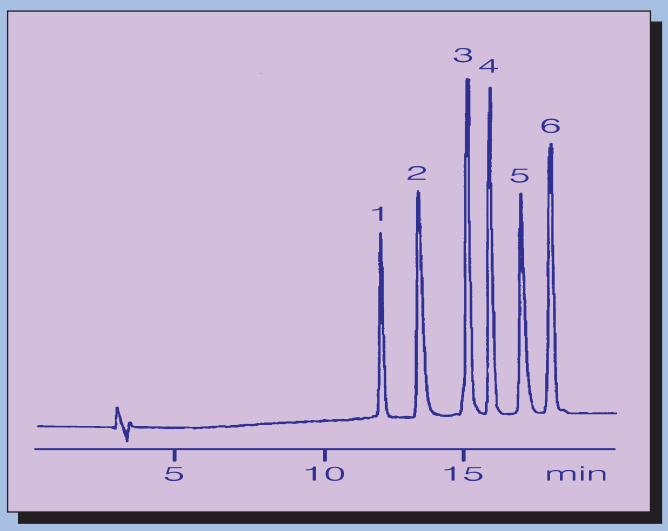
Tailor-made, customized columns for particular applications

In order to ensure the validity of HPLC results over an extended period of time, not only is the reproducibility of filling the column important but also to a high degree the batch-to-batch reproducibility of the packing material itself, whereby excellent resolution, respectively high efficiency and long stand times must be taken for granted. This is particularly true for the analysis of complex mixtures such as pesticides, polyaromatic hydrocarbons, amino acids, etc. For a range of selected applications, the time and effort of optimisation of the separation (selection of stationary phase, eluent composition, flow rate, temperature, etc.) may be eliminated simply by choosing the appropriate ***GROM*** special column. These columns are packed with stationary phases especially developed in our R&D laboratories for a particular application. The stationary phases are subjected to stringent quality control in order to guarantee the absolute reproducibility of their selectivity for the separation in question. Each special column is accompanied by a detailed protocol of the chromatographic conditions and, where applicable, the conditions of derivatization.
GROM special columns are available in both the standard ***NovoGROM*** hardware or as ***NovoGROM*** cartridges for use with quick connectors in the sizes 2, 3 and 4 mm internal diameter. (Please enquire for other dimensions, e.g., ***NovoGROM*** Microbore or ***NovoGROM*** capillary columns.)

I. Biochemical applications

Proteins and peptides

10 129 Peptide Separation



1) Oxytocin
2) Bradykinin
3) Angiotensin
4) Eledoisin
5) Neurotensin
6) Angiotensin I

Column phase:		GROM-Bio RP-1 (C18), 5 µm
Column size:		250 x 2 mm
Eluent	**A:**	0.1% TFA in H_2O
	B:	0.1% TFA in H_2O /ACN = 30 / 70
Gradient:		5 - 100% B (0-30 min)
Flow rate:		0.3 ml/min
Pressure:		16 MPa
Temperature:		RT
Detection (UV):		210 nm
Injection:		10 µl (= 10 pMol)

Stationary phase	Field of application	Order number
GROM-Bio Reversed Phase I widepore C18	small polypeptides, nucleotides	GS BR 1 0530 K 2502 250 x 2 mm cartridge
GROM-Bio Reversed Phase II widepore C8	peptides, medium sized proteins	GS BR 2 0530 K 2502 250 x 2 mm cartridge
GROM Bio Reversed Phase III widepore C4	proteins (MW 3 000 Dalton)	GS BR 3 0530 K 2502 250 x 2 mm cartridge

Amino acids

For detailed information see pages 53-67.

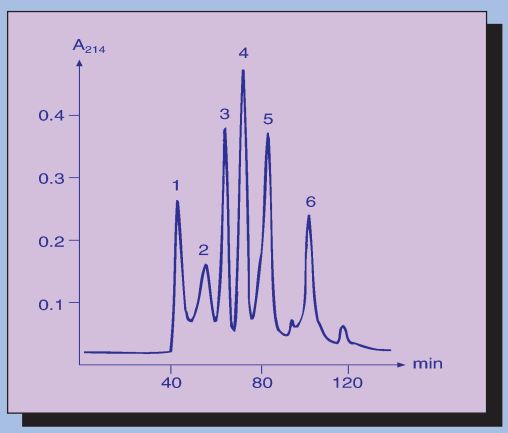
High performance prepacked size exclusion chromatography column

Novarose™ SE - 100/17 for Size Exclusion Chromatography

Superior performance in purification, molecular weight determination and fast desalting of peptides and proteins

A new emulsification and crosslinking method has made it possible to modify highly purified agarose and to produce small, spherical beads, thereby decreasing pore size and particle size while keeping the matrix volume low. Thus, outstanding results are obtained employing ***Novarose SE*** in high performance size exclusion chromatography. *Novarose ™ SE* - 100 / 17 columns are designed for analytical and semi-preparative separations of biopolymers such as proteins in the 10,000 to 100,000 Daltons molecular weight range. Due to the low diffusion coefficients involved, protein separation requires comparatively ***low flow rates*** to give ***high resolution*** in size exclusion chromatography. This is especially true when highly heterogeneous samples are applied. Nevertheless, impurities, which are always of interest but hidden at higher flow rates, can easily be detected at relative low flow rates.

10 184 Analytical separation of protein mixture



Experimentals conditions: **column:** Novarose ™ SE - 100 / 17–300 x 8 mm; **eluent:** 0.05 M Na-phosphate pH 6.7, 0.15 M NaCl; **flow rate:** 0.25 ml / min; **temperature:** ambient; **detection (UV):** 214 nm; **sample injected:** mixture of 1) 24.6 µg, thyroglobulin, 2) 24.6 µg aldolase, 3) 12.3 µg ovalbumin, 4) 12.4 µg carbonic anhydrase, 5) 24.0 µg ribonuclease and 25.0 µg insulin dissolved in 80 µl eluent buffer.

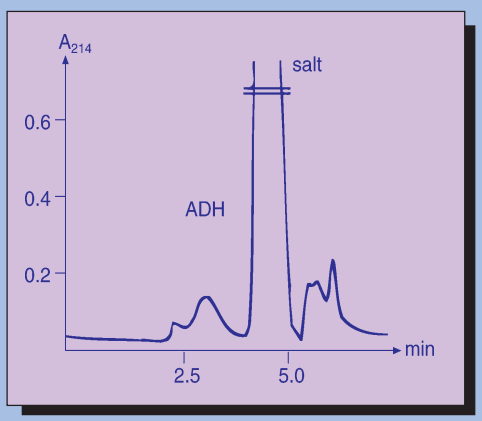
The following table summarizes the separation efficiency for carbonic anhydrase (peak 4) at different flow rates. Decreasing the flow rate clearly demonstrates the slower diffusion rate of larger molecules. The efficiency nearly doubles when reducing the flow rate by half.

