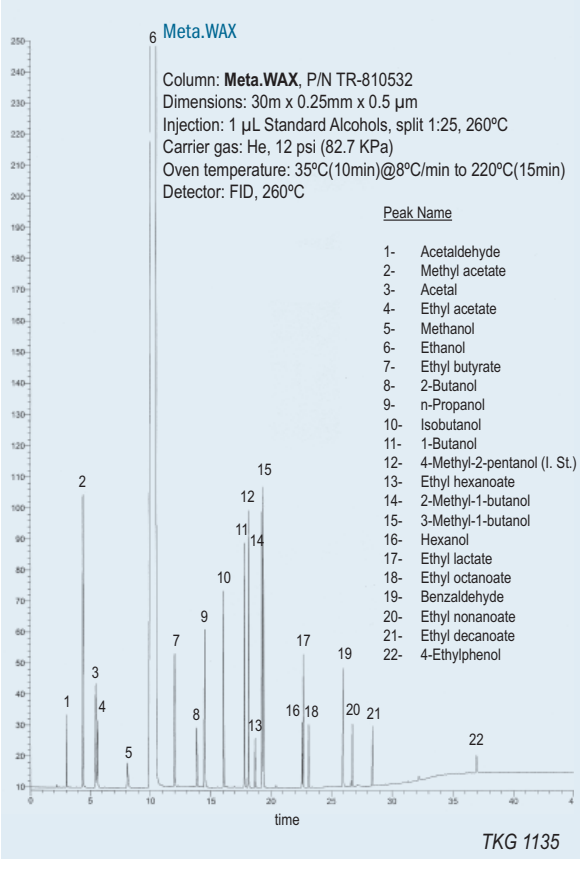
Meta.WAX

(100%) Polyethylene glycol, bonded and cross-linked phase.

- 100% Polyethylene glycol (PEG)
- High polarity column
- Minimum operating temperature 20º C
- Designed for analyzing volatiles in alcoholic beverages
- Excellent symmetry for aldehyde and glycol peaks



Structure of Polyethylene glycol



Meta.WAX Equivalent Phase

Agilent: HP-WAX, DB-WAX
Varian: CP-WAX 57 CB
Restek: Rtx-WAX

Meta.WAX

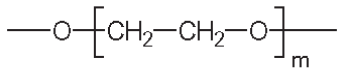
Internal Diam.(mm)	Length (m)	Film Thickness (µm)	Temp limits (°C)	Part. N°. (P/N)
0,10	10	0,10	20 to 240/250	**TR-810141**
	10	0,20	20 to 240/250	**TR-812141**
	20	0,10	20 to 240/250	**TR-810181**
	20	0,20	20 to 240/250	**TR-812181**
0,18	10	0,18	20 to 240/250	**TR-810944**
	20	0,18	20 to 240/250	**TR-810984**
	20	0,30	20 to 240/250	**TR-812984**
	40	0,18	20 to 240/250	**TR-8109C4**
	40	0,30	20 to 240/250	**TR-8129C4**
0,25	15	0,10	20 to 240/250	**TR-810112**
	15	0,25	20 to 240/250	**TR-810212**
	15	0,50	20 to 240/250	**TR-810512**
	30	0,10	20 to 240/250	**TR-810132**
	30	0,25	20 to 240/250	**TR-810232**
	30	0,50	20 to 240/250	**TR-810532**
	60	0,20	20 to 240/250	**TR-812162**
	60	0,25	20 to 240/250	**TR-810262**
0,32	15	0,25	20 to 240/250	**TR-810213**
	15	0,50	20 to 240/250	**TR-810513**
	15	1,00	20 to 230/240	**TR-811013**
	30	0,25	20 to 240/250	**TR-810233**
	30	0,50	20 to 240/250	**TR-810533**
	30	1,00	20 to 230/240	**TR-811033**
	60	0,25	20 to 240/250	**TR-810263**
	60	0,50	20 to 240/250	**TR-810563**
	60	0,64	20 to 240/250	**TR-816463**
	60	1,00	20 to 230/240	**TR-811063**
0,53	15	1,20	20 to 230/240	**TR-811215**
	30	1,20	20 to 230/240	**TR-811235**

Meta. WAX 400

100% Polyethylene glycol (PEG), nonbonded phase.

- Column designed for analysis of volatiles in alcoholic beverages and solvents
- Maximum resolution of amylic alcohols
- High number of plates even at very low temperature (<20ºC)

Structure of Polyethyleneglycol



Meta.WAX 400 Equivalent Phase

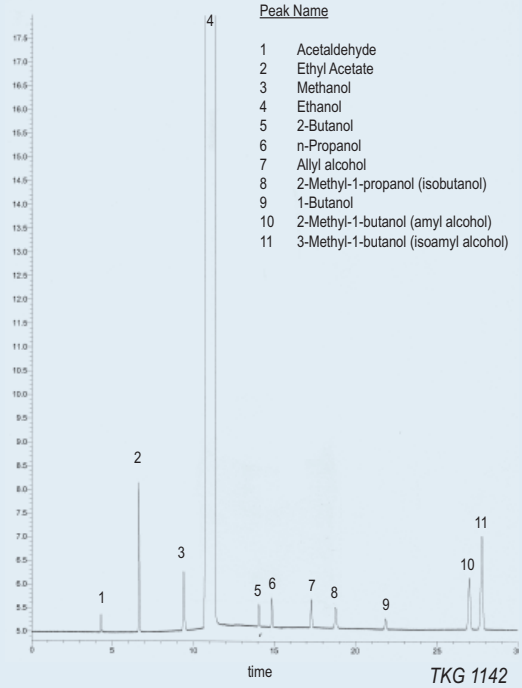
Varian: CP Carbowax 400

Meta.WAX 400

Internal Diam.(mm)	Length (m)	Film Thickness (µm)	Temp limits (°C)	Part. N°. (P/N)
0,32	50	0,20	0 to 60/80	**TR-402153**

Meta.WAX 400

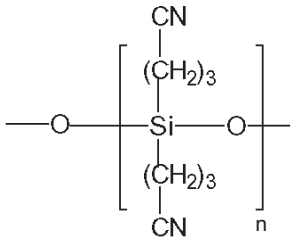
Column: **Meta.WAX 400**, P/N TR-402153
Dimensions: 50m x 0.32mm x 0.20 µm
Injection: 1 µL standard (split 1:50), 175ºC
Carrier gas: He, 11 psi (75.8 Kpa)
Oven Temperature: 30ºC(5 min.) @ 4ºC/min to 60ºC(10 min.)
Detector Temperature: FID, 175ºC



TR-CN100

(100%) Cyanopropyl polysiloxane, nonbonded phase

- 100% Cyanopropyl polysiloxane
- Column of maximum polarity
- Designed for separating fatty acids methyl esters (FAMEs)
- High selectivity towards cis-trans isomers of FAMEs



Structure of Poly(biscyanopropyl)siloxane

TR-CN100 Equivalent Phase

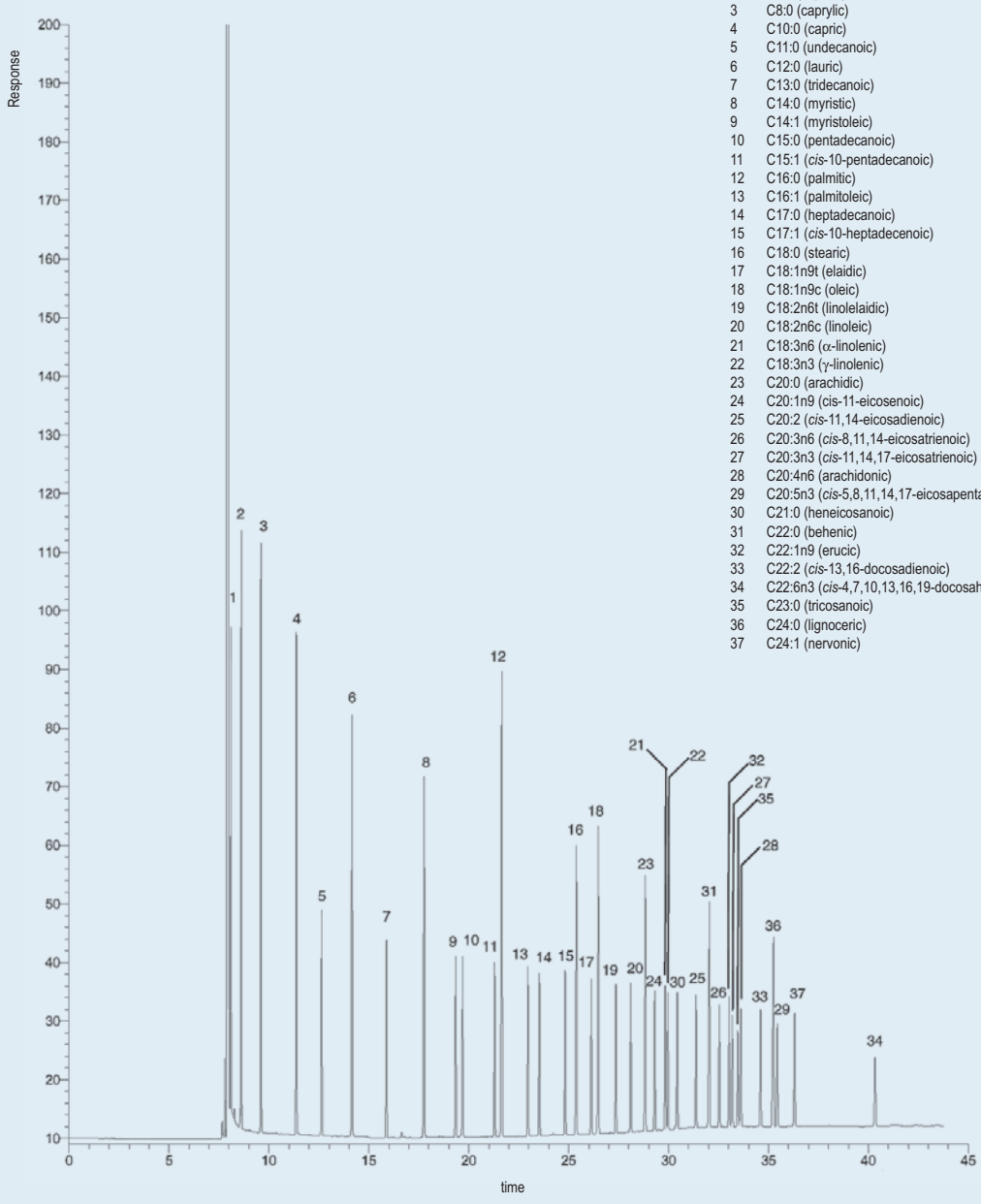
Supelco: SP-2340, SP-2380
Restek: Rt-2330, Rt-2580
Varian: CP-SIL 88

TR-CN100

Internal Diam.(mm)	Length (m)	Film Thickness (µm)	Temp limits (°C)	Part. N°. (P/N)
0,18	75	0,14	40 to 240/250	**TR-881674**
0,25	15	0,20	40 to 240/250	**TR-882112**
	30	0,20	40 to 240/250	**TR-882132**
	60	0,20	40 to 240/250	**TR-882162**
	100	0,20	40 to 240/250	**TR-882192**
0,32	15	0,20	40 to 240/250	**TR-882113**
	30	0,20	40 to 240/250	**TR-882133**
	60	0,20	40 to 240/250	**TR-882163**
0,53	15	0,20	40 to 225/250	**TR-882115**
	30	0,20	40 to 225/250	**TR-882135**
	60	0,20	40 to 225/250	**TR-882165**

TR-CN100 - SEPARATION OF METHYL ESTERS (FAMES)

Column: **TR-CN100**, P/N TR-882192
Size: 100m x 0.25 mm x 0.20µm
Injection: 1µL Total FAMES en CH2Cl2 (30 mg/mL), split 1:100, 260ºC
Carrier gas: He 45 psi, 21 cm/s (140ºC)
Program temperature: 140ºC(6min) @ 4ºC/min to 240ºC(10min)
Detector: FID, 260ºC



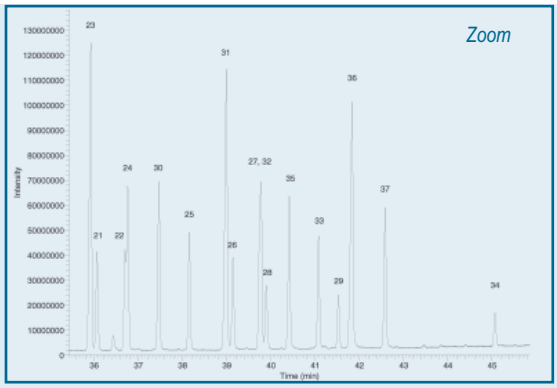
Peak Name

1	C4:0 (butyric)
2	C6:0 (caproic)
3	C8:0 (caprylic)
4	C10:0 (capric)
5	C11:0 (undecanoic)
6	C12:0 (lauric)
7	C13:0 (tridecanoic)
8	C14:0 (myristic)
9	C14:1 (myristoleic)
10	C15:0 (pentadecanoic)
11	C15:1 (*cis*-10-pentadecanoic)
12	C16:0 (palmitic)
13	C16:1 (palmitoleic)
14	C17:0 (heptadecanoic)
15	C17:1 (*cis*-10-heptadecenoic)
16	C18:0 (stearic)
17	C18:1n9t (elaidic)
18	C18:1n9c (oleic)
19	C18:2n6t (linolelaidic)
20	C18:2n6c (linoleic)
21	C18:3n6 (α-linolenic)
22	C18:3n3 (γ-linolenic)
23	C20:0 (arachidic)
24	C20:1n9 (cis-11-eicosenoic)
25	C20:2 (*cis*-11,14-eicosadienoic)
26	C20:3n6 (*cis*-8,11,14-eicosatrienoic)
27	C20:3n3 (*cis*-11,14,17-eicosatrienoic)
28	C20:4n6 (arachidonic)
29	C20:5n3 (*cis*-5,8,11,14,17-eicosapentaenoic)
30	C21:0 (heneicosanoic)
31	C22:0 (behenic)
32	C22:1n9 (erucic)
33	C22:2 (*cis*-13,16-docosadienoic)
34	C22:6n3 (*cis*-4,7,10,13,16,19-docosahexaenoic)
35	C23:0 (tricosanoic)
36	C24:0 (lignoceric)
37	C24:1 (nervonic)

