

AppliChrom® ABOA SugarSep

For HPLC analysis of

- sugars
- sugaralcohols
- alcohols
- carboxylic acids

Special chromatography material for fast and reliable analysis using HPLC-RI or HPLC-ELSD at approx. 60-80°C

Advantages:

- no organic eluents necessary, eluent = water
- good for environment; eluent = water
- low costs for deposition of used eluents; eluent = water
- easy to handle, measurement direct possible from aqueous sample
- Low invest; measurement possible with standard-HPLC system if RI or ELSD (evaporative light scattering detector) is connected with HPLC-system.

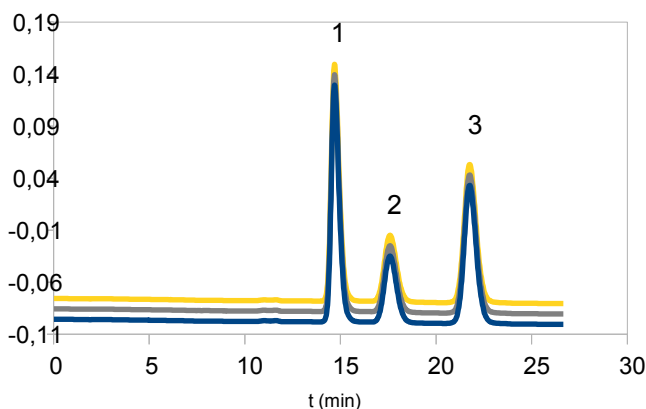
AppliChrom ABOA SugarSep-Ca – analysis of sugars, sugaralcohols and alcohols

AppliChrom ABOA SugarSep-Pb – analysis of sugars, especially from wood hydrolysate

AppliChrom ABOA SugarSep-H – analysis of sugars, sugaralcohols, alcohols and carboxylic acids

Why using AppliChrom products:

AppliChrom means: high degree of reproducibility, column for column, lot for lot.



Quality assurance

3 consecutive Lots:

AppliChrom® ABOA SugarSep-Ca

300x8mm
0.4ml/min H₂O
80°C
RI-detection
20µl
Peaks in order of elution
1. sucrose
2. glucose
3. fructose

AppliChrom means: own synthesis- and developmentcenter in Oranienburg (Germany/Europe)



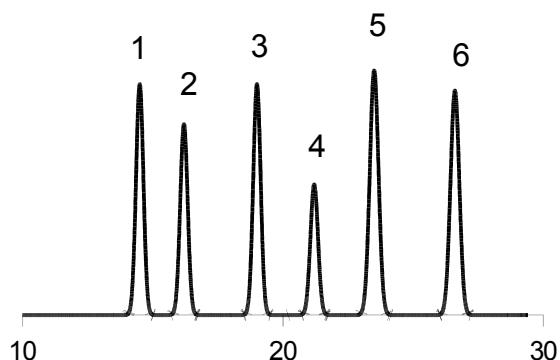
Inhouse control about the whole production process & base for furtur innovative productlines for todays and further needs of our customers.

*) Laboratory picture taken from: Märkische Allgemeine Zeitung, 15. März 2014 (Online report: 2014-02-27: <http://www.maz-online.de/Lokales/Oberhavel/Polymere-Multitalente>)

AppliChrom® ABOA SugarSep

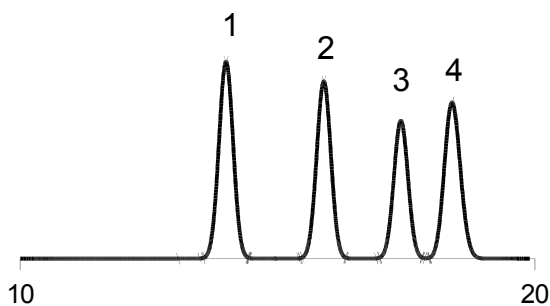
Applications:

HPLC-analysis of monosaccharides, disaccharides, sugaralcohols, glycerin



AppliChrom® ABOA SugarSep-Ca

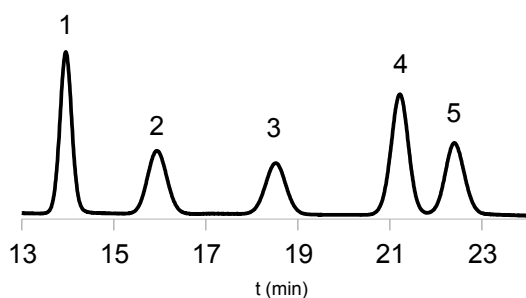
300x8mm
0.5ml/min H₂O
80°C
RI-detection
20µl
Peaks in order of elution (RI)
1. sucrose
2. glucose
3. fructose
4. glycerin
5. mannitol