Data of resolution of proteins

flow rate [ml / min]	resolution between two successive peaks 2 / 3	3 / 4	4 / 5	5 / 6	efficiency* N / m
1.00	0.44	0.56	0.71	1.08	1420
0.50	0.54	0.79	0.91	1.16	2900
0.25	0.77	0.96	1.11	0.89	4267
0.10	0.96	1.30	1.46	1.88	8113
0.05	1.11	1.34	1.57	2.00	8317

* calculated on carbonic anhydrase, peak 4 (same experimental conditions as in Applic. 10 184)

10 186 Desalting of alcohol dehydrogenase

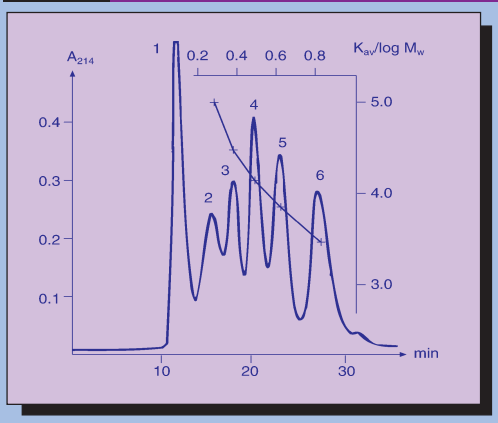


However, often speed is also considered as an important parameter in chromatographic procedures especially for less complex separations, such as the removal of salt from a biopolymer preparation or buffer exchange. A quick and simple desalting step is often required prior to enzymatic digestion. The rigidity and chemical stability of the ***Novarose SE*** also make it ideal for high flow rates or use with extreme pH values. Thus, the figure „desalting of alcohol-dehydrgenase" shows the facile removal of 6 M guanidinum hydrochloride and dithiotreitol from alcohol dehydrogenase within a few minutes (flow rate 4,0 ml/min).

10 185 Protein molecular weight determination

This figure represents an easy, quick method for the determination of molecular weights of globular proteins. The K_{av} values for the different proteins in the mixture are calculated and plotted against the logarithm of their molecular weight. Good linearity is shown in the recommended separation range.

Experimental conditions:
s. above, except 0.5 ml/min flow rate



II. *GROM* Gel Permeation Chromatography (GPC)

... to meet all the needs of highly sophisticated Polymer Analysis

NovoGROM-GPC columns are packed with novel **styrol divinylbenzene copolymer** packings. The spherical, macroporous particles show excellent, narrow particle and pore size distributions, therefore guaranteeing:

- **Extraordinary performance, i.e., superior resolution**
- **Excellent reproducibility**
- **Unique mechanical and chemical strength/stability**
- **High solvent compatibility**
- **Long column durability/life time**

These features are, as always additionally enhanced by ***GROM***'s quick delivery and prompt, cost-saving refill service. Specially designed, easy-to-handle column hardware enables the optimal flow diversion needed for high resolution. These individually tested columns are normally packed and shipped in tetrahydrofuran (THF). However, upon request, they can be packed in other solvents as well. **Note!** Water or alcohols must never be used as eluents.

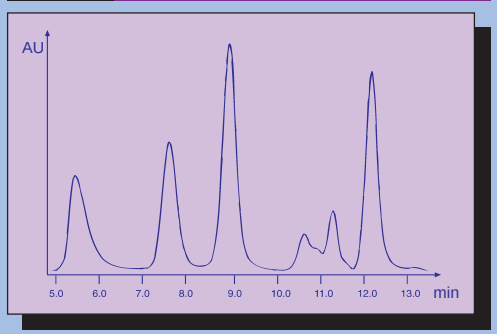
Description

Product	Particle Size [µm]	Mol. Weight [Dalton]
NovoGROM- GPC - 100 Å	5 / 10	< 3 x 10^3
NovoGROM- GPC - 500 Å	5 / 10	< 2 x 10^4
NovoGROM- GPC - 1,000 Å	5 / 10	1 x 10^3–4 x 10^4
NovoGROM- GPC - 10,000 Å	5 / 10	4 x 10^3–5 x 10^5
NovoGROM- GPC - 100,000 Å	5 / 10	1 x 10^4–2 x 10^6
NovoGROM- GPC - 1,000,000 Å	5 / 10	2 x 10^5–1 x 10^7

Specifications

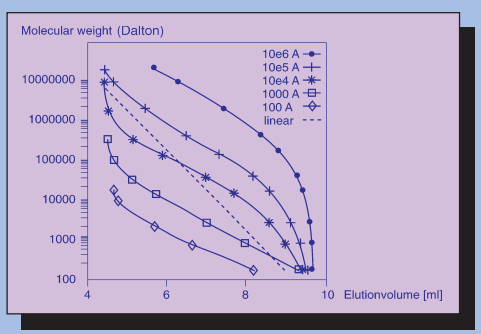
Parameters	Particle Size [5 µm]	[10 µm]
Efficiency [N/m], min.	55 000	35 000
typically	> 65 000	> 40 000
Maximum Pressure.	160	160
typical pressure drop / 30 cm	25	15
Maximum Lin. Flow. [cm/min]	3	6
Temperature [°C]	< 100°	< 140°

10 187 Polystyrol separation



Column phase: Linear, 5 µm
Column size: 300 x 8 mm
Sample: mixture of polystyrols
Eluent: THF
Flow rate: 1 ml / min
Detection: RI
Temperature: 25°C

Calibration curves of polystyrols
(column: 300 x 8 mm)



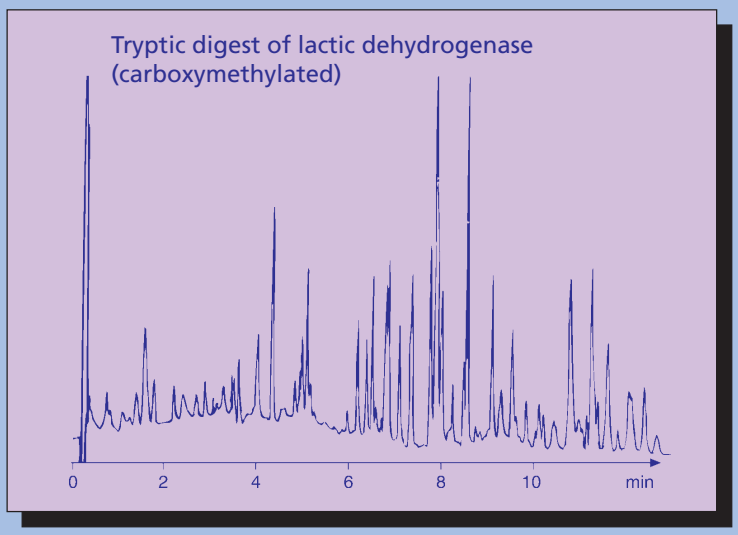
Field of application

Solvents commonly used	Applications
Tetrahydrofuran	styrols, (meth-)acrylates, dienes, PVC, PIB, PC, phenol resins, cellulose esters, tricarbanilates, epoxide resins, polysilanes, PEG
Chloroalkanes	styrols, (meth-)acrylates, dienes, PVC, PIB, PC, polyphenylene oxide etc.
Dioxane	Cl-butadiene, vinyl acetate
Methylethyl ketone	styrols, etc.
Ethyl acetate	styrols, etc.
Cyclohexane	dienes, etc.
Benzene	styrols, dienes, PIB
Toluene	styrols, dienes, PIB, phenylene oxides, silicones
Xylene	styrols, dienes, PIB, phenylene oxides, silicones
o-Dichlorbenzene	styrols, ethylenes, propylenes, EPR, PIB, asphalt, wax
Trichlorbenzene	styrols, ethylenes, propylenes, EPR, PIB, asphalt, wax
m-Kresol	styrols, polyamides, polyesters, photoresists
Chinoline	styrols
Dimethylformamide	APS, PAN, PEO, polysulfones, polyvinyl pyrrolidones, polyurethanes, melamine and phenolic resins
Dimethylacetamide	APS, PAN, PEO, polysulfones, polyviny lpyrrolidones, polyurethanes, melamine and phenolic resins
N-Methylpyrrolidone	polyimide, poly-THF, polyvinyl pyrrolidone, saccharides
Dimethylsulfoxide	gelatin, lignin, starch, polysaccharides
Hexafluoro-iso-propanol	melamine resins, polyamides, polyesters, polyketones