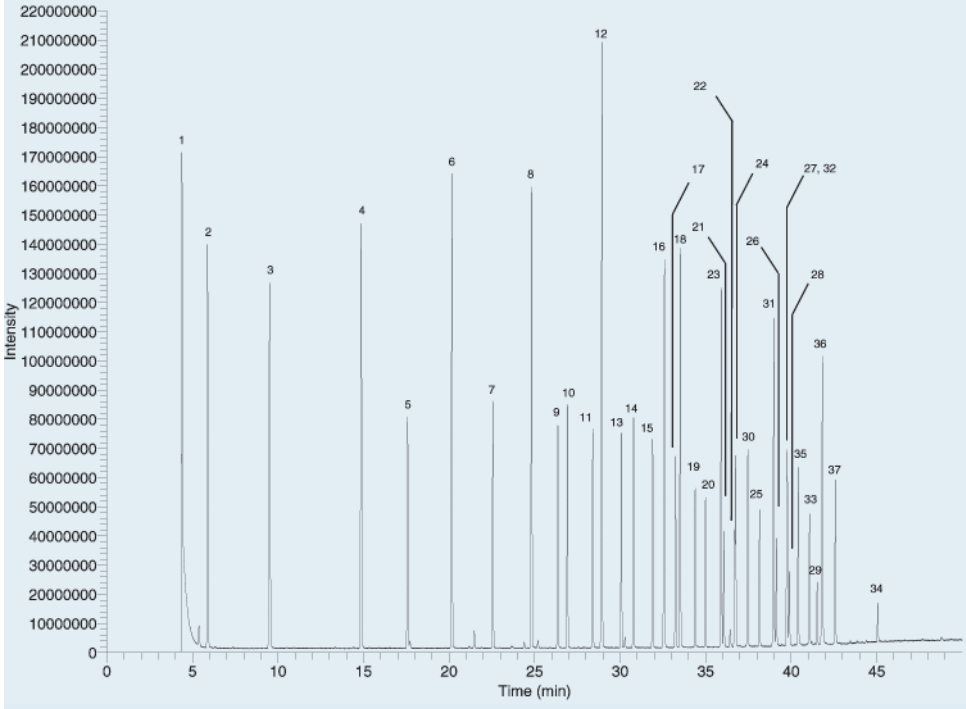
TKG 1229

37 FAME MIX- MS DETECTOR

Column: **TR-CN100**, P/N: TR-882162
Dimensions: 60m x 0.25mm x 0.20µm
Inyection: 280ºC, split 50:1
Carrier gas: Helium, constant pressure @ 24psi
Oven temperature: 90ºC (7min) to 240ºC @ 4ºC/min (3min)
Detector: MS
Transfer line temp.: 230ºC
Ionization mode: EI
Scan range: 40-450amu
Sample: 0.5µL Food Industry FAME Mix 30mg/ml in methylene chloride



TKG 1251



Peak Name

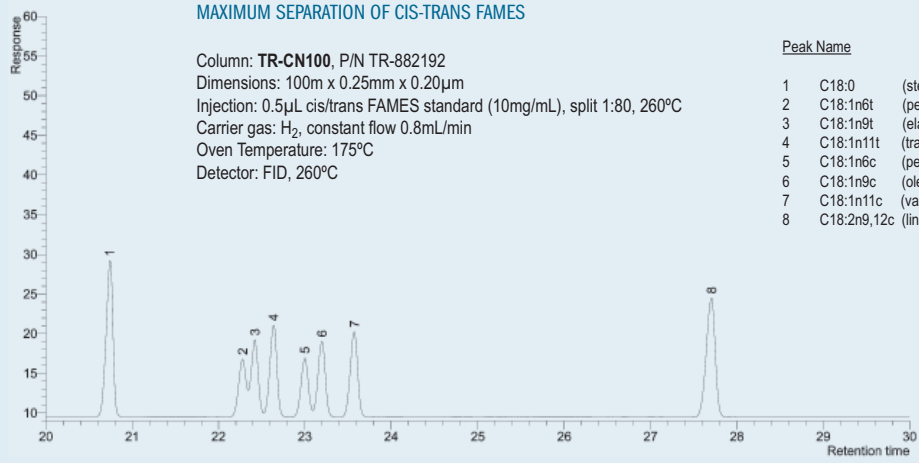
1. C4:0
2. C6:0
3. C8:0
4. C10:0
5. C11:0
6. C12:0
7. C13:0
8. C14:0
9. C14:1(*cis*-9)
10. C15:0
11. C15:1(*cis*-10)
12. C16:0
13. C16:1(*cis*-9)
14. C17:0
15. C17:1(*cis*-10)
16. C18:0
17. C18:1(*trans*-9)
18. C18:1(*cis*-9)
19. C18:2(all-*trans*-9,12)
20. C18:2(all-*cis*-9,12)
21. C18:3(all-*cis*-6,9,12)
22. C18:3(all-*cis*-9,12,15)
23. C20:0
24. C20:1(cis-11)
25. C20:2(all-*cis*-11,14)
26. C20:3(all-*cis*-8,11,14)
27. C20:3(all-*cis*-11,14,17)
28. C20:4(all-*cis*-5,8,11,14)
29. C20:5(all-*cis*-5,8,11,14,17)
30. C21:0
31. C22:0
32. C22:1(*cis*-13)
33. C22:2(all-*cis*-13,16)
34. C22:6 (all-*cis*-4,7,10,13,16,19)
35. C23:0
36. C24:0
37. C24:1(cis-15)

MAXIMUM SEPARATION OF CIS-TRANS FAMES

Column: **TR-CN100**, P/N TR-882192
Dimensions: 100m x 0.25mm x 0.20µm
Injection: 0.5µL cis/trans FAMES standard (10mg/mL), split 1:80, 260ºC
Carrier gas: H_2, constant flow 0.8mL/min
Oven Temperature: 175ºC
Detector: FID, 260ºC

Peak Name

1	C18:0	(stearic acid methyl ester)
2	C18:1n6t	(petroselaidic acid methyl ester)
3	C18:1n9t	(elaidic acid methyl ester)
4	C18:1n11t	(transvaccenoic acid methyl ester)
5	C18:1n6c	(petroselinoic acid methyl ester)
6	C18:1n9c	(oleic acid methyl ester)
7	C18:1n11c	(vaccenoic acid methyl ester)
8	C18:2n9,12c	(linoleaic acid methyl ester)



TKG 1255

TR-CRESOL

Propietary nonbonded phase.

- Stationary phase of perfectly defined purity
- Column specially designed for analysis of phenolic compounds (phenols, cresylic acids)
- Derivatization of phenolic compounds is not required to obtain suitable resolution
- Resolves m-cresol/p-cresol and 2.4-xylenol/2.5-xylenol pairs, which are not separated with other columns used for this analysis such as TRB-5 and TRB-WAX

TR-CRESOL Equivalent Phase

Varian: CP-CRESOL

TR-CRESOL

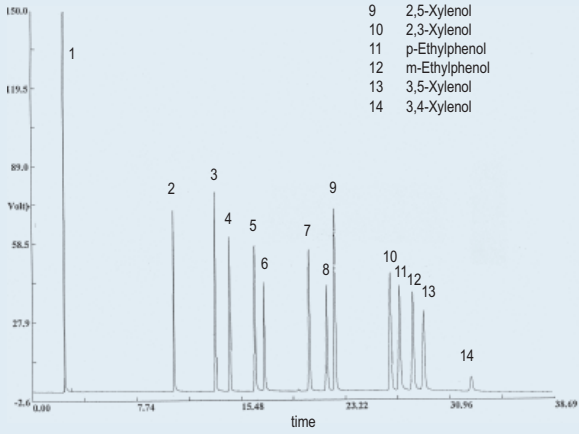
Internal Diam.(mm)	Length (m)	Film Thickness (µm)	Temp limits (°C)	Part. N°. (P/N)
0,25	30	0,20	130	**TR-702132**
	60	0,20	130	**TR-702162**

TR-CRESOL

Column: **TR-CRESOL**, P/N TR-702162
Dimensions: 60m x 0.25mm x 0.20 µm
Injection: 1 µL standard Cresols (5000 ng/mL comp.), split 1:25, 150ºC
Carrier gas: H2, constant pressure 24 psi (165 Kpa)
Oven temperature: 130ºC
Detector: FID, 150ºC

Peak Name

1 Methylene chloride
2 Phenol
3 o-Cresol
4 2,6-Xylenol
5 p-Cresol
6 m-Cresol
7 o-Ethylphenol
8 2,4-Xylenol
9 2,5-Xylenol
10 2,3-Xylenol
11 p-Ethylphenol
12 m-Ethylphenol
13 3,5-Xylenol
14 3,4-Xylenol

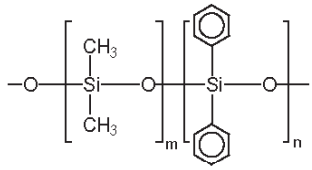


TKG 1137

TR-17

Polymethylphenylsiloxane

- Polymethylphenylsiloxane
- Recommended by pharmacopoeia for determining the impurities of sodium saccharin (o-p-toluenesulphonamides)



Structure of Poly(dimethyldiphenyl)siloxane

TR-17 Equivalent Phase

Agilent: HP-17

TR-17

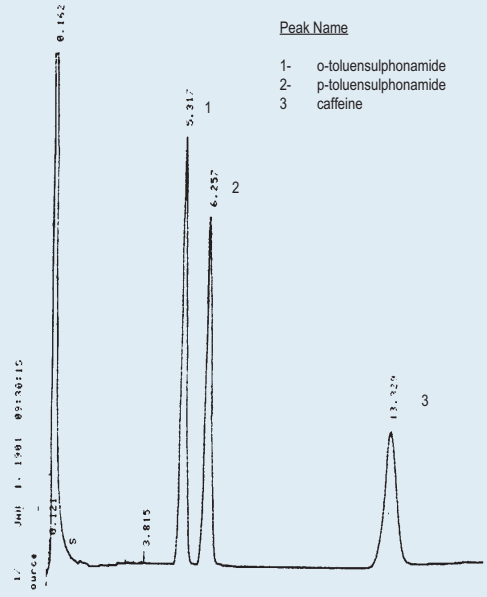
Internal Diam.(mm)	Length (m)	Film Thickness (µm)	Temp limits (°C)	Part. N°. (P/N)
0,53	10	2,00	40 to 220/240	**TR-712045**

TR-17

Column: **TR-17** P/N TR-712045
Dimensions: 10m X 0,53 mm X 2.0 µm
Injector: 260ºC
Carrier gas: He, 6.5 psi
Injection: 1ml standard, split (1:4)
Oven Temperature: 180ºC
Detector: FID, 280ºC

Peak Name

1- o-toluensulphonamide
2- p-toluensulphonamide
3 caffeine



TKG 1138

Teknokroma Capillary Columns

Meta.VOC

Proprietary bonded and crosslinked phase.

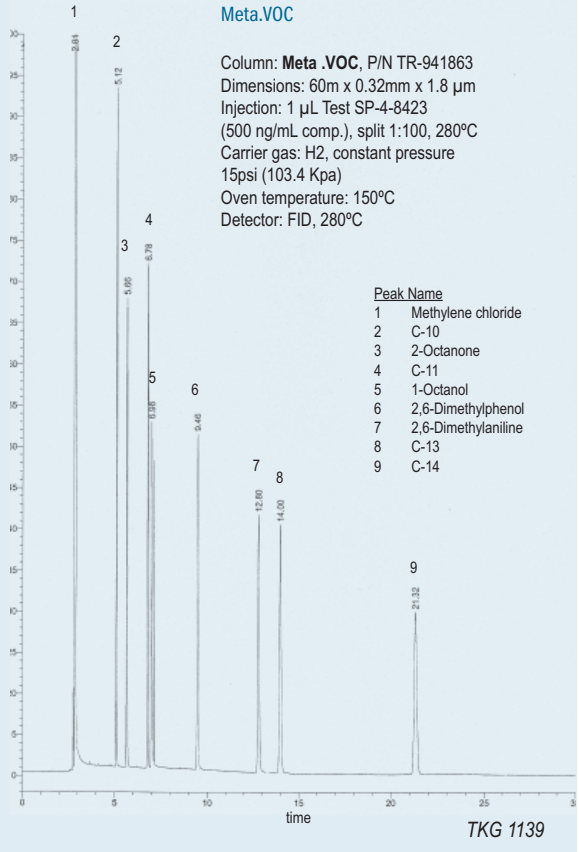
- Developed for analysis of volatile organic compounds (VOC)
- Intermediate polarity column

Meta.VOC Equivalent Phase

Agilent: DB-502.2, HP-VOC
Supelco: VOCOL
Restek: Rtx-502.2

Meta.VOC

Internal Diam.(mm)	Length (m)	Film Thickness (µm)	Temp limits (°C)	Part. N°. (P/N)
0,18	20	1,00	-20 to 240/250	**TR-941084**
0,20	10	1,20	-20 to 240/250	**TR-941249**
0,25	30	1,50	-20 to 240/250	**TR-941532**
	60	1,50	-20 to 240/250	**TR-941562**
0,32	60	1,80	-20 to 240/250	**TR-941863**
	60	3,00	-20 to 230/240	**TR-943063**
0,53	30	3,00	-20 to 230/240	**TR-943035**
	60	3,00	-20 to 230/240	**TR-943065**
	105	3,00	-20 to 230/240	**TR-9430K5**



Meta.VOC

Column: **Meta .VOC**, P/N TR-941863
Dimensions: 60m x 0.32mm x 1.8 µm
Injection: 1 µL Test SP-4-8423
(500 ng/mL comp.), split 1:100, 280ºC
Carrier gas: H2, constant pressure
15psi (103.4 Kpa)
Oven temperature: 150ºC
Detector: FID, 280ºC

Peak Name

1	Methylene chloride
2	C-10
3	2-Octanone
4	C-11
5	1-Octanol
6	2,6-Dimethylphenol
7	2,6-Dimethylaniline
8	C-13
9	C-14

TKG 1139

TRB-608

Proprietary bonded and crosslinked phase.

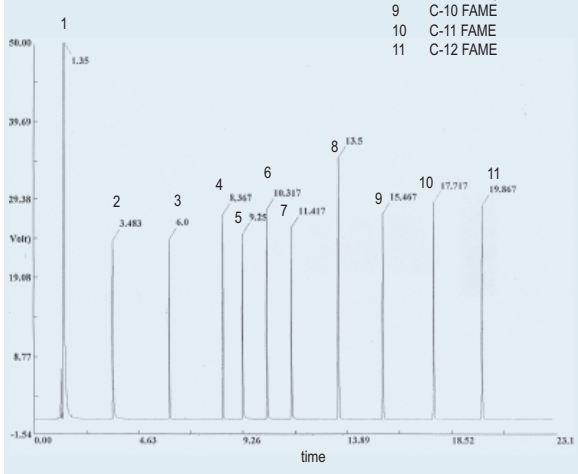
- Specifically designed for analysing chlorinated pesticides and PCBs
- Designed for the EPA 508, 608 and 8080 methods.