AppliChrom® ABOA SugarSep-Pb

300x8mm
0.4ml/min H₂O
60°C
RI-detection
20µl
Peaks in order of elution
1. sucrose
2. glucose
3. fructose
4. glycerin

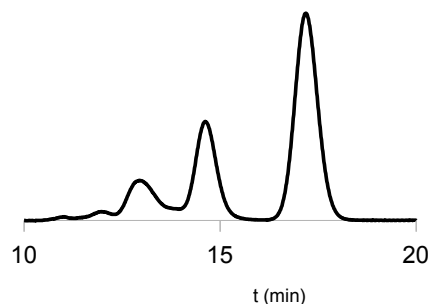
HPLC analysis of saccharose, glucose, fructose, glycerin, ethanol & honeysample:



AppliChrom® ABOA SugarSep-Ca

300x8mm
0.5ml/min H₂O
80°C
RI-detection
20µl
Peaks in order of elution (RI)
1. saccharose
2. glucose
3. fructose
4. glycerin
5. ethanol

HPLC-analysis of a honey (analysis of sugars)



AppliChrom® ABOA SugarSep-Ca

300x8mm
0.5ml/min H₂O
80°C
RI-detection
20µl

AppliChrom® ABOA SugarSep

Analysis of mono and disaccharides

HPLC-analysis of a cola-drink

AppliChrom® ABOASugarSep-Pb for HPLC of sugars

300x8mm
0.4ml/min H₂O
60°C
RI-detection
20µl

Peaks in order of elution; identification by comparison of retention times from standards

RI vs. t_r [min]
1. sucrose
2. glucose
3. fructose

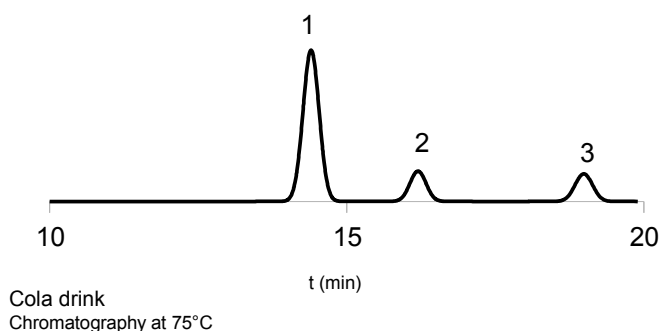
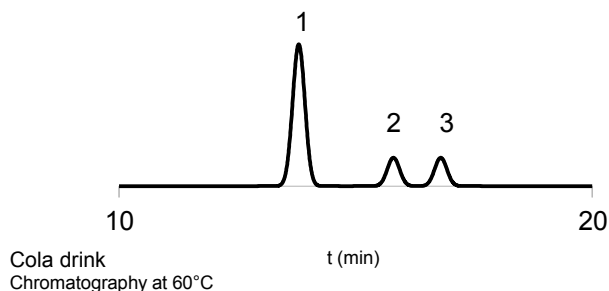
HPLC-analysis of a cola-drink

AppliChrom® ABOASugarSep-Ca for HPLC of sugars

300x8mm,
0.5ml/min H₂O
75°C
RI-detection
20µl

Peaks in order of elution; identification by comparison of retention times from standards

RI vs. t_r [min]
1. Sucrose
2. Glucose
3. Fructose



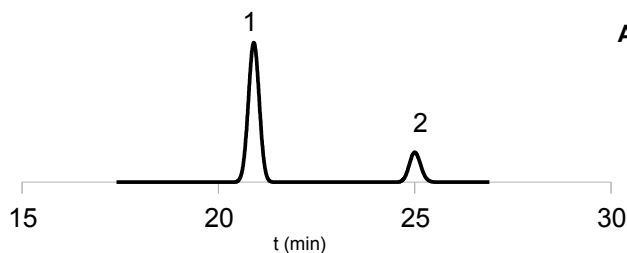
Fermentation control:

AppliChrom® ABOA SugarSep-H for HPLC of sugars and acids

300x8mm,
0.4ml/min 0.1% H₂SO₄,
75°C
RI-detection
20µl,

Peaks in order of elution RI vs. t_r [min]

1. glucose
2. DL-lactic acid (Milchsäure)

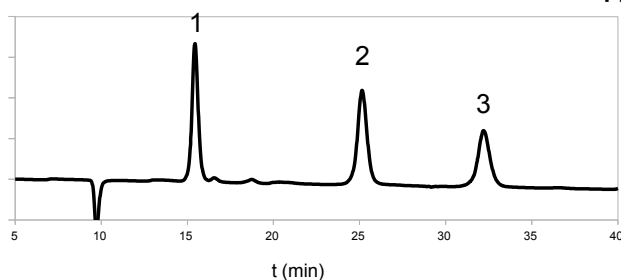


AppliChrom® ABOA SugarSep-H for HPLC of alcohols and acids

300x8mm,
0.4ml/min 0.1% H₂SO₄,
75°C
RI-detection
20µl,

Peaks in order of elution RI vs. t_r [min]

1. citric acid
2. acetic acid
3. 1,4-butandiol

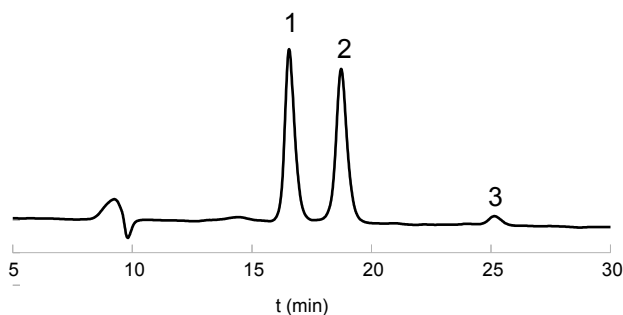


AppliChrom® ABOA SugarSep-H for HPLC of aceto balsamico – sugars and acids

300x8mm,
0.4ml/min 0.1% H₂SO₄,
75°C
RI-detection
20µl,

Peaks in order of elution, RI vs. t_r [min]

1. glucose
2. fructose
3. acetic acid

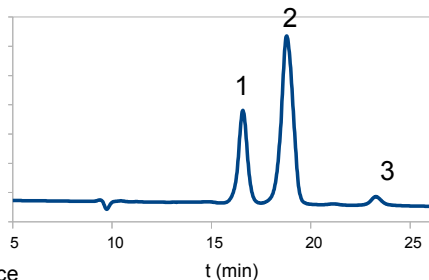


AppliChrom® ABOA SugarSep

Influence of Temperature on HPLC:

Sample: an apple juice

AppliChrom® ABOA SugarSep-H for apple juice HPLC at high temperature

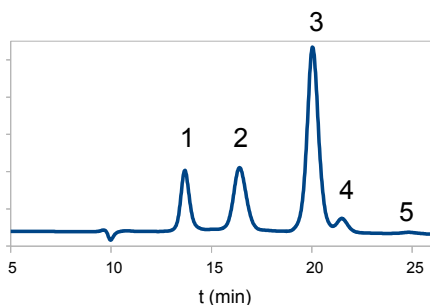


An apple juice
Chromatography at 80°C

300x8mm,
0.4ml/min 0.1% H₂SO₄,
80°C
RI-detection
20µl,
Peaks in order of elution, RI vs. t_r [min]
1. glucose
2. fructose/malic acid
3. sorbitol

(Sucrose hydrolyses; malic acid and fructose signals overlap)

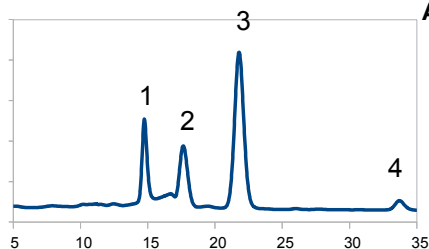
AppliChrom® ABOA SugarSep-H for apple juice HPLC at low temperature



An apple juice
Chromatography at 30°C

300x8mm,
0.4ml/min 0.1% H₂SO₄,
30°C
RI-detection
20µl,
Peaks in order of elution, RI vs. t_r [min]
1. sucrose
2. glucose
3. fructose
4. malic acid
5. sorbitol