III. Novel High Performance High Speed

either by uniformly spherical, porous 1.5 µm ODS particles or by fully spherical, non-porous 1.5 µm ODS particles packed in the unique, out-standing NovoGROM 33 x 2.0 mm or resp. 33 x 4.6 mm column hardware

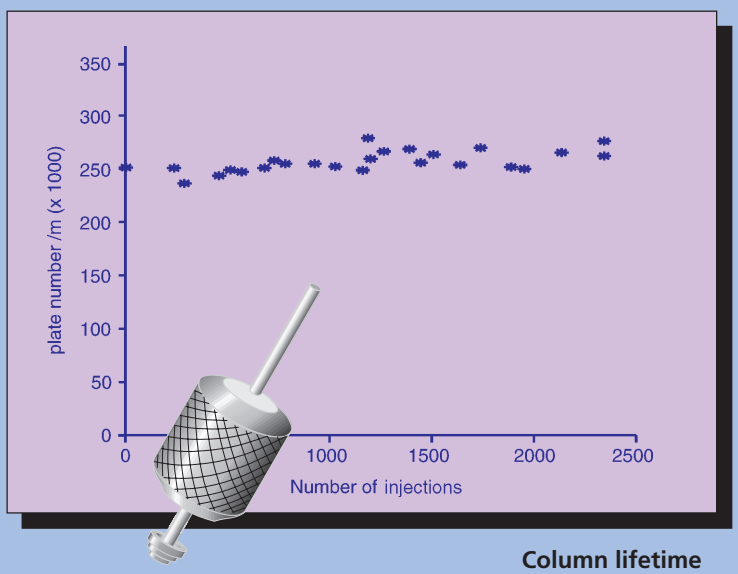
For high-speed, high-resolution HPLC two types of uniformly spherical **1,5 µm *GROM*-Sil ODS-2 FE** particles are available, either fully porous micro-spheres (pore size 100 Å / particle size 1.5 ± 0.3 µm, specific surface area of 200 m^2/g) or monodisperse **non-porous** beads (particle size 1.5 ± 0.05 µm, specific surface area of 2.1 m^2/g). Both are fully end-capped C18 phases meeting all the requirements of the most advanced high performance liquid chromatography applications. For instance, in a minimum of analysis time, they perform excellent separations of nucleotides, peptides, proteins, pharmaceuticals, etc.



10 179 Peptides, tryptic digested

Column phase:	GROM-SIL 100 ODS-2 FE, 1.5 µm
Column size:	33 x 4.6 mm
Eluent A:	H_2O, 0.1% TFA
Eluent B:	ACN, 0.1% TFA
Gradient:	0–15 min, 5–60% B
Flow rate:	1ml/min
Detection (UV):	215 nm
Temperature:	RT
Injection:	2 µl

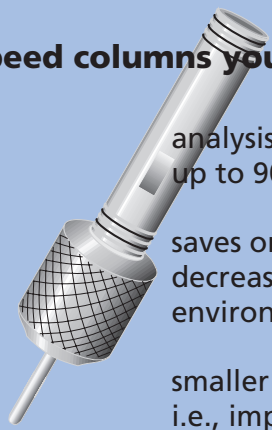
Even after more than 2 500 injections, both types of columns packed with either 1.5 µm porous- or 1.5 µm non-porous particles still show excellent physical and chemical stability (even in 0.1% TFA containing eluents). There is no change in retention time and practically no increase in pressure drop and peak asymmetry over the life of the column. These ***NovoGROM*** high speed columns of only 33 mm length provide up to 10 000 plates, and thus in most cases have a resolution nearly identical to that which is typically found for standard analytical HPLC columns.



Column lifetime

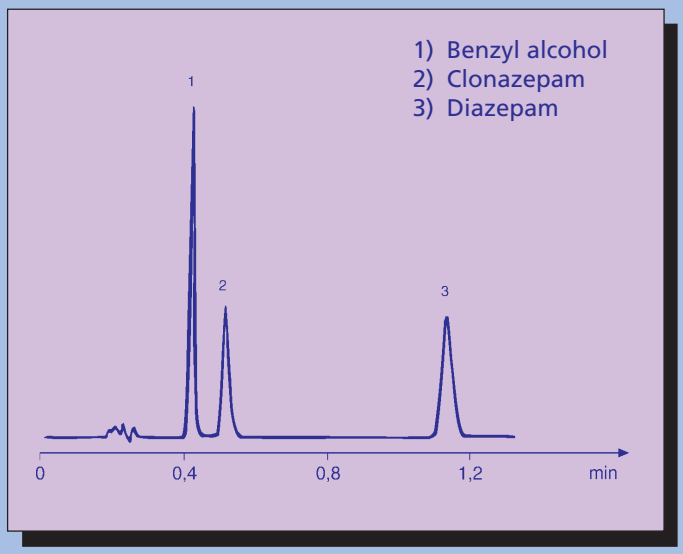
Employing *NovoGROM* high speed columns you gain tremendously in

- **Speed:** analysis time in seconds or minutes, with up to 90% increase in sample throughput
- **Low solvents consumption:** saves on purchase and disposal costs, decreasing solvent consumption brings improved environmental compatibility
- **Decreased diffusion:** smaller peak volume and less band broadening, i.e., improved sensitivity



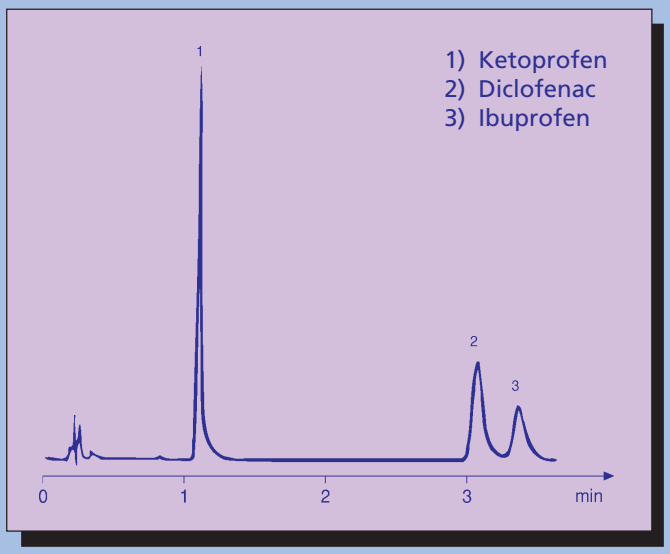
Liquid Chromatography

10 030 b Sedatives -Benzodiazepins



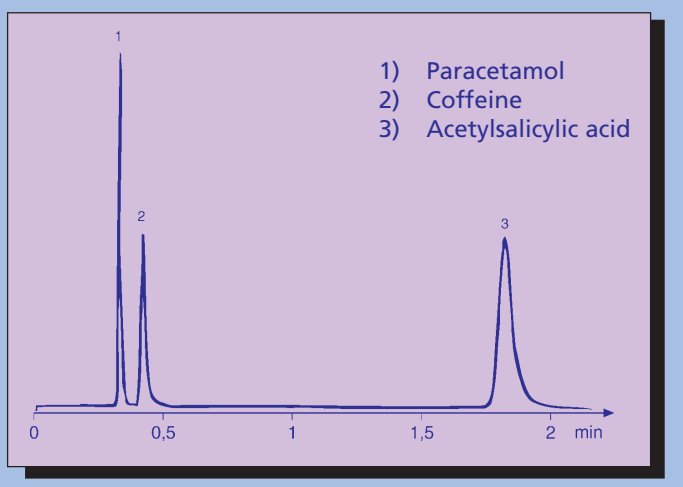
Column phase: GROM-SIL 100 ODS-2 FE, 1.5 µm
Column size: 33 x 4.6 mm
Eluent: 35% v/v Acetonitrile, 65% v/v 0.1% TFA
Flow rate: 1.5 ml/min
Pressure: 26.2 MPa
Temperature: RT
Detection: 254 nm
Sample: 1 µl