TRB-608 Equivalent Phase

Agilent: HP-608
Supelco: SPB-608
SGE: BP-608

TRB-608

Internal Diam.(mm)	Length (m)	Film Thickness (µm)	Temp limits (°C)	Part. N°. (P/N)
0,18	20	0,18	-20 to 300/310	**TR-360984**
0,25	30	0,25	-20 to 300/310	**TR-360232**
0,53	15	0,50	-20 to 290/300	**TR-360515**
	30	0,50	-20 to 290/300	**TR-360535**



TRB 608

Column: **TRB-608**, P/N TR-360232
Dimensions: 30m x 0.25mm x 0.25mm
Injection: 1 µL Grob Test, split 1:100, 280ºC
Carrier gas: H2, constant pressure
11 psi (75.8 Kpa)
Oven temperature: 40ºC @ 6ºC/min
to 300ºC(5min)
Detector: FID, 340ºC

Peak Name

1	Methylene chloride
2	2,3-Butanediol
3	C-10
4	C-11
5	1-Octanol
6	Nonanal
7	2,6-Dimethylphenol
8	2,6-Dimethylaniline
9	C-10 FAME
10	C-11 FAME
11	C-12 FAME

TKG 1140

TR-TCEP

1, 2, 3-tris (2-cyanoethoxy) propane, nonbonded phase

- High polarity column
- Column for analysis of alcohols in gasoline
- Separation of the aliphatic hydrocarbons up to C12 in aromatics

TR-TCEP

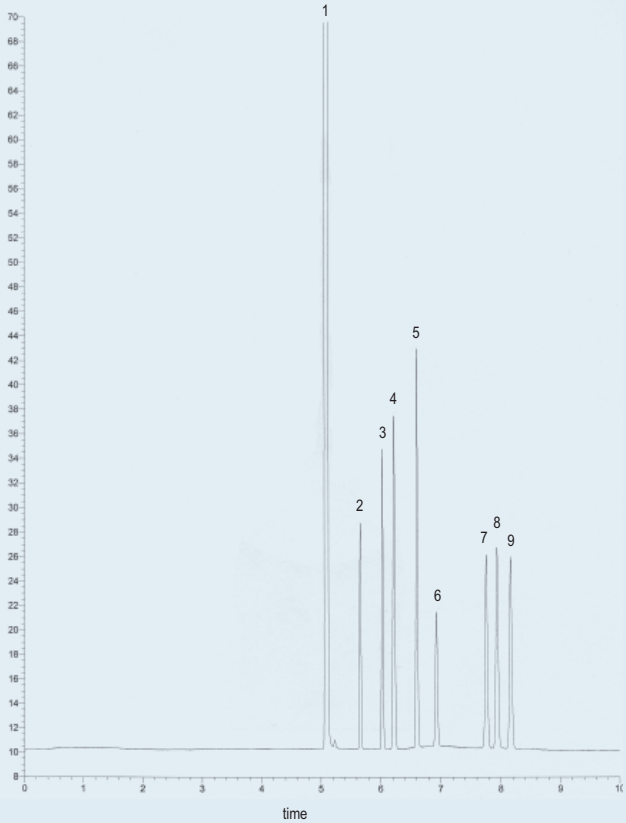
Internal Diam.(mm)	Length (m)	Film Thickness (µm)	Temp limits (°C)	Part. N°. (P/N)
0,25	30	0,40	0 to 135	**TR-960432**
	60	0,40	0 to 135	**TR-960462**

TR-TCEP Equivalent Phase

Supelco: TCEP
Restek: Rt-TCEP
Varian: CP-TCEP

TR-TCEP

Column: **TR-TCEP**, P/N TR-960462
Dimensions: 60m x 0.25mm x 0.40 µm
Injection: 1 µL standard (20 ng/mL comp.), split 1:50, 170ºC
Carrier gas: H2, constant pressure 24 psi (165 Kpa)
Oven temperature: 110ºC
Detector: FID, 170ºC

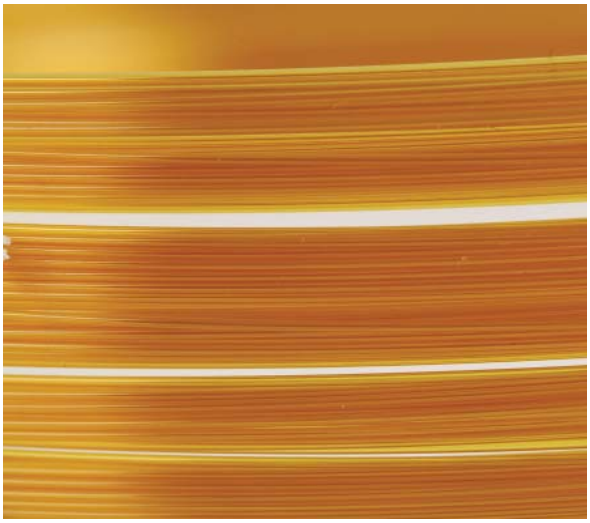


Peak Name

1 Isooctane
2 C-11
3 C-12
4 Benzene
5 C-13
6 Toluene
7 Ethylbenzene
8 p-Xylene
9 Cumene

TKG 1141

Teknokroma Capillary Columns



MetaBLOOD 1 & MetaBLOOD 2

Stationary phases specially designed by Teknokroma for the analyses of volatiles in blood.

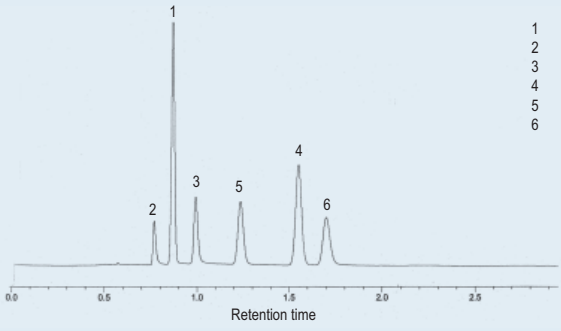
- Bonded and Cross linked phases
- For analysis of volatile compounds in biological fluids
- Extremely low analysis time
- Possibility of utilization in dual system, as analytical and as well as confirmation column.
- Order of elution different for some compounds

MetaBLOOD 1 and MetaBLOOD 2 Equivalent Phases

Agilent/JW: DB-ALC1, DB-ALC2
Restek: Rtx-BAC1, Rtx-BAC2

Alcohols in Blood

Column: **MetaBLOOD 1**, P/N TR-853035
Dimensions: 30m x 0.53mm x 3.0 µm
Injection: 1 mL Head Space 2t, alcohols standard, split 1:10, 250ºC
Carrier gas: He, 80 cm/s to 40ºC
Oven temperature: 40ºC (Isothermal)
Detector: FID, 260ºC



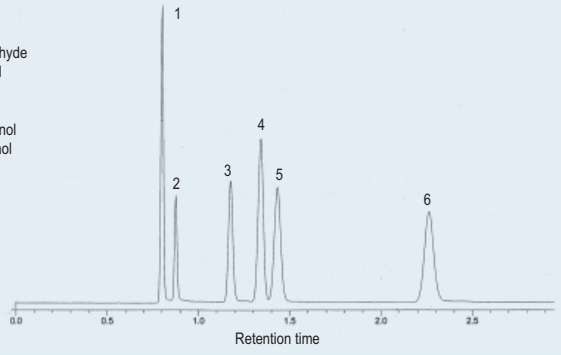
TKG 1198

Alcohols in Blood

Column: **MetaBLOOD 2**, P/N TR-862035
Dimensions: 30m x 0.53mm x 2.0 µm
Injection: 1 mL Head Space 2t, sample blood alcohols mix, 250ºC
Carrier gas: He, 80 cm/s (40ºC)
Oven temperature: 40ºC (Isothermal)
Detector: FID, 260ºC

Peak Name

1 Acetaldehyde
2 Methanol
3 Ethanol
4 Acetone
5 Isopropanol
6 n-Propanol



TKG 1200

MetaBLOOD 1

Internal Diam.(mm)	Length (m)	Film Thickness (µm)	Temp limits (°C)	Part. N°. (P/N)
0,32	30	1.80	-20 to 240/260	**TR-851833**
0,53	30	3.00	-20 to 240/260	**TR-853035**

MetaBLOOD 2

Internal Diam.(mm)	Length (m)	Film Thickness (µm)	Temp limits (°C)	Part. N°. (P/N)
0,32	30	1.20	-20 to 240/260	**TR-861233**
0,53	30	2.00	-20 to 240/260	**TR-862035**

TRB-BIODIESEL

- Glycerin and Mono-,Di,Triglycerides analysis tested under EN14105/ASTM D6584 methods
- Chemical inertness guaranteed for a good responce for glycerin analysis
- Low column bleed at high temperatures
- Two columns, silica (High temperature polymide) and stainless steel (INOX)

TRB-BIODIESEL

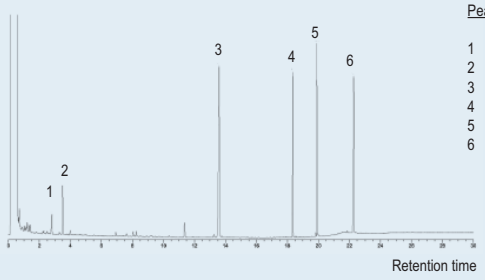
Internal Diam.(mm)	Length (m)	Film Thickness (µm)	Temp limits (°C)	Part. N°. (P/N)
0,32 (Fused Silica)	10 + 2m x 0.53mm precolumn attached using INOX connector	0.10	400	**TR-G780143**
0,28 (INOX)	10 + 2m x 0.53mm precolumn attached using INOX connector	0.10	400	**TR-G780147INOX**

TRB-BIODIESEL COLUMN

Analysis of Glycerin and Glycerides (EN14105/ASTM D6584)

Low Bleed at 370ºC

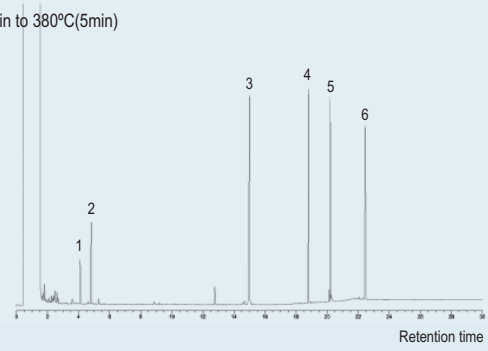
Column: **TRB-BIODIESEL**, with retention gap, 2m x 0.53mm ID
Injection: Biodiesel standard, cool on column
Carrier gas: H_2, constant flow 3 mL/min
Program temperature: 50ºC(1min) @ 15ºC/min to 180ºC @ 7ºC/min to 230ºC @ 30ºC/min to 380ºC(5min)
Detector: FID, 380ºC (N_2, make up)



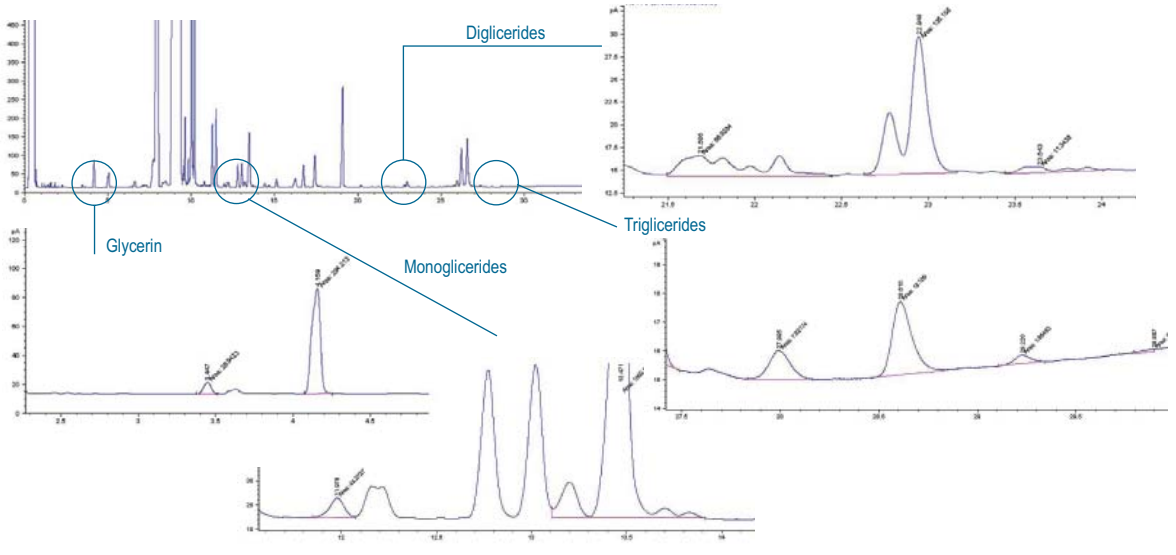
Peak Name

1 Glycerin
2 Buthanetriol (IS1)
3 Monoolein
4 Tricaprin (IS2)
5 Diolein
6 Triolein

Retention Gap (2m x 0.53mmID) + Silica Column (10m x 0.32mmID x 0.1 µm)



Retention Gap (Inox, 2m x 0.53mmID) + Inox Column (10m x 0.28mmID x 0.1 µm)



Chromatogram obtained from the analysis of Rapesseed oil. Provided by Mercedes H. Muñoz from ACCIONA

Also for Biodiesel analysis

Methanol analysis (EN-14110)
FAMEs and Linolenic acid methyl ester analysis analysis (EN-14103)

TRB-1, 30m x 0.32mm x 3.0 µm, P/N TR-113033
SupraWax-280, 30m x 0.32mm x 0.25 µm, P/N TR-830233

Teknokroma Microbore Columns (0.10 mm ID)

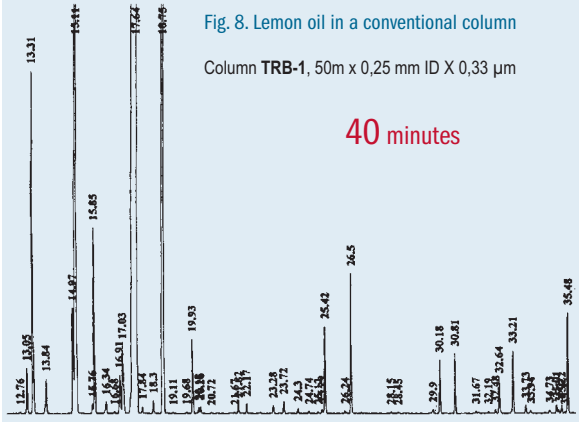
- MINIMUM BLEED LEVEL (approximately 10 times less than that of a conventional column of 0.25 mm ID).
- HIGH ANALYTICAL SPEED (the analysis are approximately 3 times faster than a conventional column of 0.25 mm ID).

These columns of 100 µm internal diameter also enable them to be connected to a conventional chromatograph fitted with a SPLIT/SPLITLESS injector, and due to its great efficiency (~7,000-10,000 plates/m) and its reduced diameter, the analysis can be undertaken with greater speed compared to standard capillary columns, without loss of peak resolving power. Having such a high level of efficiency enables the analysis of complex mixtures, with a large number of components. The standard length is 10 metres (Fig. 8 and Fig. 9).