AppliChrom® ABOA SugarSep-Ca for apple juice HPLC at high temperature



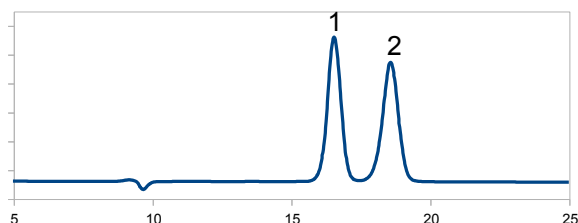
An apple juice
Chromatography at 80°C

300x8mm,
0.4ml/min 0.1% H₂SO₄,
80°C
RI-detection
20µl,
Peaks in order of elution, RI vs. t_r [min]
1. sucrose
2. glucose
3. fructose
4. sorbitol

HPLC of A Cola-drink:

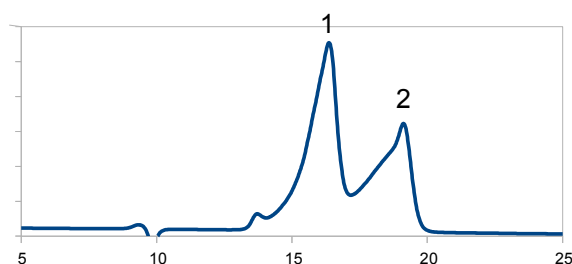
Suppression of sucrose hydrolysis by lowering temperature; selection of eluent and column

AppliChrom® ABOA SugarSep-H in cola-drink HPLC at high temperature



A cola drink
Chromatography at 80°C

300x8mm,
0.4ml/min 0.1% H₂SO₄,
80°C
RI-detection
20µl,
Peaks in order of elution, RI vs. t_r [min]
1. glucose
2. fructose



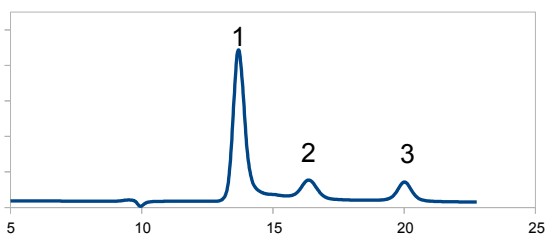
A cola drink
Chromatography at 55°C

AppliChrom® ABOA SugarSep-H

300x8mm,
0.4ml/min 0.1% H₂SO₄,
55°C
RI-detection
20µl,
Peaks in order of elution, RI vs. t_r [min]
1. glucose
2. fructose

(hydrolysis during chromatography is observed at 55°C => lower temperature e.g. 30°C is recommended)

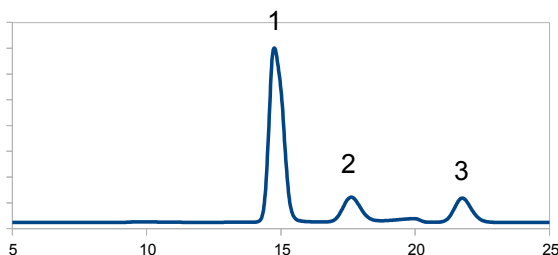
AppliChrom® ABOA SugarSep



Cola drink
Chromatography at 30°C

AppliChrom® ABOA SugarSep-H

300x8mm,
0.4ml/min 0.1% H₂SO₄,
30°C
RI-detection
20µl,
Peaks in order of elution, RI vs. t_r [min]
1. sucrose
2. glucose
3. fructose



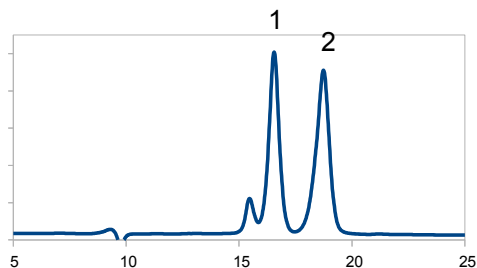
Cola drink
Chromatography at 80°C

AppliChrom® ABOA SugarSep-Ca

300x8mm,
0.4ml/min 0.1% H₂O,
80°C
RI-detection
20µl,
Peaks in order of elution, RI vs. t_r [min]
1. sucrose
2. glucose
3. fructose

An Orange juice:

Suppression of hydrolysis by temperature lowering gives an increase of informations of sample.
Comparison AppliChrom ABOASugarSep-H and SugarSep-Ca.