10 031 b Nonsteroid anti-inflammatory drugs



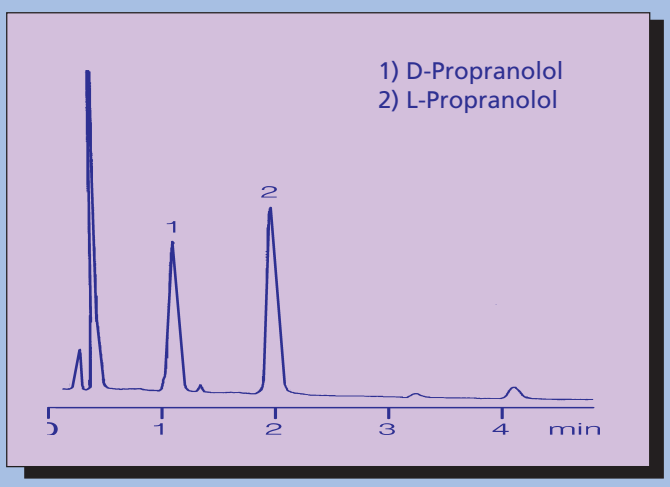
Column phase: GROM-SIL 100 ODS-2 FE, 1.5 µm
Column size: 33 x 4.6 mm
Eluent: 40% v/v Acetonitrile, 60% v/v 0.1% TFA
Flow rate: 1.5 ml/min
Pressure: 26 MPa
Temperature: RT
Detection: 254 nm
Sample: 1 µl (100 µg/ml, Ibuprofen 1000 µg/ml)

10 032 c Analgesic, antipyretic Thomapyrin pill



Column phase: GROM-SIL 100 ODS-2 FE, 1.5 µm
Column size: 33 x 4.6 mm
Eluent: 15% v/v Acetonitrile, 85% v/v 0.1% TFA
Flow rate: 1.5 ml/min
Pressure: 29.2 MPa
Temperature: RT
Detection: 274 nm; after 1 min, 227 nm
Sample: 10 µl (Paracetamol 2 mg/m², Coffeine 0.5 mg/ml, ASA 2 mg/ml)

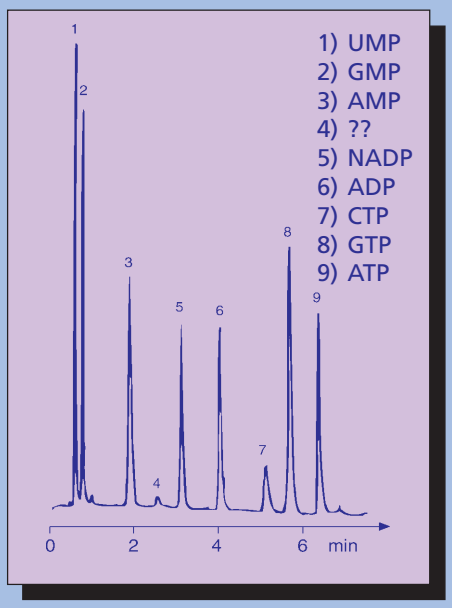
10 053 b High Speed HPLC Analysis -Determination of Optical Antipodes of a β-Blocker



Column phase: GROM-SIL 100 ODS-2 FE, 1.5 µm
Column size: 33 x 4.6 mm
Eluent: water / acetonitrile = 30 / 70
Flow rate: 1.0 ml/min
Pressure: 18 MPa
Temperature: RT
Detection (Fluor.): 263 nm (exc.), 313 nm (em.)
Injection: 1µl (= 500 fmol)

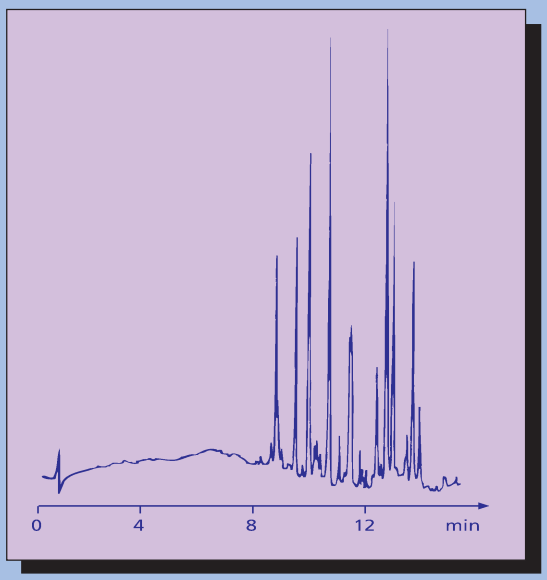
High Speed Liquid Chromatography

10 180 Nucleotides



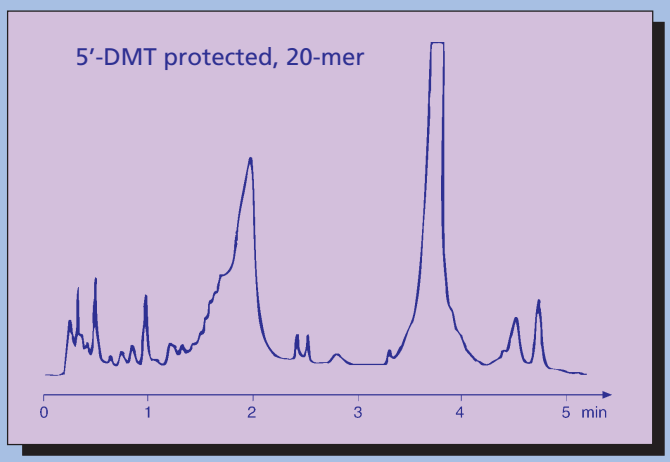
Column phase: GROM-SIL 100 ODS-2 FE, 1.5 µm
Column size: 33 x 4.6 mm
Eluent: A: 30 mM KH_2PO_4 / K_2HPO_4, 0.5 MTBA, pH 6.0
B: 60% A + 40% ACN
Gradient: 0–40% B (0–8 min)
Flow rate: 1.5 ml/min
Temperature: RT
Detection (UV): 254 nm
Sample: 10 µl (10 µg each)

10 182 Protein Digest



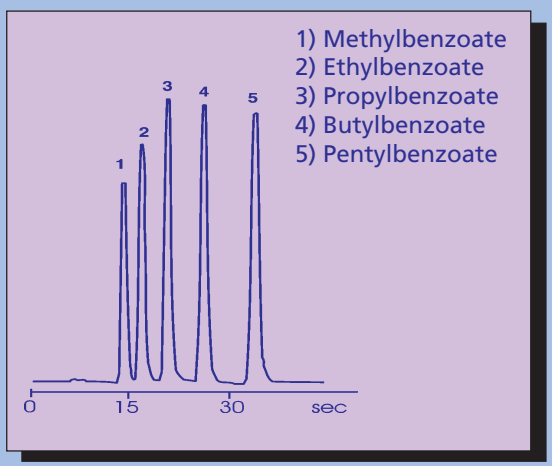
Column phase: GROM-SIL 100 ODS-2 FE, 1.5 µm
Column size: 33 x 2.0 mm
Eluent: A: 0.1% TFA in H_2O
B: 0.1% TFA in ACN
Gradient: 5–50% B (0–12 min)
Flow rate: 0.2 ml/min
Pressure: 10–27 MPa
Temperature: RT
Detection (UV): 214 nm
Sample: 1 µl (5 pMol)