Fig. 8. Lemon oil in a conventional column

Column **TRB-1**, 50m x 0,25 mm ID X 0,33 µm

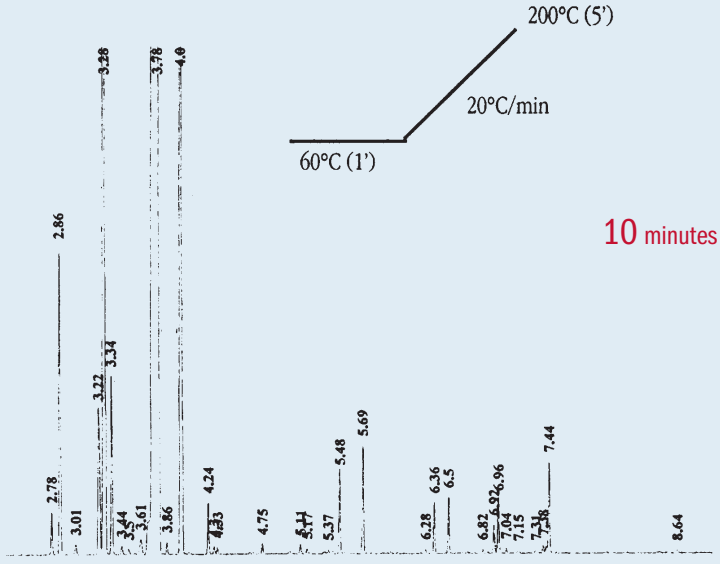
40 minutes



TKG 1143

Fig. 9. Lemon oil in a 100 µm column

Column **TRB-5**, 10m x 0,1 mm ID X 0,33 µm



TKG 1144

Teknokroma Microbore Columns (0.10 mm ID)

Limiting factors

1. WORKING PRESSURE (GAS FLOW)

With microbore columns the working pressures are higher so that more precautions should be taken regarding gas leaks from the injector cavity or with ferrules.
At optimed pressure the carrier gas flow is low (H2~0.2cc/min, He ~0.1cc/min), which is good for working with mass detectors, since it does not exceed its emptying capacity. Not optimizing these parameters may cause losses in peak resolution.

2. SAMPLE CAPACITY

In these columns with a small diameter the sample that can be injected is much smaller than with a column with a conventional diameter. Its sample capacity is around ten times less than that of a column of 0.25 mm ID.

3. INJECTOR

The columns of 0.1 mm ID are compatible with the injection techniques in Split-splitless. It is not recommended to work with direct or on-column injection.
The glass liners, with internal diameters of 2-4 mm, are not the most suitable since, due to their large dead volume, and the fact that one is working with small gas carrying flows, it is difficult for there to be a correct sweep in the injection zone. This transforms into an enlarging of peaks, with the subsequent loss of resolution (especially for liners of 4 mm). It is highly recommended to work with liners of 0.75-1 mm diameter.

Working with this type of small volume liner, along with the microbore columns, means that one must be extremely careful with the purity of the samples that are injected. The samples must be clean and the non-volatile residues must be minimised in order to avoid contaminations that cause absorption of analytes, decompositions, the appearance of ghost peaks, etc.

4. DETECTOR

The gas flows of the detector must be optimised for working with the microbore columns. It is possible that in some detectors the auxiliary gas flow(make up) will have to be increased in order to minimise its dead volume and enable the correct sweep of the compounds that leave the column at very low flow levels.
Since the peaks elute very fast and are very narrow (the peak widths are generally less than 1 s) it is necessary to work at very high speeds on the electrometer and with fast integration so that the quantification of the peaks is correct.
The small volume of these columns means that the stationary phase quantity deposited in them is very small compared to a conventional column. This, along with the low flow levels with which it works, causes the bleed level (proportional to the quantity of the phase and flow) to be minimal, even at high temperatures, thus favouring the signal/noise ratio and contributing to the detectors not getting contaminated.

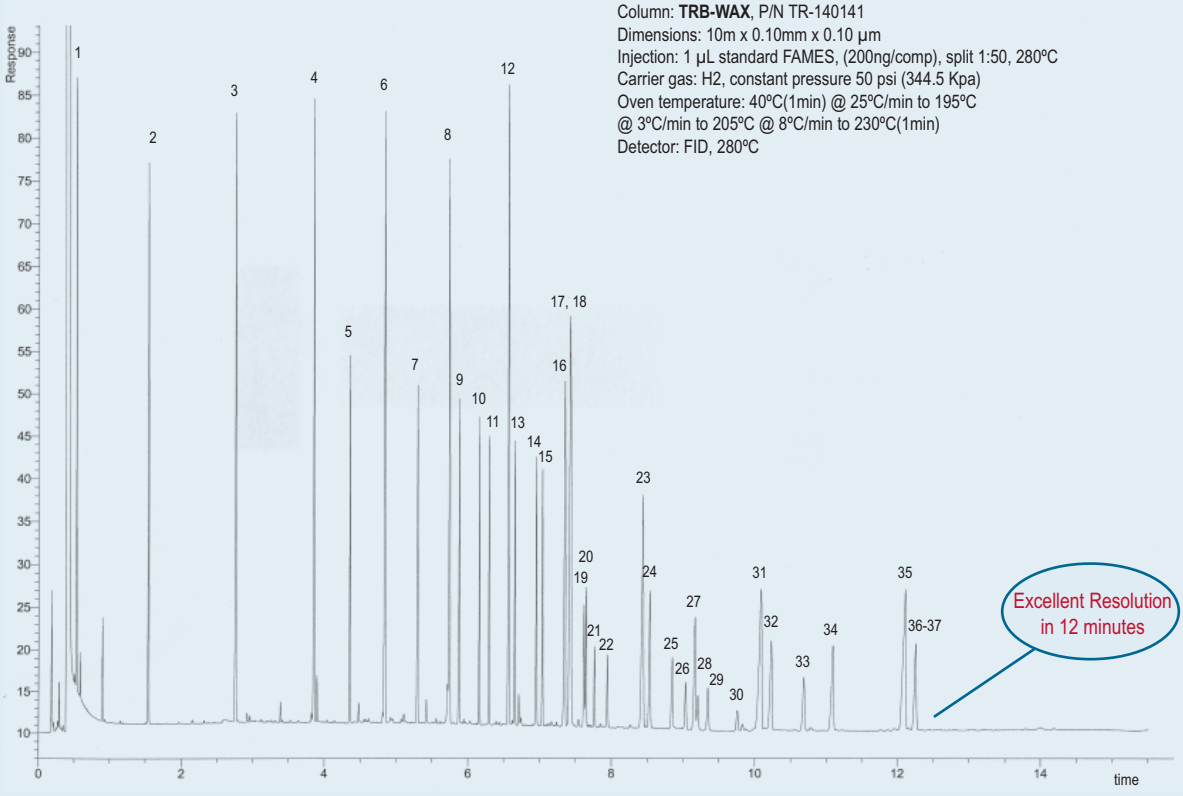
Teknokroma Microbore Columns of 100 µm

Phase	Length (m)	(df µm)	P/N
TRB-1	5	0.12	**TR-1107A1**
	10	0.10	**TR-110141**
	10	0.40	**TR-110441**
	20	0.10	**TR-110181**
	20	0.40	**TR-110481**
	40	0.20	**TR-1121C1**
	40	0.40	**TR-1104C1**
TRB-1ms	10	0.10	**TR-510141**
	10	0.40	**TR-510441**
	20	0.10	**TR-510181**
	20	0.40	**TR-510481**
TRB-5	10	0.10	**TR-120141**
	10	0.17	**TR-121941**
	10	0.33	**TR-123341**
	10	0.40	**TR-120441**
	20	0.10	**TR-120181**
	20	0.40	**TR-120481**
TRB-5ms	10	0.10	**TR-520141**
	10	0.40	**TR-520441**
	20	0.10	**TR-520181**
	20	0.40	**TR-520481**
TRB-50	10	0.10	**TR-500141**
	10	0.20	**TR-502141**
	20	0.10	**TR-500181**
TRB-225	20	0.10	**TR-250181**
TRB-1701	20	0.10	**TR-130181**
	20	0.40	**TR-130481**
Meta.WAX	10	0.10	**TR-810141**
	10	0.20	**TR-812141**
	20	0.10	**TR-810181**
	20	0.20	**TR-812181**
TRB-WAX	10	0,10	**TR-140141**
	10	0,20	**TR-142141**
	20	0,10	**TR-140181**
	20	0,20	**TR-142181**
Supra.WAX-280	10	0.10	**TR-830141**
	15	0.10	**TR-830111**
	20	0.10	**TR-830181**
	20	0.20	**TR-832181**
	15	0.20	**TR-832111**
TRB-FFAP	10	0,10	**TR-150141**
	10	0,20	**TR-152141**
	15	0,10	**TR-150111**
	20	0,10	**TR-150181**

Teknokroma Microbore Columns (0.10 mm ID)

37 FAME MIX

Column: **TRB-WAX**, P/N TR-140141
Dimensions: 10m x 0.10mm x 0.10 µm
Injection: 1 µL standard FAMES, (200ng/comp), split 1:50, 280ºC
Carrier gas: H2, constant pressure 50 psi (344.5 Kpa)
Oven temperature: 40ºC(1min) @ 25ºC/min to 195ºC
@ 3ºC/min to 205ºC @ 8ºC/min to 230ºC(1min)
Detector: FID, 280ºC



Peak Name

1	Butyric acid methyl ester (C4:0)
2	Caproic acid methyl ester (C6:0)
3	Caprylic acid methyl ester (C8:0)
4	Capric acid methyl ester (C10:0)
5	Undecanoic acid methyl ester (C11:0)
6	Lauric acid methyl ester (C12:0)
7	Tridecanoic acid methyl ester (C13:0)
8	Myristic acid methyl ester (C14:0)
9	Myristoleic acid methyl ester (C14:1)
10	Pentadecanoic acid methyl ester (C15:0)
11	*Cis*-10-pentadecenoic acid methyl ester (C15:1)
12	Palmitic acid methyl ester (C16:0)
13	Palmitoleic acid methyl ester (C16:1)
14	Heptadecanoic acid methyl ester (C17:0)
15	*Cis*-10-heptadecenoic acid methyl ester (C17:1)
16	Stearic acid methyl ester (C18:0)
17	Oleic acid methyl ester (C18:1n9c)
18	Elaidic acid methyl ester (C18:1n9t)
19	Linoleic acid methyl ester (C18:2n6c)
20	Linolelaidic acid methyl ester (C18:2n6t)
21	γ-Linolenic acid methyl ester (C18:3n6)
22	Linolenic acid methyl ester (C18:3n3)
23	Arachidic acid methyl ester (C20:0)
24	*Cis*-11-eicosenoic acid methyl ester (C20:1)
25	*Cis*-11,14-eicosadienoic acid methyl ester (C20:2)
26	*Cis*-8,11,14-eicosatrienoic acid methyl ester (C20:3n6)
27	Heneicosanoic acid methyl ester (C21:0)
28	*Cis*-11,14,17-eicosatrienoic acid methyl ester (C20:3n3)
29	Arachidonic acid methyl ester (C20:4n6)
30	*Cis*-5,8,11,14,17-eicosapentaenoic acid methyl ester (C20:5n3)
31	Behenic acid methyl ester (C22:0)
32	Erucic acid methyl ester (C22:1n9)
33	*Cis*-13,16-docosadienoic acid methyl ester (C22:2)
34	Tricosanoic acid methyl ester (C23:0)
35	Lignoceric acid methyl ester (C24:0)
36	*Cis*-4,7,10,13,16,19-docosahexaenoic acid methyl ester (C22:6n3)
37	Nervonic acid methyl ester (C24:1)

TKG 1145

Custom Capillary Columns

Teknokroma also provides you with the possibility of working with nonbonded and bonded custom capillary columns, which are still described today in official methods, or which appear in the scientific bibliography. We can supply you with these columns in the size and phase thickness that you require for a similar price as our standard Teknokroma columns. As an example:

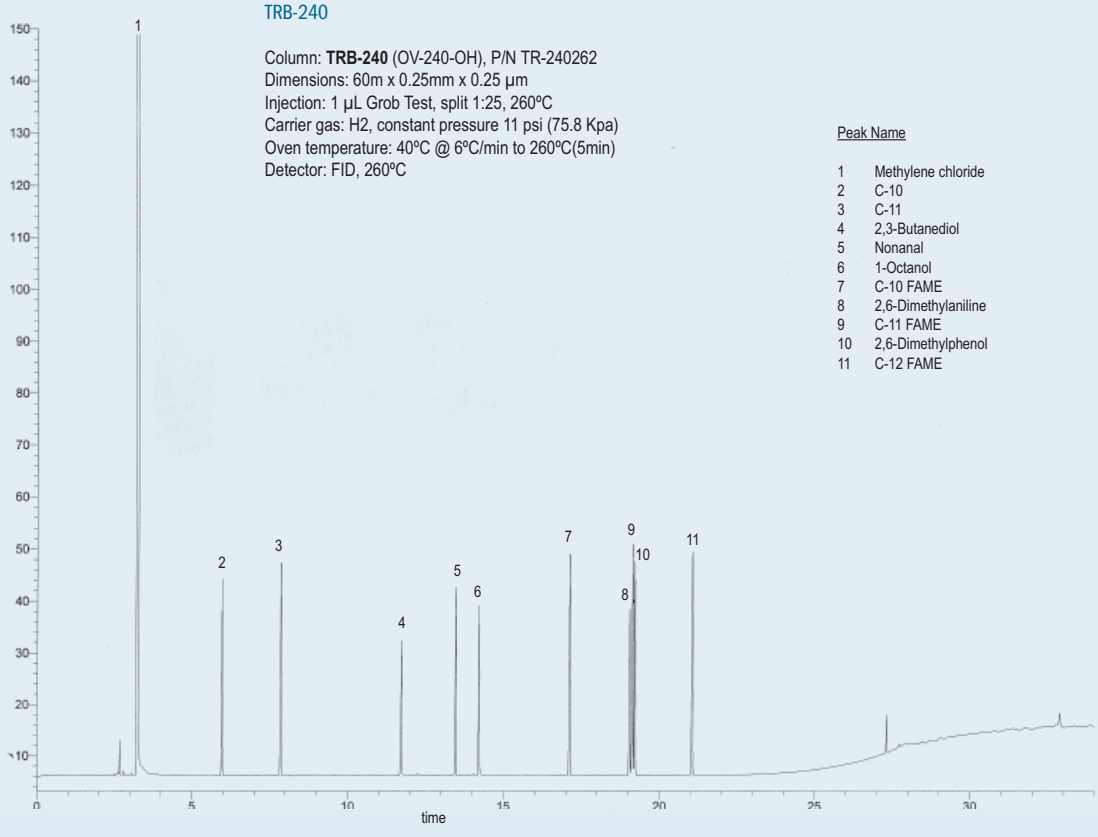
TR-101 - 100% polydimethylsiloxane phase("silicone fluid").
TR-SE-30 - 100% polydimethylsiloxane phase.
TR-SE-52 - 5% phenyl -95% dimethylpolysiloxane phase.
TR-SE-54 - 5% phenyl-1% vinyl-94% dimethylpolysiloxane phase.
TR-20M - polyethylene glycol 100% (Carbowax 20M) phase.