10 181 Antisense-Oligonucleotides



Column phase: GROM-SIL 100 ODS-2 FE, 1.5 µm
Column size: 33 x 4.6 mm
Eluent: A: 0.05 M TEAA, pH 7.0
B: 30% A + 70% ACN
Gradient: 0–70% B (0–6 min)
Flow rate: 1.0 ml/min
Temperature: RT
Detection (UV): 260 nm
Sample: 10 µl (10 µg each)

10 162 High Speed Separation of Benzoates

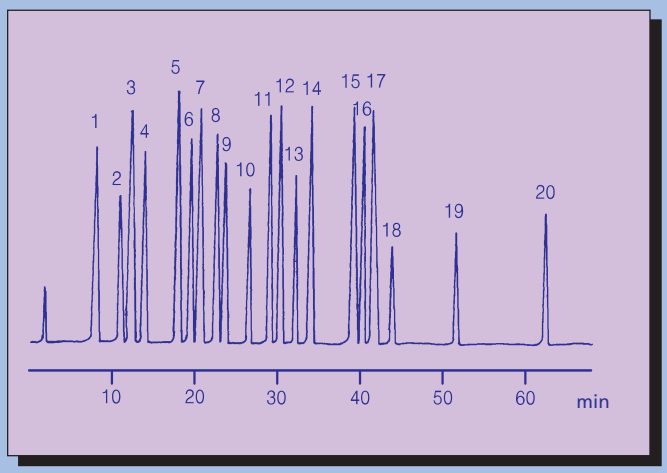


Column phase: GROM-SIL-ODS 0 AB, 1.5 µm
Column size: 33 x 4 mm
Eluent: H_2O / ACN = 30 / 70
Flow rate: 2 ml/min
Pressure: 23,8 MPa
Temperature: RT
Detection (UV): 254 nm
Sample: 1 µl (0,5-1,5 mg/ml of each)

IV. Environmental analysis

Pesticides

10 070 Analysis of Pesticides by Reversed Phase HPLC - I

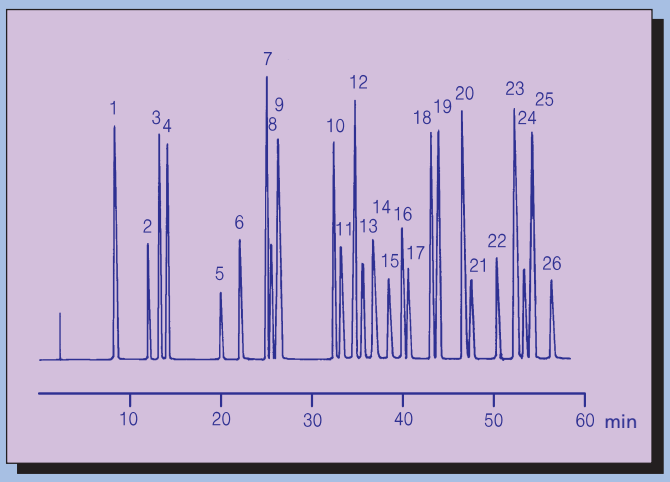


Column phase: GROM-SIL PE-1 (tailor-made)
Column size: 250 x 4 mm
Eluent A: 1 mM ammonium acetate
B: ACN
Gradient: 10-60% B (0-60 min)
Flow rate: 0.9 ml/min
Pressure: 12 MPa
Temperature: 40°C
Detection (UV): 230 nm
Injection: 10 µl (0.5 - 100 µg/ml)

1) Crimidine
2) Bromacil
3) Simacine
4) Hexazinone
5) Metabenzthiazurone
6) Chlortolurone
7) Atrazine
8) Isoproturone
9) Metobromurone
10) Buturone
11) Ametryn
12) Propazine
13) Linurone
14) Terbutylazine
15) Prometone
16) Clorpropham
17) Terbutryne
18) Metholachlor
19) Pentachlorophenol
20) Mecoprop

10 071 Analysis of Pesticides by Reversed Phase HPLC - II

Column phase: GROM-SIL PE-2 (tailor-made)
Eluent A: 1 mM ammonium acetate
B: ACN
Gradient: 15-55% B (0-55 min)
Flow rate: 0.9 ml/min
Pressure: 20 MPa
Temperature: 40°C
Detection (UV): 230 nm
Injection: 10 µl (0.5 - 100 µg/ml)

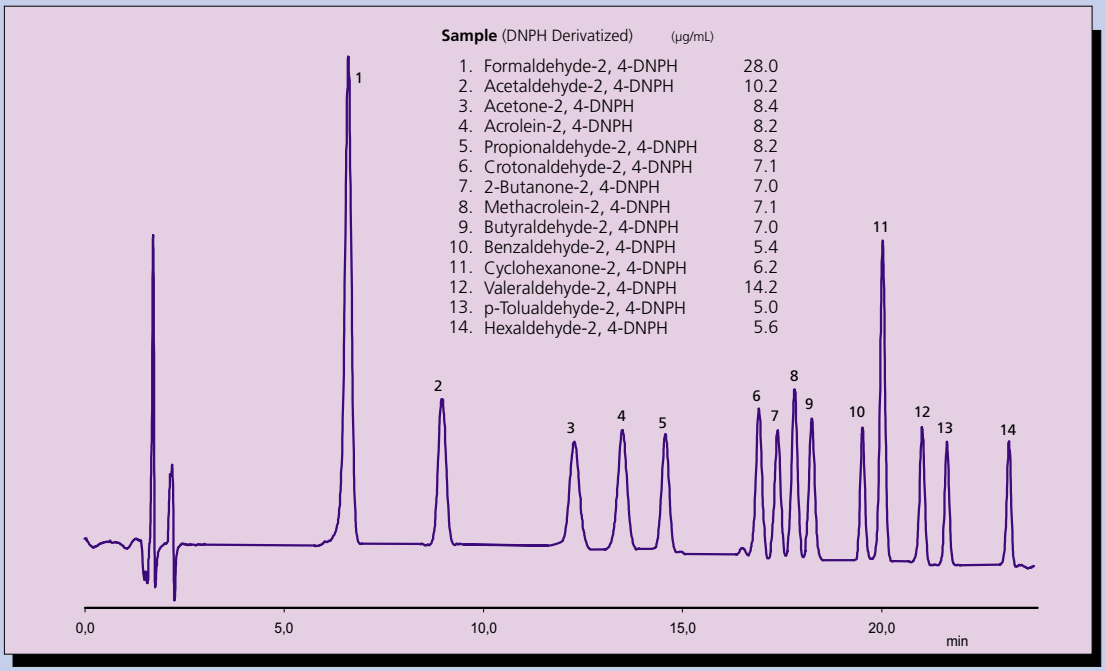


1) Desisopropylatrazine
2) Metamitrone
3) Fenurone
4) Desethylatrazine
5) Crimidine
6) Metoxurone
7) Simazine
8) Metribuzine
9) Cyanazine
10) Methabenzthiazurone
11) Chlortolurone
12) Atrazine
13) Monolinurone
14) Isoproturone
15) Metobromurone
16) Propham
17) Metazachlor
18) Sebutylazine
19) Propazine
20) Terbutylazine
21) Linurone
22) Chloroxurone
23) Prometryne
24) Clorpropham
25) Terbutryne
26) Metolachlor

Columns	Dimensions	Field of application	Order number
Pesticides I 5 µm, 10% Carbon content	250 x 2 mm cartridge 250 x 4 mm cartridge	Environmental analysis	GS PE 1 0512 K 2502 GS PE 1 0512 K 2504
Pesticides II 3 µm, 11% Carbon content	250 x 2 mm cartridge 250 x 4 mm cartridge	Environmental analysis	GS PE 2 0312 K 2502 GS PE 2 0312 K 2504

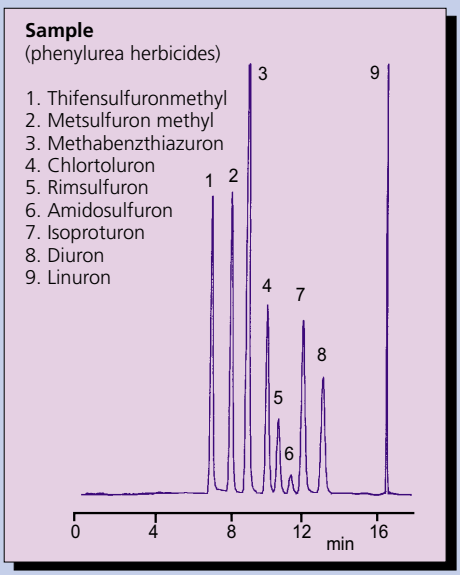
Note! All products are also available in standard column hardware. Other dimensions upon request. Reduced prices for refill-columns

10 135 Aldehydes and Ketones, Analysis of Auto Emission Mix



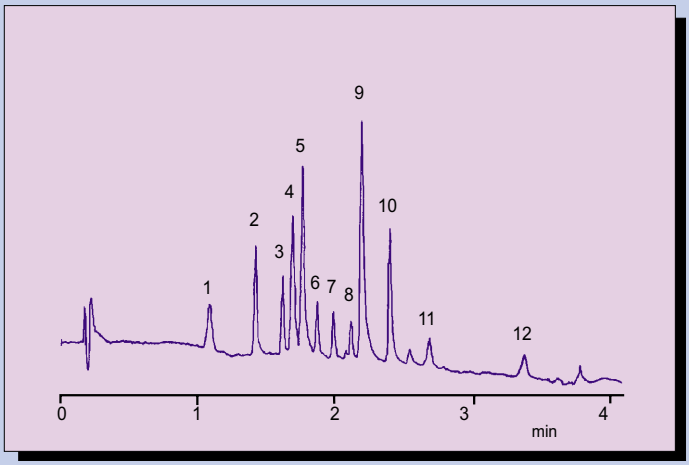
Column phase: GROM-SIL AK, 5 µm
Column size: 250 x 4 mm
Eluent A: H_2O
B: ACN / THF = 75 / 25
Gradient: 40% B (0-10 min), 40 - 85% B (10-30 min)
Flow rate: 1.0 ml/min
Pressure: 19.0 MPa
Temperature: RT
Detection (UV): 365 nm
Injection: 10 µl (5 to 30 µg/ml of each)

10 134 Analysis of Phenylurea Herbicides



Column phase: GROM-SIL PEST-3, 4 µm
Column size: 250 x 4 mm
Eluent A: 80 µl H_3PO_4 (85%) + H_2O
B: ACN
Gradient: 35% B (0-15 min), 35-80% B (15-20 min),
Flow rate: 1.0 ml/min
Pressure: 17 MPa
Temperature: 18°C
Detection (UV)**:** 220 nm
Injection: 10 µl (10 µg/ml MeOH of each)

10 079 High Speed HPLC Analysis of Phenols (EPA)

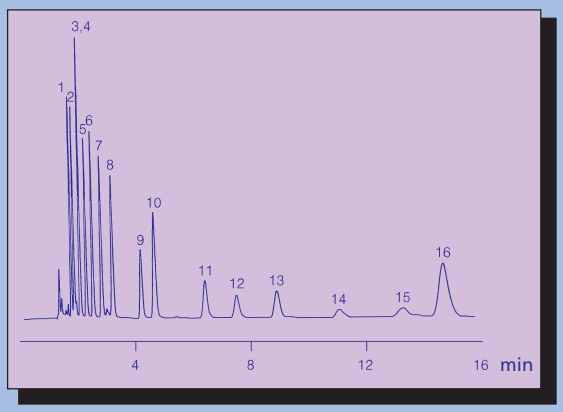


1. Phenol
2. 4-Nitrophenol
3. 2-Chlorphenol
4. 2,4-Dinitrophenol
5. 2-Nitrophenol
6. 2,4-Dimethylphenol
7. 4-Chloro-3-methyl-phenol
8. 2,4-Dichlorophenol
9. 2-Methyl-4,6-dinitro-phenol
10. 2,3,5-Trichlorophenol
11. 2,4,6-Trichlorophenol
12. Pentachlorophenol

Column phase: GROM-SIL 100 ODS-2 FE, 1,5µm
Column size: 33 x 4.6 mm
Eluent A: 0,1% TFA in H_2O
B: ACN
Gradient: 20% B (0-0.17 min), 20-40% B (0.17-0.5 min)
40-70% B (0.5-2.83 min), 70-100% B (2.83-3.0 min)
Flow rate: 1.3 ml/min
Pressure: 8 - 27 MPa
Temperature: RT
Detection (UV): 274 nm
Injection: 50 µl (0.04 ppm)

Polycyclic aromatic hydrocarbons (PAH's)

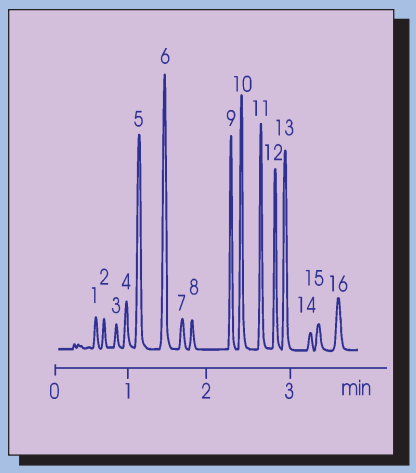
10 036 Isocratic Separation of Polycyclic Aromatic Hydrocarbons (PAH's)



Column phase: GROM-SIL PAH -1 (tailor-made)
Column size: 250 x 4mm
Eluent: water / ACN = 15 / 85
Flow rate: 1.5 ml/min
Pressure: 13 MPa
Temperature: 25°C
Detection (UV): 254 nm
Injection: 5 µl (5 µg/ml each)

1) Naphthalene
2) Acenaphthylene
3) Acenaphthene
4) Fluorene
5) Phenanthrene
6) Anthracene
7) Fluoranthene
8) Pyrene
9) Benz(a)anthracene
10) Chrysene
11) Benzo(b)fluoranthene
12) Benzo(k)fluoranthene
13) Benzo(a)pyrene
14) Dibenzo(a,h)anthracne
15) Benzo(g,h)perylene
16) Ideno(1,2,3,c,d)pyrene