We can also supply you with columns for inverse gas chromatography, used for the characterisation of polymers. Teknokroma can coat your polymer in our fused silica column.

FOR OTHER PHASES NOT INCLUDED IN THIS LIST CONTACT OUR TECHNICAL DEPARTMENT

TRB-240

Column: **TRB-240** (OV-240-OH), P/N TR-240262
Dimensions: 60m x 0.25mm x 0.25 µm
Injection: 1 µL Grob Test, split 1:25, 260ºC
Carrier gas: H2, constant pressure 11 psi (75.8 Kpa)
Oven temperature: 40ºC @ 6ºC/min to 260ºC(5min)
Detector: FID, 260ºC



Peak Name

1	Methylene chloride
2	C-10
3	C-11
4	2,3-Butanediol
5	Nonanal
6	1-Octanol
7	C-10 FAME
8	2,6-Dimethylaniline
9	C-11 FAME
10	2,6-Dimethylphenol
11	C-12 FAME

TKG 1147

Guard Columns (Retention Gap)

NON POLAR
MEDIUM POLAR (INTERMEDIATE)
POLAR
AQUASAFE
BASE-DEACTIVATED

NON POLAR

Methyl deactivated, suitable for pentane/hexane and other non polar solvents.

Internal Diam.(mm)	Length (m)	Part. N°. (P/N)
0,25	3 x 1	**TR-100012**
	1 x 5	**TR-100052**
	1 x 10	**TR-100042**
	1 x 20	**TR-100082**
0,32	3 x 1	**TR-100013**
	1 x 5	**TR-100053**
	1 x 10	**TR-100043**
	1 x 20	**TR-100083**
0,53	3 x 1	**TR-100015**
	1 x 5	**TR-100055**
	1 x 10	**TR-100045**
	1 x 20	**TR-100085**

UNIVERSAL PRESS FIT CONNECTORS

Deactivated Universal	Description
TR-330001	Universal Press Fit 12pk
TR-330002	Universal Press Fit Angled Y/ 1 unit
TR-330032	Universal Press Fit Angled Y/ 3 units

MEDIUM POLAR (INTERMEDIATE)

Phenyl-methyl deactivated, USP (467) suitable for methylene chloride, hexane, toluene, and a wide range of similar solvents

Internal Diam.(mm)	Length (m)	Part. N°. (P/N)
0,25	3 x 1	**TR-200012**
	1 x 5	**TR-200052**
	1 x 10	**TR-200042**
	1 x 20	**TR-200082**
0,32	3 x 1	**TR-200013**
	1 x 5	**TR-200053**
	1 x 10	**TR-200043**
	1 x 20	**TR-200083**
0,53	3 x 1	**TR-200015**
	1 x 5	**TR-200055**
	1 x 10	**TR-200045**
	1 x 20	**TR-200085**

POLAR

Polyethylene glycol deactivated, suitable for methanol, water and a wide range of similar polar solvents.

Internal Diam.(mm)	Length (m)	Part. N°. (P/N)
0,25	3 x 1	**TR-300012**
	1 x 5	**TR-300052**
	1 x 10	**TR-300042**
	1 x 20	**TR-300082**
0,32	3 x 1	**TR-300013**
	1 x 5	**TR-300053**
	1 x 10	**TR-300043**
	1 x 20	**TR-300083**
0,53	3 x 1	**TR-300015**
	1 x 5	**TR-300055**
	1 x 10	**TR-300045**
	1 x 20	**TR-300085**

AQUASAFE

Proprietary deactivation suitable for water direct aqueous injections.

Internal Diam.(mm)	Length (m)	Part. N°. (P/N)
0,25	3 x 1	**TR-310012**
	1 x 5	**TR-310052**
	1 x 10	**TR-310042**
	1 x 20	**TR-310082**
0,32	3 x 1	**TR-310013**
	1 x 5	**TR-310053**
	1 x 10	**TR-310043**
	1 x 20	**TR-310083**
0,53	3 x 1	**TR-310015**
	1 x 5	**TR-310055**
	1 x 10	**TR-310045**
	1 x 20	**TR-310085**

BASE-DEACTIVATED

Proprietary deactivation suitable for analysis of amines and other basic compounds

Internal Diam.(mm)	Length (m)	Part. N°. (P/N)
0,25	3 x 1	**TR-320012**
	1 x 5	**TR-320052**
	1 x 10	**TR-320042**
	1 x 20	**TR-320082**
0,32	3 x 1	**TR-320013**
	1 x 5	**TR-320053**
	1 x 10	**TR-320043**
	1 x 20	**TR-320083**
0,53	3 x 1	**TR-320015**
	1 x 5	**TR-320055**
	1 x 10	**TR-320045**
	1 x 20	**TR-320085**

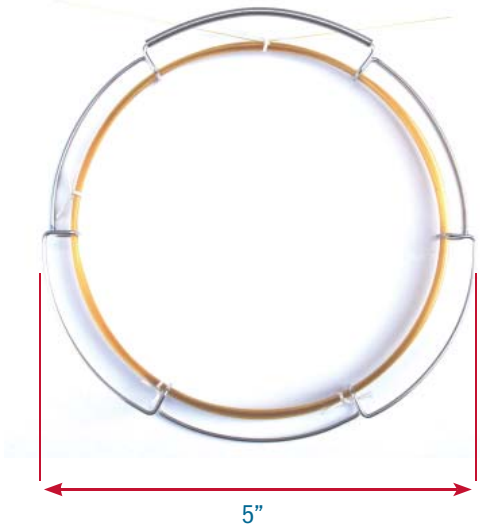
Teknokroma Metal Capillary Columns
Stainless steel Teknokroma columns (TR-INOX)

- Chemical inertness comparable to that of fused silica
- Bonded and crosslinked
- Ideal for chromatographs in industrial control processes
- Practically unbreakable
- Enables the use of high analysis temperatures

Teknokroma can supply you with Teknokroma stainless steel columns with a 0.53 mm internal diameter and with an external diameter similar to that of fused silica semi-capillary columns, enabling you to use the same standard ferrules of 0.8 mm ID.
These columns are available with our most popular stationary phases.
To order a metallic column simply add the prefix INOX at the end of the corresponding reference to the column in the catalog.

For example: TRB-2887 of 10m x 0.53 mm x 2.65µm
P/N TR-192645
With stainless steel tube, 10m x 0.53 mm x 2.65µm
P/N TR-192645INOX

Columns for the Agilent GC 6850
5-inch column cage



For columns that have to be placed in the oven of the 6850 chromatograph, the column must be rolled up in a 5 inch cage.
To order a column in a 5 inch cage you just need to add a 5 to the end of the catalog number of the corresponding column.

For example: TRB-5, 30m x 0.25 mm x 0.25µm
P/N TR-120232
With 5 inch cage, TRB-5, 30m x 0.25 mm x 0.25µm
P/N TR-1202325

USP Capillary Column Equivalents

USP CODE	General Description	Teknokroma Recommended Capillary Equivalent
G1	Dimethylpolysiloxane oil	TRB-1, TRB-1ms
G2	Dimethylpolysiloxane gum	TRB-1, TRB-1ms
G3	50%phenyl-50%methylpolysiloxane	TRB-50
G5	3-cyanopropylsiloxane	TR-CN100
G6	Poly(ethylenepropylene)glycol	TRB-F50
G8	90%-3-cyanopropyl-10%phenylmethylsiloxane	TR-CN100
G9	Methylvinylpolysiloxane	TRB-1, TRB-1ms
G14	Polyethylene glycol (MW = 951-1050)	TRB-WAX
G15	Polyethylene glycol (MW = 3000-3070)	TRB-WAX
G16	Polyethylene glycol (MW = 15000)	TRB-WAX
G19	25%phenyl-25%cyanopropylmethylsiloxane	TRB-225
G20	Polyethylene glycol (MW = 400-420)	Meta.WAX 400
G25	Polyethylene glycol TPA	TRB-FFAP
G27	5%phenyl-95%methylpolysiloxane	TRB-5, TRB-5ms, Meta.X5
G28	25%phenyl-75%-dimethylpolysiloxane	TRB-20
G32	20%phenylmethyl-80%-dimethylpolysiloxane	TRB-20
G35	Polyethylene glycol with Nitroterephthalic acid	TRB-FFAP
G36	1%vinyl-5%phenylmethylpolysiloxane	TRB-5, TRB-5ms, Meta.X5
G39	Polyethylene glycol (MW=1500)	TRB-WAX
G42	35%diphenyl-65%dimethylpolysiloxane	TRB-35
G43	6%cyanopropylphenyl-94%dimethylpolysiloxane	TRB-624, TRB-1301, TR-G43
G46	14%cyanopropylphenyl-86%dimethylpolysiloxane	TRB-1701

EPA Drinking Water Test Methods

EPA Method	Application	Recommended Teknokroma Capillary Column		Part Number
501.3	Trihalomethanes by GC/MS and SIM	TRB-624	30m x 0.53mm x 3.0 µm	TR-603035
		TRB-624	75m x 0.53mm x 3.0 µm	TR-603075
		TRB-624	105m x 0.53mm x 3.0 µm	TR-6030K5
		TRB-624	30m x 0.25mm x 1.0 µm	TR-601032
502.2	Volatile halogenated Organics in Water by Purge & Trap GC/PID/ELCD	TRB-624	30m x 0.25mm x 3.0 µm	TR-603035
503.1	Volatile Aromatics & Unsaturated Organics by Purge & Trap GC	TRB-624	30m x 0.53mm x 3.0 µm	TR-603035
		TRB-624	30m x 0.25mm x 1.4 µm	TR-601432
504.1	1,2-Dibromoethane (EDB), 1,2-Dibromo-3-chloropropane (DBCP), and 1,2,3-Trichloropropane (123TCP) by GC/MS	TRB-1	30m x 0.32mm x 0.25 µm	TR-110233
		TRB-624	30m x 0.32mm x 3.0 µm	TR-603035
		TRB-624	30m x 0.25mm x 1.4 µm	TR-601432
505	Organohalide Pesticides & Aroclors by GC/ECD	TRB-1	30m x 0.32mm x 1.0 µm	TR-111033
		TRB-50	30m x 0.32mm x 0.5 µm	TR-500533
		TRB-50	30m x 0.25mm x 0.25 µm	TR-500232
507	Nitrogen & Phosphorous containing Pesticides in Water by GC/NPD	TRB-5	30m x 0.25mm x 0.25 µm	TR-120232
		TRB-5ms	30m x 0.25mm x 0.25 µm	TR-520232
		TRB-1701	30m x 0.25mm x 0.25 µm	TR-130232
508	Chlorinated Pesticides in Water by GC/MS	TRB-5	30m x 0.25mm x 0.25 µm	TR-120232
		TRB-5ms	30m x 0.25mm x 0.25 µm	TR-520232
		TRB-1701	30m x 0.25mm x 0.25 µm	TR-130232
513	2,3,7,8-Tetrachlorodibenzo-p-dioxin by GC/MS	TRB-5ms	60m x 0.25mm x 0.10 µm	TR-520162
515.2	Determination of chlorinated acids in water using liquid-solid extraction & GC/ECD	TRB-1	30m x 0.32mm x 0.25 µm	TR-110233
		TRB-5	30m x 0.32mm x 0.25 µm	TR-120233
		TRB-1701	30m x 0.32mm x 0.25 µm	TR-130233
		TRB-5ms	30m x 0.32mm x 0.25 µm	TR-520233
524.2	Measurement of purgeable organic compounds in water by Purge & Trap capillary column GC/MS	TRB-624	30m x 0.25mm x 1.4 µm	TR-601432
		TRB-624	30m x 0.53mm x 3.0 µm	TR-603035
		TRB-624	75m x 0.53mm x 3.0 µm	TR-603075
		TRB-624	60m x 0.32mm x 1.8 µm	TR-601863
525	Organic compounds in drinking water by liquid-solid extraction and capillary column GC/MS	TRB-5	30m x 0.32mm x 0.25 µm	TR-120233
		TRB-5ms	30m x 0.25mm x 0.25 µm	TR-520232

EPA Solid Waste Test Methods

EPA Method	Application	Recommended Teknokroma Capillary Column		Part Number
8010	Halogenated volatile organics	TRB-624	75m x 0.53mm x 3.0 µm	TR-603075
		TRB-624	30m x 0.25mm x 1.4 µm	TR-601432
8015	Non- Halogenated volatile organics	TRB-624	30m x 0.53mm x 3.0 µm	TR-603035
		TRB-624	30m x 0.25mm x 1.4 µm	TR-601432
8020/8021	Aromatic volatile organic	TRB-624	30m x 0.53mm x 3.0 µm	TR-603035
		TRB-624	30m x 0.25mm x 1.4 µm	TR-601432
8030/8031	Acrolein, acrylonitrile, acetonitrile	TRB-624	30m x 0.53mm x 3.0 µm	TR-603035
		TRB-624	30m x 0.25mm x 1.4 µm	TR-601432
8040/8041	Phenols	TRB-5	30m x 0.53mm x 1.5 µm	TR-121535
		TRB-5ms	30m x 0.25mm x 0.25 µm	TR-520232
8060/8061	Phthalate esters	TRB-1	15m x 0.53mm x 1.5 µm	TR-111515
		TRB-1ms	30m x 0.25mm x 0.4 µm	TR-510432
8080	Organochlorine pesticides and PCBs	TRB-5	30m x 0.53mm x 1.5 µm	TR-121535
		TRB-5ms	30m x 0.25mm x 0.5 µm	TR-520532
8081/8082	Organochlorine pesticides and PCBs as Arochlor	TRB-5	30m x 0.53mm x 1.5 µm	TR-121535
		TRB-1701	30m x 0.53mm x 1.0 µm	TR-131035
8090/8091	Nitroaromatics and cyclics ketones	TRB-5	30m x 0.53mm x 1.5 µm	TR-121535
		TRB-5ms	30m x 0.25mm x 0.5 µm	TR-520532
8100	Polynuclear aromatic hydrocarbons	TRB-5	30m x 0.32mm x 0.25 µm	TR-120233
		TRB-5ms	30m x 0.32mm x 0.25 µm	TR-520233
8120/8121	Chlorinated hydrocarbons	TRB-1	30m x 0.32mm x 1.0 µm	TR-111033
		TRB-1ms	30m x 0.32mm x 1.0 µm	TR-511033
8140	Organophosphorus pesticides	TRB-1	30m x 0.32mm x 1.5 µm	TR-111535
		TRB-1701	30m x 0.53mm x 1.0 µm	TR-131035
		TRB-1	30m x 0.25mm x 0.25 µm	TR-110232
8141	Organophosphorus pesticides	TRB-5	15m x 0.53mm x 1.5 µm	TR-121515
		TRB-5ms	15m x 0.25mm x 0,25 µm	TR-520212
8150/8151	Chlorinated herbicides	TRB-5	25m x 0.53mm x 1.0 µm	TR-121025
		TRB-1701	30m x 0.53mm x 1.0 µm	TR-131035
		TRB-5ms	15m x 0.25mm x 0,25 µm	TR-520232
8240	GC/MS for volatile organics	TRB-624	30m x 0.53mm x 3.0 µm	TR-603035
		TRB-624	75m x 0.53mm x 3.0 µm	TR-603075
		TRB-624	105m x 0.53mm x 3.0 µm	TR-6030K5
		TRB-624	30m x 0.25mm x 1.0 µm	TR-601032
8250	GC/MS for semi-volatile organics	TRB-5ms	30m x 0.25mm x 0,50mm	TR-520532

EPA Solid Waste Test Methods

EPA Method	Application	Recommended Teknokroma Capillary Column		Part Number
8260	GC/MS method for volatile organics capillary techniques	TRB-624	30m x 0.53mm x 3,0 µm	TR-603035
		TRB-624	75m x 0.53mm x 3,0 µm	TR-603075
		TRB-624	105m x 0.53mm x 3,0 µm	TR-6030K5
		TRB-624	30m x 0.25mm x 1,0 µm	TR-601032
8270	GC/MS method for semi-volatile organics capillary techniques	TRB-5	30m x 0.25mm x 1,0 µm	TR-121032
		TRB-5ms	30m x 0.25mm x 1,0 µm	TR-521032
8280	Analysis of polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans	TRB-5	30m x 0.25mm x 0,25 µm	TR-120232
		TRB-5ms	60m x 0.25mm x 0,25 µm	TR-520162

EPA Waste Water Test Methods

EPA Method	Application	Recommended Teknokroma Capillary Column		Part Number
601	Purgeable halocarbons	TRB-624	30m x 0.53mm x 3.0 µm	TR-603035
		TRB-624	75m x 0.53mm x 3,0 µm	TR-603075
		TRB-624	105m x 0.53mm x 3,0 µm	TR-6030K5
		TRB-624	30m x 0.25mm x 1,0 µm	TR-601032
602	Purgeable aromatics	TRB-624	30m x 0.53mm x 3.0 µm	TR-603035
		TRB-624	105m x 0.53mm x 3.0 µm	TR-6030K5
		TRB-624	30m x 0.25mm x 1.0 µm	TR-601032
603	Acrolein and acrylonitrile	TRB-624	30m x 0.53mm x 3.0 µm	TR-603035
		TRB-624	30m x 0.25mm x 1.0 µm	TR-601032
604/605	Phenols and benzidines	TRB-5ms	30m x 0.53mm x 1.4 µm	TR-521435
		TRB-5ms	30m x 0.25mm x 0.25 µm	TR-520232
606	Phthalate esters	TRB-5	15m x 0.53mm x 1.5 µm	TR-121515
		TRB-5ms	30m x 0.25mm x 0.25 µm	TR-520232
		TRB-5	15m x 0.53mm x 1.5 µm	TR-121515
		TRB-5ms	30m x 0.25mm x 0.25 µm	TR-520232
607	Nitrosamines	TRB-5	30m x 0.53mm x 1.5 µm	TR-121535
		TRB-5ms	30m x 0.25mm x 0.50 µm	TR-520532
608	Organochlorine pesticides and PCBs	TRB-5	50m x 0.53mm x 1.0 µm	TR-121055
		TRB-5ms	50m x 0.25mm x 0.12 µm	TR-520752
609	Nitroaromatics and isophorone	TRB-5	30m x 0.53mm x 1.5 µm	TR-121535
		TRB-5ms	30m x 0.25mm x 0.5 µm	TR-520532

EPA Waste Water Test Methods

EPA Method	Application	Recommended Teknokroma Capillary Column		Part Number
610	Polycyclic Aromatic Hydrocarbons	TRB-5	30m x 0.32mm x 0.25 µm	TR-120233
		TRB-5ms	30m x 0.32mm x 0.10 µm	TR-520133
611	Haloethers	TRB-5	15m x 0.53mm x 1.5 mm	TR-121515
		TRB-5ms	30m x 0.25mm x 0.50 mm	TR-520532
612	Chlorinated hydrocarbons	TRB-5	30m x 0.32mm x 1.0 mm	TR-121033
		TRB-5ms	30m x 0.25mm x 1.0 mm	TR-521032
613	2,3,7,8-tetrachlorodibenzo-p-dioxin	TRB-5ms	60m x 0.25mm x 0.10 mm	TR-520162
615	Chlorinated herbicides	TRB-1701	30m x 0.53mm x 1.0 mm	TR-131035
		TRB-1701	30m x 0.25mm x 0.25 mm	TR-130232
619	Triazine herbicides	TRB-50	30m x 0.53mm x 1.0 mm	TR-501035
		TRB-50	30m x 0.25mm x 0.50 mm	TR-500532
624	Purgeables	TRB-624	30m x 0.53mm x 3.0 mm	TR-603035
		TRB-624	75m x 0.53mm x 3.0 mm	TR-603075
		TRB-624	105m x 0.53mm x 3.0 mm	TR-6030K5
		TRB-624	30m x 0.25mm x 1.4 mm	TR-601432
625	Base/neutrals and acids	TRB-5ms	30m x 0.32mm x 0.25 mm	TR-520233
		TRB-1ms	30m x 0.25mm x 0.25 mm	TR-510232
680	Pesticides and PCBs in water and soil/ sediment	TRB-5	30m x 0.32mm x 0.25 mm	TR-120233
		TRB-5ms	30m x 0.32mm x 0.25 mm	TR-520233
1624	Volatile organic compounds by isotope dilution GC/MS	TRB-624	30m x 0.53mm x 3.0 mm	TR-603035
		TRB-624	30m x 0.25mm x 1.4 mm	TR-601432
1625	Semivolatile organic compounds by isotope dilution	TRB-5	30m x 0.25mm x 0.25 mm	TR-120232
		TRB-5ms	30m x 0.25mm x 0.25 mm	TR-520232
1653	Chlorinated phenols in waste water by in-situ MS acylation and GC low bleed/MS	TRB-5	30m x 0.32mm x 0.25 mm	TR-120233
		TRB-5ms	30m x 0.32mm x 0.25 mm	TR-520233

Method	Teknokroma P/N	Teknokroma Phase Recommendation	Sample
D1983	TR-882162	**TR-CN100** 60 m x 0.25 mm x 0.2 µm	FAME analysis
D2245	TR-882162	**TR-CN100** 60 m x 0.25 mm x 0.2 µm	Oils and oil acids in solvent-reducible paints
D2267	TR-960462	**TR-TCEP** 60 m x 0.25 mm x 0.40 µm	Aromatics in light naphthas and aviation gasolines
D2306	TR-140262	**TRB-WAX** 60 m x 0.25 mm x 0.25 µm	C8 aromatic hydrocarbons
D2360	TR-140263	**TRB-WAX** 60 m x 0.32 mm x 0.25 µm	Trace impurities in monocyclic aromatic hydrocarbons and total aromatic determination
D2426	TR-111535	**TRB-1** 30 m x 0.53 mm x 1.5 µm	Butadiene dimer and styrene in butadiene concentrates
D2456	TR-141035	**TRB-WAX** 30 m x 0.53 mm x 1.0 µm	Polyhydric alcohols in alkyd resins
D2505	TR-115035	**TRB-1** 30 m x 0.53 mm x 5 µm	Ethylene, other hydrocarbons, and carbon dioxide in dioxide in high-purity ethylene
D2597		30% SE-30 on Chromosorb PAW 80/100 - Molecular Sieve 13X 45/60	Analysis of demethanozed hydrocarbon liquid mixtures containing nitrogen and carbon dioxide
D2580	TR-820423 TR-151035	**Meta.X5** 25 m x 0.32 mm x 0.4 µm **TRB-FFAP** 30 m x 0.53 mm x 1.0 µm	Phenols in water
D2600	TR-960462 TR-141223	**TR-TCEP** 60 m x 0.25 mm x 0.4 µm **TRB-WAX** 25 m x 0.32 mm x 1.2 µm	Aromatic traces in light saturated hydrocarbons
D2743	TR-882162	**TR-CN100** 60 m x 0.25 mm x 0.2 µm	Oil and oil acids
D2800	TR-882162	**TR-CN100** 60 m x 0.25 mm x 0.2 µm	FAME analysis
D2804	TR-141035 TR-571015	**TRB-WAX** 30 m x 0.53 mm x 1.0 µm **TRB-F50** 15 m x 0.53 mm x 1.0 µm	Purity of methyl ethyl ketone
D2887	TR-112645	**TRB-1** 10 m x 0.53 mm x 2.65 µm	Boiling range distribution of petroleum
Extended	TR-1108A5	**TRB-1** 5 m x 0.53 mm x 0.88 µm	
D2908	TR-601833 TR-603035 TR-140533 TR-141035	**TRB-624** 30 m x 0.32 mm x 1.8 µm **TRB-624** 30 m x 0.53 mm x 3.0 µm **TRB-WAX** 30 m x 0.32 mm x 0.5 µm **TRB-WAX** 30 m x 0.53 mm x 1.0 µm	Volatile organics in water
D2998	TR-111033	**TRB-1** 30 m x 0.32 mm x 1.0 µm	Polyhydric alcohols in alkyd resins
D2999	TR-111535	**TRB-1** 30 m x 0.53 mm x 1.5 µm	Monopentaerythritol in commercial pentaerythritol
D3009	TR-140533 TR-141035	**TRB-WAX** 30 m x 0.32 mm x 0.5 µm **TRB-WAX** 30 m x 0.53 mm x 1.0 µm	Composition of turpentine
D3054	TR-110553	**TRB-1** 50 m x 0.32 mm x 0.5 µm	Impurities in cyclohexane
D3086	TR-120752	**TRB-5** 50 m x 0.25 mm x 0.12 µm	Organochlorine pesticides in water
D3168	TR-111033 TR-111535	**TRB-1** 30 m x 0.32 mm x 1.0 µm **TRB-1** 30 m x 0.53 mm x 1.5 µm	Polymers in emulsion paints
D3257		25%Bis-(2-cyanoethyl)formamide on Chromosorb PAW	Aromatics in mineral spirits
D3271	TR-141035	**TRB-WAX** 30 m x 0.53 mm x 1.0 µm	Solvent analysis in paints
D3304	TR-120752	**TRB-5** 50 m x 0.25 mm x 0.12 µm	PCBs in environmental materials
D3328	TR-113033 TR-113035	**TRB-1** 30 m x 0.32 mm x 3.0 µm **TRB-1** 30 m x 0.53 mm x 3.0 µm	Comparison of waterborne petroleum oils
D3329	TR-141065	**TRB-WAX** 60 m x 0.53 mm x 1.0 µm	Purity of methyl isobutyl ketonespirits
D3432	TR-111033 TR-111535	**TRB-1** 30 m x 0.32 mm x 1.0 µm **TRB-1** 30 m x 0.53 mm x 1,5 µm	Toluene diisocyanates in urethane prepolymers
D3447	TR-115055	**TRB-1** 50 m x 0.53 mm x 5.0 µm	Purity of trichlorotrifluoroethane (CFC-113)
D3452	TR-111535	**TRB-1** 30 m x 0.53 mm x 1,5 µm	Identification of rubber
D3457	TR-882162	**TR-CN100** 60 m x 0.25 mm x 0.2 µm	FAME analysis
D3465	TR-115223 TR-111535	**TRB-1** 25 m x 0.32 mm x 0.52 µm **TRB-1** 30 m x 0.53 mm x 1.5 µm	Purity of monomeric plasticizers
D3524	TR-110845	**TRB-1** 10 m x 0.53 mm x 0.88 µm 10% OV-101 on Chromosorb WAW 80/100	Diesel fuel diluent used in diesel engine oil
D3525		10% Dexel 300 on Chromosorb WAW 80/100	Gasoline diluent in used gasoline engine oils
D3534	TR-120252	**TRB-5** 50 m x 0.25 mm x 0.25 µm	PCBs in water
D3606	TR-510112 TR-960462	**TRB-1ms** 15 m x 0.25 mm x 0.1 µm **TR-TCEP** 60 m x 0.25 mm x 0.4 µm	Benzene and toluene in gasoline
D3687	TR-140533 TR-141035	**TRB-WAX** 30 m x 0.32 mm x 0.5 µm **TRB-WAX** 30 m x 0.53 mm x 1.0 µm	Volatile organic compounds
D3710	TR-1150J5	**TRB-1** 7.5 m x 0.53 mm x 5.0 µm	Boiling range distribution of gasoline and gasoline fractions
D3725	TR-151035	**TRB-FFAP** 30 m x 0.53 mm x 1.0 µm	Fatty acids in drying oils
D3760	TR-140263 TR-110563	**TRB-WAX** 60m x 0.32 mm x 0.25 µm **TRB-1 60** m x 0.32 mm x 0.5 µm	Analysis of isopropylbenzene (cumene)