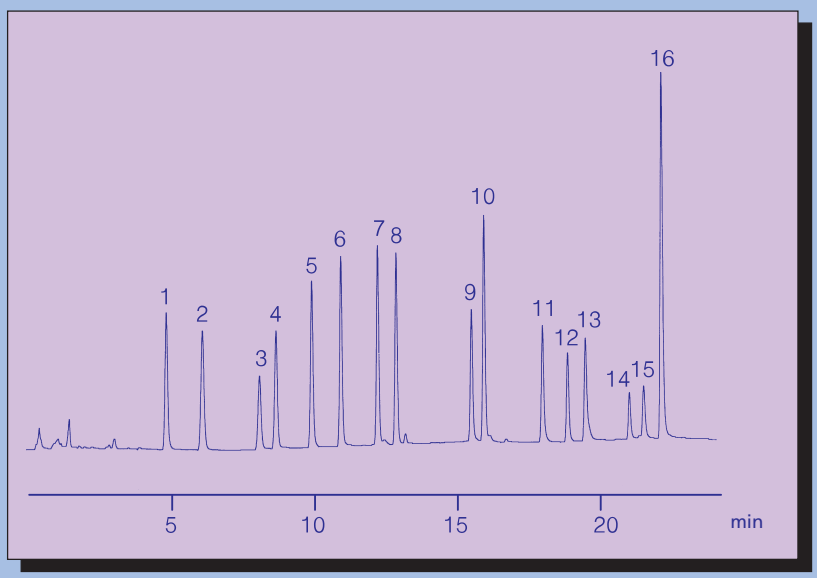
10 163 Analysis of Polycyclic Aromatic Hydrocarbons (EPA Standard)



1) Naphthalene
2) Acenaphthylene
3) Acenaphthene
4) Fluorene
5) Phenanthrene
6) Anthracene
7) Fluoranthene
8) Pyrene
9) Benz(a)anthracene
10) Chrysene
11) Benzo(b)fluoranthene
12) Benzo(k)fluoranthene
13) Benzo(a)pyrene
14) Dibenzo(a,h) anthracene
15) Benzo(g,h)perylene
16) Ideno(1,2,3,c,d)pyrene

Column phase: GROM-PAH, 3 µm
Column size: 50 x 4 mm
Eluent A: H_20 / MeOH = 20 / 80
B: ACN
Gradient: 10% B (0-0.5 min), 100% B (0-1.0 min), 100 % B (1.0-4.0 min)
Flow rate: 2.0 ml/min
Pressure: 16.4 MPa
Temperature: RT
Detection (UV): 254 nm (1.3 µl flow cell)
Injection: 2 µl (10 mg/ml of each)

10 037 Separation of PAH´s by Gradient Elution



Column phase: GROM-SIL PAH -1 (taylor-made)
Column size: 250 x 4mm
Eluent A: water
B: ACN
Gradient: 50% B (0-5 min), 50-85% B (5-15 min), 85-100% B (15-20 min), 100% B (20-25 min)
Flow rate: 1.5 ml/min
Pressure: 24 MPa
Temperature: 25°C
Detection (UV): 254 nm
Injection: 5 µl (5 µg/ml, each)

1) Naphthalene
2) Acenaphthylene
3) Acenaphthene
4) Fluorene
5) Phenanthrene
6) Anthracene
7) Fluoranthene
8) Pyrene
9) Benzo(a)anthracene
10) Chrysene
11) Benzo(b)fluoranthene
12) Benzo(k)fluoranthene
13) Benzo(a)pyrene
14) Dibenzo(a,h)anthracne
15) Benzo(g,h)perylene
16) Ideno(1,2,3,c,d)pyrene

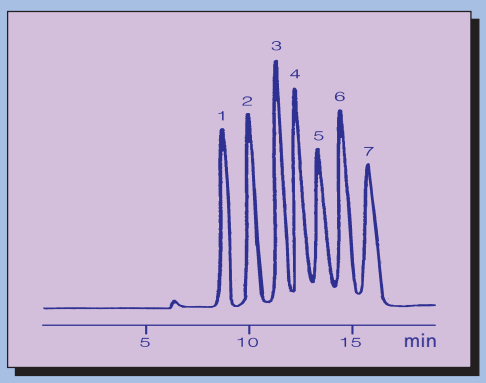
Columns	Dimensions	Field of application	Order number
PAH-column for EPA-standard - (separation of the 16 PAH´s)	250 x 2 mm cartridge 250 x 4 mm cartridge 50 x 4.6 mm cartridge	environmental analysis: soil, pollution (air / water), etc.	GS PA 1 0530 K 2502 GS PA 1 0530 K 2504 GS PA 1 0330 K 0505

Note! All products are also available as columns (complete with end-fittings). Please enquire for other dimensions. Reduced prices for Refill-columns.

Analysis of beer and wine

V. Analysis of beverages and foods

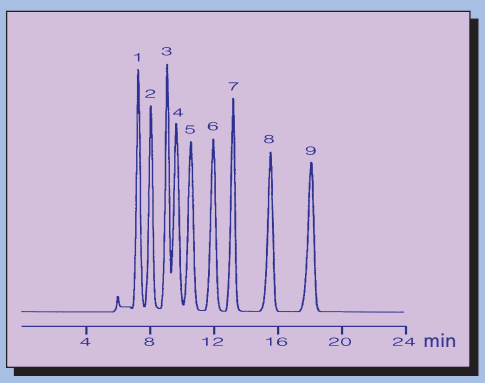
10 082 Analysis of Sugars in Beverages



1) Raffinose
2) Maltose
3) Glucose
4) Xylose
5) Galactose
6) Arabinose
7) Mannose

Column phase: GROM-RESIN ZP, 10 µm
Column size: 300 x 8 mm
Eluent: water
Flow rate: 0.7 ml/min
Pressure: 1 MPa
Temperature: 70°C
Detection: RI
Injection: 15 µl

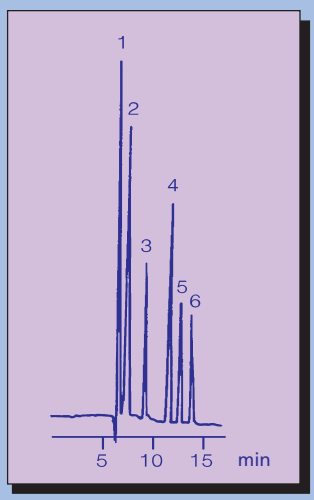
10 083 Analysis of Oligosaccharides and Alcohols in Food



1) Maltotriose
2) Maltose
3) Lactulose
4) Glucose
5) Xylose
6) Arabinose
7) Adonitol
8) Arabitol
9) Xylitol

Column phase: GROM-RESIN ZC, 10 µm
Column size: 300 x 8 mm
Eluent: Ca_2EDTA (50 mg/L H_2O)
Flow rate: 0.7 ml/min
Pressure: 1 MPa
Temperature: 85°C
Detection: RI
Injection: 15 µl

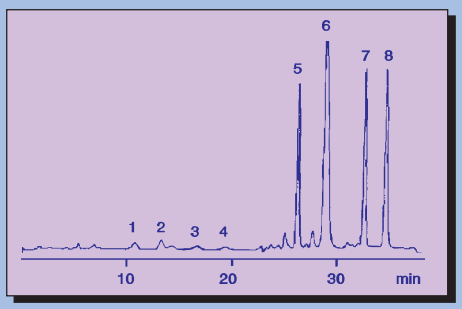
10 084 HPLC Determination of Organic Acids



1) Oxalic acid
2) Maleic acid
3) Malonic acid
4) Succinic acid
5) Formic acid
6) Acetic acid