ASTM Methods

Method	Teknokroma P/N	Teknokroma Phase Recommendation	Sample
D3797	TR-140563	**TRB-WAX** 60 m x 0.32 mm x 0.5 µm	Analysis of o-Xylene
D3798	TR-140563 TR-140263	**TRB-WAX** 60m x 0.32 mm x 0.5 µm **TRB-WAX** 60 m x 0.32 mm x 0.25 µm	Analysis of p-Xylene
D3876	TR-111033 TR-111535	**TRB-1** 30 m x 0.32 mm x 1.0 µm **TRB-1** 30 m x 0.53 mm x 1.5 µm	Methoxyl and hydroxypropyl substitution in cellulose ether products
D3962	TR-151035	**TRB-FFAP** 30 m x 0.53 mm x 1.0 µm	Impurities in styrene
D4059	TR-120252	**TRB-5** 50 m x 0.25 mm x 0.25 µm	PCBs in insulating liquids
D4275	TR-113033 TR-113035	**TRB-1** 30 m x 0.32 mm x 3.0 µm **TRB-1** 30 m x 0.53 mm x 3.0 µm	Butylated hydroxy toluene in ethylene and ethylenevinylacetate polymers
D4367		10% SE-30 on Chromosorb WAW 80/100 25% TCEP on Chromosorb PAW 80/100	Benzene in hydrocarbon solvents
D4415	TR-150233	**TRB-FFAP** 30 m x 0.32 mm x 0.25 µm	Determination of dimer and acrylic acid
D4420	TR-510112 TR-960462	**TRB-1ms** 15 m x 0.25 mm x 0.1 µm **TR-TCEP** 60 m x 0.25 mm x 0.4 µm	Aromatics in gasoline
D4492	TR-140263	**TRB-WAX** 60 m x 0.32 mm x 0.25 µm	Analysis of benzene
D4534	TR-960462	**TR-TCEP** 60 m x 0.25 mm x 0.4 µm	Benzene content of cyclic products
D4735	TR-151035	**TRB-FFAP** 30 m x 0.53 mm x 1.0 µm	Trace thiophene in refined benzene
D4768	TR-151035	**TRB-FFAP** 30 m x 0.53 mm x 1.0 µm	Phenol and cresol inhibitors in insulating oils
D4815	TR-115035 + TCEP precolumn	**TRB-1** 30 m x 0.53 mm x 5.0 µm + **TCEP precolumn** (56cm)	MTBE, ETBE, TAME, DIPE, tert-amyl alcohol, C1-C4 alcohols in gasoline
D4864	TR-121515	**TRB-5** 15 m x 0.53 mm x 1.5 µm	Traces of methanol in propylene
D5008	TR-115045 TR-140233	**TRB-1** 10 m x 0.53 mm x 5.0 µm **TRB-WAX** 30 m x 0.32 mm x 0.25 µm	Ethyl methyl pentanol content and purity of 2-ethylhexanol
D5060	TR-140563	**TRB-WAX** 60m x 0.32 mm x 0.5 µm	Impurities in high-purity ethylbenzene
D5134	TR-110559	**TRB-50.2PONA** 50 m x 0.20 mm x 0.5 µm	Impurities in high-purity ethylbenzene
D5135	TR-140563	**TRB-WAX** 60m x 0.32 mm x 0.5 µm	Styrene analysis
D5307		10% UCW-982 on Chromosorb PAW 80/100 3% OV-1 on Chromosorb WHP 80/100 10% SE-30 on Chromosorb PAW 80/100	Boiling range distribution of crude oil-simulated distillation of crude oil through 538ºC
D5310	TR-120232 TR-252129	**TRB-5** 30 m x 0.25 mm x 0.25 µm **TRB-225** 25 m x 0.20 mm x 0.20 µm	Tar acid composition
D5399	TR-113045	**TRB-1** 10 m x 0.53 mm x 3.0 µm	Boiling point distribution of hydrocarbon solvents
D5441	TR-110592 TR-110559	**TRB-1** 100m x 0.25 mm x 0.5 µm **TRB-50.2PONA** 50 m x 0.20 mm x 0.5 µm	Analysis of MTBE
D5442	TR-110232 TR-120232	**TRB-1** 30 m x 0.25 mm x 0.25 µm **TRB-5** 15 m x 0.25 mm x 0.25 µm	Analysis of petroleum waxes
D5480	TR-115065	**TRB-1** 60 m x 0.53 mm x 5.0 µm	Engine oil volatility by GC
D5501	TR-110592	**TRB-1** 100m x 0.25 mm x 0.5 µm	Ethanol content of denatured fuel ethanol
D5504	TR-974033	**TRB-SULFUR** 30 m x 0.32 mm x 4.0 µm	Sulfur compounds in natural gas and gaseous fuels by GC and SCD
D5580	TR-115035 + TCEP precolumn	**TRB-1** 30 m x 0.53 mm x 5.0 µm + **TCEP** precolumn (56cm)	Aromatics in gasoline
D5599	TR-111062	**TRB-1** 60m x 0.25 mm x 1.0 µm	Oxygenates in gasoline by GC and oxygen selective flame ionization detector
D5623	TR-114033	**TRB-1** 30m x 0.32 mm x 4.0 µm	Sulfur compounds in light petroleum liquids by GC and sulfur selective detection
D5713	TR-110559	**TRB-50.2PONA** 50 m x 0.20 mm x 0.5 µm	Analysis of high-purity benzene for cyclohexane feedstock by capillary GC
D5769	TR-111062 TR-115063	**TRB-1** 60m x 0.25 mm x 1.0 µm **TRB-1** 60 m x 0.32 mm x 5.0 um	Determination of benzene, toluene and total aromatics in finished gasoline by GC/MS
D5917	TR-140263	**TRB-WAX** 60m x 0.32 mm x 0.25 µm	Trace impurities in monocyclic aromatic hydrocarbons by GC and external calibration
D6144	TR-111062	**TRB-1** 60m x 0.25 mm x 1.0 µm	alpha-Methylstyrene by capillary GC
D6159	TR-115035	**TRB-1** 30 m x 0.53 mm x 5.0 µm	Hydrocarbon impurities in ethylene
E0202	TR-812122	**Meta.WAX** 25 m x 0.25 mm x 0.2 µm	Analysis of glycols
E1100	TR-810535	**Meta.WAX** 30 m x 0.53 mm x 0.50 µm	Analysis of denaturated ethanol

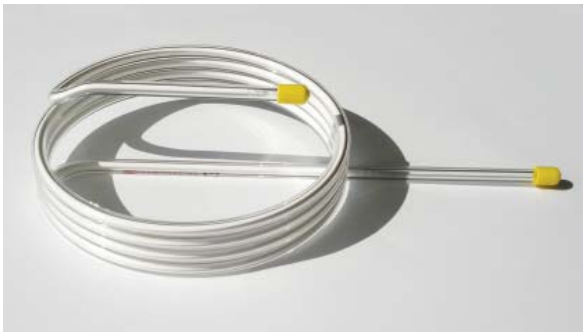
NIOSH Regulatory Methods

Method	Method Name	Teknokroma Phase Recommendation	Teknokroma P/N
1000	Allyl chloride	**TRB-624** 30 m x 0.25 mm I.D., 1.4 µm	TR-601432
1001	Methyl chloride	**TRB-624** 30 m x 0.25 mm I.D., 1.4 µm	TR-601432
1002	Chloroprene	**TRB-624** 30 m x 0.25 mm I.D., 1.4 µm	TR-601432
1003	Halogenated hydrocarbons	**TRB-624** 30 m x 0.25 mm I.D., 1.4 µm	TR-601432
1004	sym-Dichloroethyl ether	**TRB-624** 30 m x 0.25 mm I.D., 1.4 µm	TR-601432
1005	Methylene chloride	**TRB-624** 30 m x 0.25 mm I.D., 1.4 µm	TR-601432
1006	Trichlorofluoromethane	**TRB-624** 30 m x 0.25 mm I.D., 1.4 µm	TR-601432
1007	Vinyl chloride	**TRB-624** 30 m x 0.25 mm I.D., 1.4 µm	TR-601432
1008	Ethylene dibromide	**TRB-624** 30 m x 0.25 mm I.D., 1.4 µm	TR-601432
1009	Vinyl bromide	**TRB-624** 30 m x 0.25 mm I.D., 1.4 µm	TR-601432
1010	Epichlorohydrin	**SupraWAX-280** 15 m x 0.32 mm I.D., 0.5 µm	TR-830513
1011	Ethyl bromide	**TRB-624** 30 m x 0.25 mm I.D., 1.4 µm	TR-601432
1012	Dibromodifluoromethane	**TRB-624** 30 m x 0.25 mm I.D., 1.4 µm	TR-601432
1013	1,2-Dichloropropane	**TRB-624** 30 m x 0.25 mm I.D., 1.4 µm	TR-601432
1014	Methyl iodide	**TRB-624** 30 m x 0.25 mm I.D., 1.4 µm	TR-601432
1015	Vinylidine chloride	**TRB-624** 30 m x 0.25 mm I.D., 1.4 µm	TR-601432
1016	1,1,1,2-Tetrachloro-2,2-difluoroethane and 1,1,2,2-Tetrachloro-1,2-difluoroethane	**TRB-624** 30 m x 0.25 mm I.D., 1.4 µm	TR-601432
1017	Bromotrifluoromethane	**TRB-624** 30 m x 0.25 mm I.D., 1.4 µm	TR-601432
1018	Dichlorodifluoromethane and 1,2-Dichlorotetrafluoroethane	**TRB-624** 30 m x 0.25 mm I.D., 1.4 µm	TR-601432
1019	1,1,2,2-Tetrachloroethane	**TRB-624** 30 m x 0.25 mm I.D., 1.4 µm	TR-601432
1020	1,1,2-Trichloro-1,2,2-trifluoroethane	**TRB-624** 30 m x 0.25 mm I.D., 1.4 µm	TR-601432
1022	Trichloroethylene	**TRB-624** 30 m x 0.25 mm I.D., 1.4 µm	TR-601432
1300	Ketones 1	**SupraWAX-280** 30 m x 0.32 mm I.D., 0.5 µm	TR-830533
1301	Ketones 2	**SupraWAX-280** 30 m x 0.32 mm I.D., 0.5 µm	TR-830533
1400	Alcohols 1	**SupraWAX-280** 30 m x 0.32 mm I.D., 0.5 µm	TR-830533
1401	Alcohols 2	**SupraWAX-280** 30 m x 0.32 mm I.D., 0.5 µm	TR-830533
1402	Alcohols 3	**SupraWAX-280** 30 m x 0.32 mm I.D., 0.5 µm	TR-830533
1403	Alcohols 4	**SupraWAX-280** 15 m x 0.32 mm I.D., 0.5 µm	TR-830513
1450	Esters 1	**SupraWAX-280** 30 m x 0.32 mm I.D., 0.5 µm	TR-830533
1500	Hydrocarbons, BP 36-126ºC	**TRB-1** 30 m x 0.25 mm I.D., 0.25 µm	TR-110232
1501	Hydrocarbons, aromatic	**Meta.X5** 30 m x 0.25 mm I.D., 0.25 µm	TR-820232
1550	Naphthas	**TRB-1** 60 m x 0.25 mm I.D., 0.25 µm	TR-110262
1551	Turpentine	**TRB-1** 60 m x 0.25 mm I.D., 0.25 µm	TR-110262
1602	Dioxane	**SupraWAX-280** 15 m x 0.32 mm I.D., 0.5 µm	TR-830513
1603	Acetic acid	**TRB-FFAP** 15 m x 0.25 mm I.D., 0.25 µm	TR-150212
1604	Acrylonitrile	**SupraWAX-280** 15 m x 0.32 mm I.D., 0.5 µm	TR-830513
1606	Acetonitrile	**SupraWAX-280** 15 m x 0.32 mm I.D., 0.5 µm	TR-830513
1608	Glycidol	**SupraWAX-280** 15 m x 0.32 mm I.D., 0.5 µm	TR-830513
1609	Tetrahydrofuran	**TRB-1** 15 m x 0.25 mm I.D., 0.25 µm	TR-110212
1610	Ethyl ether	**SupraWAX-280** 15 m x 0.32 mm I.D., 0.5 µm	TR-830513
1611	Methylal	**SupraWAX-280** 15 m x 0.32 mm I.D., 0.5 µm	TR-830513
1612	Propylene oxide	**SupraWAX-280** 15 m x 0.32 mm I.D., 0.5 µm	TR-830513
1613	Pyridine	**SupraWAX-280** 15 m x 0.32 mm I.D., 0.5 µm	TR-830513
1614	Ethylene oxide	**SupraWAX-280** 15 m x 0.32 mm I.D., 0.5 µm	TR-830513
1615	Methyl-tert-butyl ether	**SupraWAX-280** 15 m x 0.32 mm I.D., 0.5 µm	TR-830513
2000	Methanol	**SupraWAX-280** 15 m x 0.32 mm I.D., 0.5 µm	TR-830513
2001	Cresol, all isomers	**SupraWAX-280** 30 m x 0.32 mm I.D., 0.5 µm	TR-830232
2002	Amines, aromatic	**Meta.X5** 30 m x 0.25 mm I.D., 1.0 µm	TR-821032
2003	1,1,2,2-Tetrabromoethane	**TRB-624** 30 m x 0.25 mm I.D., 1.4 µm	TR-601432
2004	Dimethylacetamide and dimethylformamide	**SupraWAX-280** 15 m x 0.32 mm I.D., 0.5 µm	TR-830513
2005	Nitrobenzenes	**SupraWAX-280** 15 m x 0.32 mm I.D., 0.5 µm	TR-830513
2007	Aminoethanol compounds	**TRB-1** 15 m x 0.25 mm I.D., 1.0 µm	TR-111012
2500	2-Butanone	**SupraWAX-280** 15 m x 0.32 mm I.D., 0.5 µm	TR-830513
2501	Acrolein	**SupraWAX-280** 15 m x 0.32 mm I.D., 0.5 µm	TR-830513
2503	Acrolein	**Meta.X5** 15 m x 0.25 mm I.D., 0.25 µm	TR-820212
2504	Tetraethyl pyrophosphate	**TRB-1** 15 m x 0.25 mm I.D., 0.25 µm	TR-110212