Column phase: GROM-RESIN AC, 10 µm
Column size: 300 x 8 mm
Eluent: 0.003 N sulfuric acid
Flow rate: 0.7 ml/min
Pressure: 7 MPa
Temperature: RT
Detection: conductivity
Injection: 20 µl

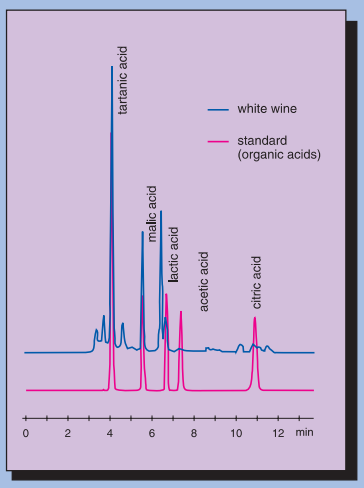
10 100 Determination of the Hop Bitter Acids in Beer by HPLC



1) Co-Isohumulon
2) N-Isohumulon
3) Ad-Isohumulon
4) Xanthohumulon
5) Co-Humulon
6) N/Ad-Humulon
7) Co-Lupulon
8) N/Ad-Lupulon

Column phase: GROM-Beer-Bitter (tailor-made)
Column size: 125 x 4 mm
Eluent A: MeOH
Eluent B: 647 ml MeOH + 349 ml H_2O + 4 ml H_3PO_4
Gradient: 100% B (0-19.5 min), 65% B (19.5-29 min), 50% B (29-36 min), 100% B (36-40 min)
Flow rate: 1.0 ml/min
Pressure: 9 MPa
Temperature: 35°C
Detection (UV): 270 / 314 nm
Injection: 10 µl beer

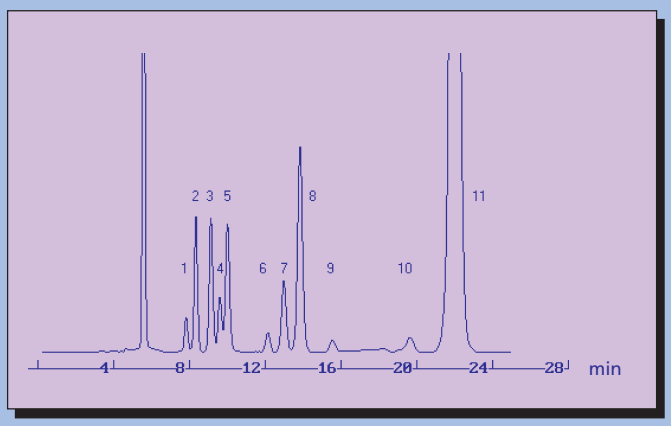
10 137 Analysis of Organic Acids in White Wine



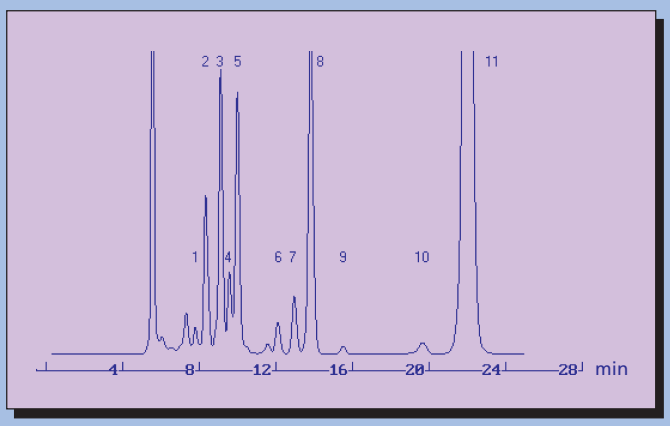
Column phase: GROM-SIL ‚Org. Acids', 5 µm
Column size: 250 x 4 mm
Eluent 20 mM Na-phosphate, pH 2.8
Flow rate: 0.5 ml/min
Pressure: 9.5 MPa
Temperature: RT
Detection (UV): 220 nm
Injection: 20 µl (0.1 to 0.2 µg/ml of each)

Analysis of wines by HPLC

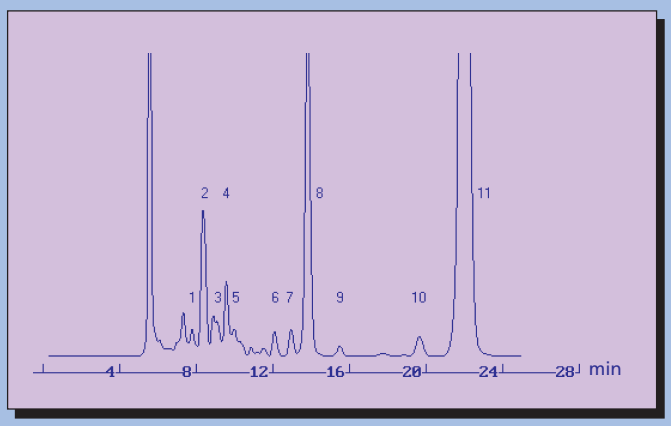
10 085 a Wine Standard



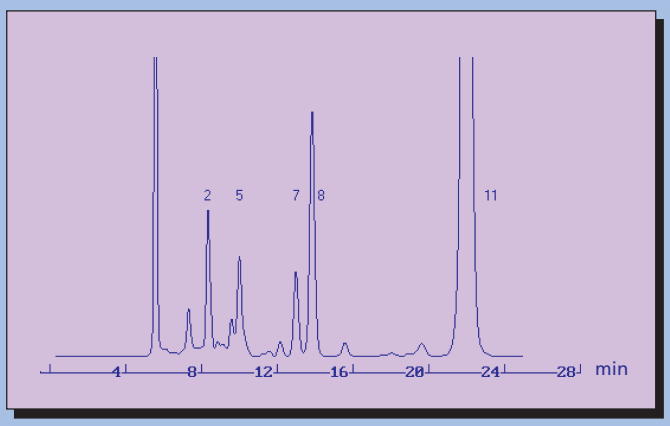
10 085 b Red Wine (sweet)



10 085 c Red Wine (dry)



10 085 d White Wine with Biological Degradation of Acids



Column phase: GROM-RESIN ZH, 10 µm + guard column
Column size: 300 x 8 mm
Eluent: 2.5 mM H_2SO_4
Flow rate: 0.6 ml/min
Pressure: 1MPa
Temperature: 60°C
Detection: RI
Sample: wine, diluted 1:10 with 10 mM H_2SO_4

1) Citric acid
2) Tartaric acid
3) Glucose
4) Malic acid
5) Fructose
6) Succinic acid
7) Lactic acid
8) Glycerol
9) Acetic acid
10) 2,3-Butanediol
11) Ethanol

Analysis of	Field of application *	Column dimensions	Order number
Monosaccharides	Foodstuff industry, Nutrition sciences	300 x 8 mm column	GP ZP 1 1012 S 3008
Mono- and disaccharides, sugar alcohols	Fermentation control/ breweries	300 x 8 mm column	GP ZC 1 1012 S 3008
Sugars, alcohols, organic acids	Beverage industry (Viticulture / Enology)	300 x 8 mm column	GP ZH 1 1012 S 3008
Organic acids	Beverage industry	300 x 8 mm column	GP AC 1 1012 S 3008
Hop bitter acids	Beverage industry	125 x 4 mm column	GS BI 1 0712 S 1204

* Further applications concerning the analysis of beverages and food see also pages 19–22