NIOSH Regulatory Methods

Method	Method Name	Teknokroma Phase Recommendation	Teknokroma P/N
2505	Furfuryl alcohol	**SupraWAX-280** 15 m x 0.32 mm I.D., 0.5 µm	TR-830513
2506	Acetone cyanohydrin	**TRB-1** 15 m x 0.25 mm I.D., 1.0 µm	TR-111012
2507	Nitroglycerine and ethylene glycol dinitrate	**SupraWAX-280** 15 m x 0.32 mm I.D., 0.5 µm	TR-830513
2508	Isophorone	**TRB-1** 15 m x 0.25 mm I.D., 0.25 µm	TR-110212
2510	1-Octanethiol	**Meta.X5** 15 m x 0.25 mm I.D., 0.25 µm	TR-820212
2513	Ethylene chlorohydrin	**SupraWAX-280** 15 m x 0.32 mm I.D., 0.5 µm	TR-830513
2515	Diazomethane	**TRB-1** 15 m x 0.32 mm I.D., 0.25 µm	TR-110213
2516	Dichlorofluoromethane	**TRB-624** 30 m x 0.25 mm I.D., 1.4 µm	TR-601432
2517	Pentachloroethane	**Meta.X5** 30 m x 0.25 mm I.D., 0.5 µm	TR-820532
2518	Hexachloro-1,3-cyclopentadiene	**TRB-624** 30 m x 0.25 mm I.D., 1.4 µm	TR-601432
2519	Ethyl chloride	**TRB-624** 30 m x 0.25 mm I.D., 1.8 µm	TR-601833
2520	Methyl bromide	**TRB-624** 30 m x 0.25 mm I.D., 1.8 µm	TR-601833
2521	Methylcyclohexanone	**SupraWAX-280** 30 m x 0.32 mm I.D., 0.5 µm	TR-830533
2522	Nitrosamines	**Meta.X5** 30 m x 0.25 mm I.D., 0.5 µm	TR-820532
2523	1,3-Cyclopentadiene	**TRB-1** 15 m x 0.32 mm I.D., 1.0 µm	TR-111013
2524	Dimethylsulfate	**SupraWAX-280** 15 m x 0.32 mm I.D., 0.5 µm	TR-830513
2525	1-Butanethiol	**TRB-1** 15 m x 0.32 mm I.D., 1.0 µm	TR-111013
2526	Nitroethane	**SupraWAX-280** 15 m x 0.32 mm I.D., 0.5 µm	TR-830513
2527	Nitromethane	**Meta.X5** 30 m x 0.25 mm I.D., 0.25 µm	TR-820232
2528	2-Nitropropane	**Meta.X5** 30 m x 0.25 mm I.D., 0.25 µm	TR-820232
2529	Furural	**SupraWAX-280** 30 m x 0.32 mm I.D., 0.5 µm	TR-830533
2530	Biphenyl	**Meta.X5** 15 m x 0.25 mm I.D., 0.25 µm	TR-820212
2531	Gluteraldehyde	**SupraWAX-280** 30 m x 0.32 mm I.D., 0.5 µm	TR-830533
2533	Tetraethyl lead (as Pb)	**TRB-1** 15 m x 0.25 mm I.D., 0.25 µm	TR-110212
2534	Tetramethyl lead (as Pb)	**TRB-1** 15 m x 0.25 mm I.D., 0.25 µm	TR-110212
2536	Valeraldehyde	**SupraWAX-280** 15 m x 0.32 mm I.D., 0.5 µm	TR-830513
2537	Methylmethacrylate	**SupraWAX-280** 15 m x 0.32 mm I.D., 0.5 µm	TR-830513
2538	Acetaldehyde	**TRB-1301** 15 m x 0.32 mm I.D., 1.0 µm	TR-601013
2539	Aldehydes, Screening	**TRB-1** 30 m x 0.32 mm I.D., 0.25 µm	TR-110232
2541	Formaldehyde	**TRB-1701** 30 m x 0.25 mm I.D., 0.25 µm	TR-130232
3502	Phenol	**Meta.X5** 15 m x 0.25 mm I.D., 0.25 µm	TR-820212
3700	Benzene	**SupraWAX-280** 15 m x 0.32 mm I.D., 0.5 µm	TR-830513
3702	Ethylene oxide	**SupraWAX-280** 30 m x 0.32 mm I.D., 0.5 µm	TR-830533
4000	Toluene	**TRB-5** 30 m x 0.25 mm I.D., 0.25 µm	TR-120232
5012	EPN, malathion, and parathion	**Meta.X5** 15 m x 0.25 mm I.D., 0.25 µm	TR-820212
5014	Chlorinated terphenyl (60% chlorine)	**Meta.X5** 15 m x 0.25 mm I.D., 0.25 µm	TR-820212
5017	Dibutyl phosphate	**Meta.X5** 15 m x 0.25 mm I.D., 0.25 µm	TR-820212
5019	Azelaic acid	**TRB-1** 15 m x 0.32 mm I.D., 0.25 µm	TR-110213
5020	Dibutyl phthalate and Di (2-ethylhexyl) phthalate	**Meta.X5** 15 m x 0.25 mm I.D., 0.25 µm	TR-820212
5021	o-Terphenyl	**TRB-1** 30 m x 0.25 mm I.D., 0.25 µm	TR-110232
5025	Chlorinated diphenyl ether	**Meta.X5** 15 m x 0.25 mm I.D., 0.25 µm	TR-820212
5029	4,4-Dimethylenedianiline	**TRB-5** 15 m x 0.25 mm I.D., 0.25 µm	TR-120212
5500	Ethylene glycol	**SupraWAX-280** 15 m x 0.32 mm I.D., 0.5 µm	TR-830513
5502	Aldrin and lindane	**Meta.X5** 15 m x 0.25 mm I.D., 0.25 µm	TR-820212
5503	Polychlorobiphenyls	**Meta.X5** 30 m x 0.25 mm I.D., 0.25 µm	TR-820232
5506	Polynuclear aromatic hydrocarbons	**Meta.X5** 30 m x 0.25 mm I.D., 0.25 µm	TR-820232
5509	Benzidine and 3,3-dichlorobenzidine	**TRB-5** 15 m x 0.53 mm I.D., 1.5 µm	TR-121515
5510	Chlordane	**Meta.X5** 15 m x 0.25 mm I.D., 0.25 µm	TR-820212
5514	Demeton	**TRB-5** 15 m x 0.25 mm I.D., 0.25 µm	TR-120212
5515	Polynuclear aromatic hydrocarbons (in the presence of isocyanates)	**Meta.X5** 30 m x 0.25 mm I.D., 0.25 µm	TR-820232
5516	2,4- and 2,6-Toluenediamine	**TRB-5** 30 m x 0.25 mm I.D., 0.25 µm	TR-120232
5517	Polychlorobenzenes	**TRB-1** 15 m x 0.25 mm I.D., 0.25 µm	TR-110212
5518	Naphthylamines	**Meta.X5** 30 m x 0.25 mm I.D., 0.25 µm	TR-820232
5519	Endrin	**Meta.X5** 30 m x 0.25 mm I.D., 0.25 µm	TR-820232

Packed Columns - Solid Supports for USP Methods



DESCRIPTION	SOLID SUPPORT	USP CODE
Siliceous earth	Silcoport® Chromosorb® WHP	**S1A**
Siliceous earth, treated as S1A and both acid-and base-washed	Silcoport® WBW	**S1AB**
Crushed firebrick, calcined or burned with a clay binder above 900ºC, acid-washed, may be silanized	Chromosorb® PAW DMDCS	**S1C**
Untreated siliceous earth	Chromosorb® W NAW	**S1NS**
Styrene-divinylbenzene copolymer with nominal surface area of less than 50m2/g an ave. pore diameter of 0.3 - 0.4 **m**m	Chromosorb® 101	**S2**
Styrene-divinylbenzene copolymer with nominal surface area of 500 to 600m2/g and ave. pore diameter of 0.0075 **m**m	Hayesep® Q Porapack® Q	**S3**
Styrene-divinylbenzene copolymer with aromatic -0 and -N groups having a nominal surface area of 400 to 600m2/g and ave. pore diameter of 0.0076 **m**m	Hayesep® R Porapack® R	**S4**
High molecular weight tetrafluorethylene polymer, 40-60 mesh	Chromosorb® T	**S5**
Styrene-divinylbenzene copolymer with nominal surface area of 250-350m2/g and ave. pore diameter of 0.0091 **m**m	Chromosorb® 102, Porapack®, Hayesp®, CarboBlack®	**S6**
Graphitized carbon having a nominal surface area of 12m2/g	CarboBlack®	**S7**
Copolymer of 4-vinyl-pyridine and styrene divinylbenzene	Hayesep® S, Porapack® S	**S8**
Porous polymer based on 2,6-diphenyl-p-phenylene oxide	Tenax® TA	**S9**
Highly cross-linked copolymer of acrylonitrite and divinylbenzene	Hayesep® C	**S10**
Graphitized carbon having a nominal surface area of 100m2/g, modified with small amounts of petrolatum and polyethylene glycol compound	CarboBlack® B 80/120 3%Rt 1500	**S11**
Graphitized carbon having a nominal surface area of 100m2/g	CarboBlack® B	**S12**

TK Packed Columns

These columns have been used for the last 50 years in all kinds of analyses for gas chromatography.

"Packed colum use today is understandable due to the wide range of solid support packings available and to their high on-column sample capacity. These aspects make packed columns quite versatile for a wide range of applications".

"Today Packed columns are still demostrating their utility in the solution of many analytical problems where it is not necessary to use the high resolution of capillary columns".

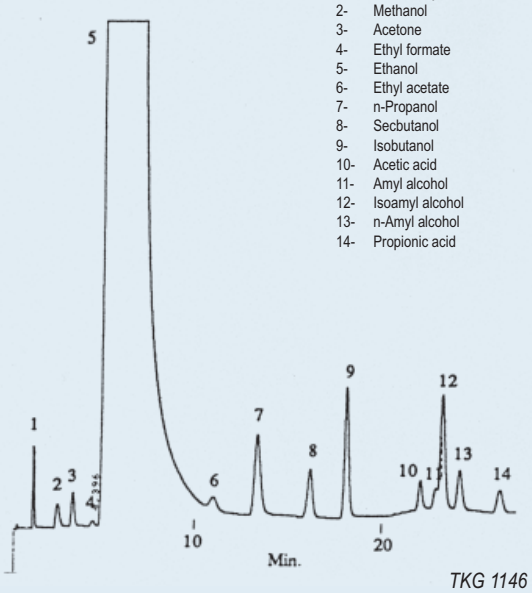
"Teknokroma has packed columns since its beginnings and have always provided a wide range and latest advantages in this area of gas chromatography. Within these new advances we showcase the latest advance in micro-packed columns (0,75mm and 1,00mm ID) and new bonded phase packings".

PACKED COLUMNS

Column: 5% Carbowax 20M CarboBlack B/AW, 80/120 mesh
Dimensions: 2m x 1/8" OD X 2mm ID, (Silcosteel)
Injection: 1 µl standard, 175ºC
Carrier Gas: He, 15mL/min
Oven temperature: 60ºC(6min) @ 10ºC/min to 150ºC(7min)
Detector: FID, 175ºC

Peak Name

1- Acetaldehyde
2- Methanol
3- Acetone
4- Ethyl formate
5- Ethanol
6- Ethyl acetate
7- n-Propanol
8- Secbutanol
9- Isobutanol
10- Acetic acid
11- Amyl alcohol
12- Isoamyl alcohol
13- n-Amyl alcohol
14- Propionic acid



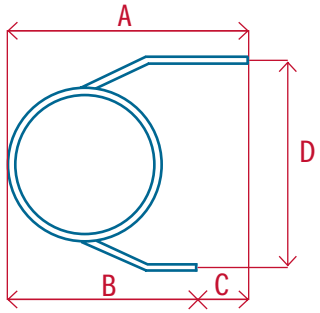
TKG 1146

WE CAN SUPPLY YOU ANY KIND OF COLUMNS... JUST ASK FOR THEM!

Tubing	External Diameter (OD)	Internal Diameter (ID)
Glass	1/4"	2mm, 3mm and 4mm
Stainless Steel	1/4" and 1/8"	4mm, 3mm and 2mm
Silcosteel®	1/4" and 1/8"	5.2mm and 2mm
	1/16"	0.75mm and 1mm
Nickel, Teflon and Copper	1/8"	2 mm

Columns can be delivered pre-conditioned or conditioned and proved at an extra cost (please inquire).

To Order a Packed Column Specify the Following



Physical Dimensions

A: _____
B: _____
C: _____
D: _____

Chromatograph manufacturer:

Model: _____
Tubing material: _____
Length: _____ O.D. _____ I.D. _____

Packing Description

Percentage of coating: _____ Phase: _____
Support: _____
Treatment (WAW,,WHP,,): _____ Mesh size: _____

Comments:

_____

DESCRIPTION	T LIMITS (°C)	USP CODE
Alltech AT™-1000	50/250	G35
Apiezon® L	50/300	-
Apiezon® M	50/300	-
Bentone 34	0/180	-
N,N-bis-(2-Cyanoethyl)formamide (BCEF)	20/125	-
N,N-bis-(p-Methoxybenzylidene)-a,a'-bi-p-toluidine (BMBT)	150	-
Bis-(2-ethoxyethyl) Adipate (BEEA)	150	-
Bis-(2-methoxyethyl) Adipate (BMEA)	150	-
Carbowax® 400	20/100	G20
Carbowax® 540	40/175	G39
Carbowax® 600	20/125	-
Carbowax® 1000	40/150	G14
Carbowax® 1540	50/175	G39
Carbowax® 3350	60/200	G15
Carbowax® 6000	60/200	-
Carbowax® 20M	60/225	G16
Carbowax® 20M-TPA	60/250	G25
DC-200, 350cstk (Methyl)	20/250	-
DC-200, 500cstk (Methyl)	20/250	-
DC-550, (25%-Phehyl)	20/225	G28
Dexsil® 300GC	50/400	G33
Di-n-butyl Maleate	20/50	-
Di-n-decyl phthalate	10/175	-
Di(2-ethylhexyl)sebacate	0/125	G11
Diethyleneglycol Adipate	20/210	-
Diethyleneglycol Succinate	20/200	G4
Diglycerol	20/100	-
2,4-Dimethylsulfonate	0/50	-
Dinonyl Phthalate	20/150	-
Diisodecyl Phthalate	20/150	G24
Ethyleneglycol Adipate	100/210	G40
Ethyleneglycol Succinate	100/210	-
Fluorad FC-431	40/200	-
FFAP	50/250	G35
Halocarbon oil 14-25	150	-
Igepal® CO-630	30/200	-
Igepal® CO-880 (Nonoxynol)	100/200	G31
Igepal® CO-990	100/200	-
Kel-F® Oil No.10	100	-
Neopentylglycol Succinate	50/230	G21
OV™-1 (Methyl gum)	100/350	G2
OV™-17 (50% phenyl)	20/350	G3
OV™-17-Vinyl (50% phenyl)	300+	-

DESCRIPTION	T LIMITS (°C)	USP CODE
OV™-25 (75% phenyl)	300	G17
OV™-101 (Methyl fluid)	20/350	G1
OV™-210 (50% Trifluoropropyl)	20/275+	G6
OV™-225 (25% phenyl, 25% cyanopropyl methyl)	20/250+	G19
OV™-275 (Dicyanoallyl)	250+	-
OV™-1701	0/250	-
b,b-Oxydipropionitrile	0/75	-
Phenyldiethanolamine Succinate	0/230	G12
Polyethylene glycol adipate	0/225	G23
Polyethyleneimine	0/175	-
Polyphenyl ether (5 rings) OS-124	0/200	-
Polyphenyl ether (6 rings) OS-138	0/225	-
Polypropylene glycol	0/150	-
Polypropyleneimine	0/200	-
QF-1 (50% Trifluoropropyl)	20/250	-
SE-30 (Methyl gum)	75/300	-
SE-30 (GC grade)	75/300	G2
SE-52 (5% Phenyl)	50/300	G27
SE-54 (5% Phenyl, 1% Vinyl)	50/300	G36
Sebaconitrile	150	-
Silar® 5CP (50% Cyanopropyl Phenyl Silicone)	50/250	G7
Silar® 9CP (90% Cyanopropyl Phenyl Silicone)	50/250	G8
Silar® 10C (100% Cyanopropyl Silicone)	50/250	G5
Sorbitol	100/150	G13
SP-1200	25/200	-
SP-2100 (Methyl silicone)	0/350	G1
SP-2300 (Polycyanopropylphenylsiloxane)	20/275	G7
SP-2330 (Poly(80%-biscyanopropyl-20%-cyanopropylphenyl)siloxane	25/275	G8
SP-2340 (Polybiscyanopropylsiloxane)	25/275	G5
Squalene	20/150	-
SUPEROX® 4 (4.000.000 MW)	300	-
SUPEROX® 20M (20.000 MW)	60/250	-
Tetracyanoethylated Pentaerythritol (TCEPE)	30/150	-
Tetrahydroxyethylethylene Diamine (THEED)	125	-
1,2,3-Tris-(2-cyanoethoxy)propane (TCEP)	20/180	-
Triton® X-100	0/200	
Triton® X-305 (Octylphenoxy Polyethoxy-ethanol)	20/250	-
UC W-98 (UC-W982)	80/300+	G9
UCON LB-1800-X (Polyalkylene Glycol)	200	G18
Versamid® 900	275	-

For other stationary phases please inquire