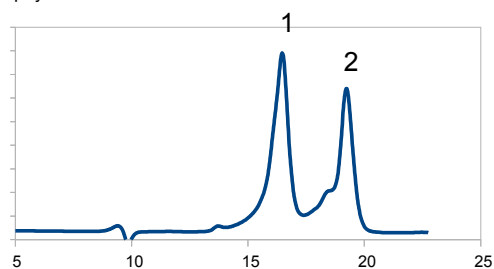


Orange juice
Chromatography at 80°C

AppliChrom® ABOA SugarSep-H

300x8mm,
0.4ml/min 0.1% H₂SO₄,
80°C
RI-detection
20µl,
Peaks in order of elution, RI vs. t_r [min]
1. glucose
2. fructose

(Hydrolysis of sucrose)

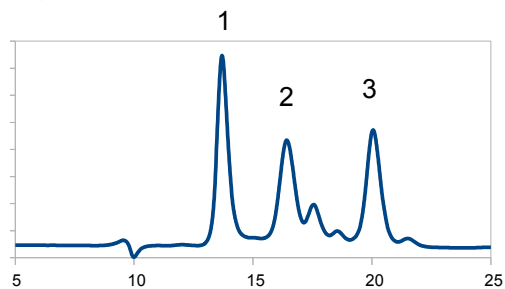


Orange juice
Chromatography at 55°C

AppliChrom® ABOA SugarSep-H

300x8mm,
0.4ml/min 0.1% H₂SO₄,
55°C
RI-detection
20µl,
Peaks in order of elution, RI vs. t_r [min]
1. glucose
2. fructose

(Hydrolysis of sucrose)



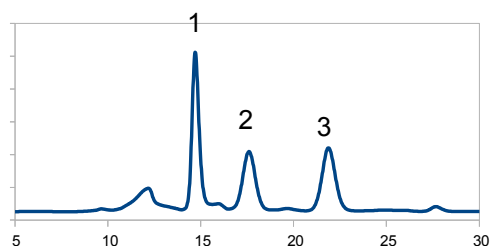
Orange juice
Chromatography at 30°C

AppliChrom® ABOA SugarSep-H

300x8mm,
0.4ml/min 0.1% H₂SO₄,
30°C
RI-detection
20µl,
Peaks in order of elution, RI vs. t_r [min]
1. sucrose
2. glucose
3. fructose

(further peaks unassigned)

AppliChrom® ABOA SugarSep



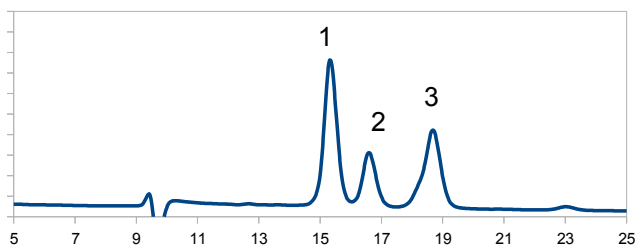
Orange juice
Chromatography at 80°C

AppliChrom® ABOA SugarSep-Ca

300x8mm,
0.4ml/min 0.1% H₂SO₄,
80°C
RI-detection
20µl,
Mainpeaks in order of elution RI vs. t_r [min]
1. sucrose
2. glucose
3. fructose

(further peaks unassigned)

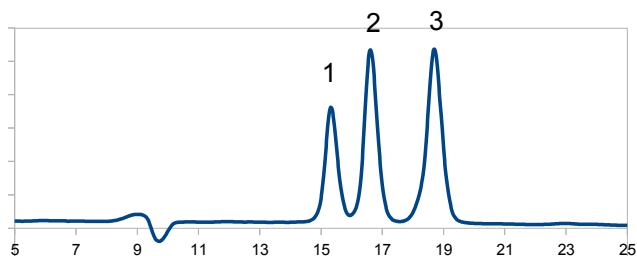
Analysis of maturationprocess of red currants:



Red currants (hitherto green),
Chromatography at 80°C

AppliChrom® ABOA SugarSep-H

300x8mm,
0.4ml/min 0.1% H₂SO₄,
80°C
RI-detection
20µl,
Peaks in order of elution, RI vs. t_r [min]
1. citric acid
2. glucose
3. fructose



Red currants,
mellow (red)
Chromatography at 80°C

AppliChrom® ABOA SugarSep-H

300x8mm,
0.4ml/min 0.1% H₂SO₄,
80°C
RI-detection
20µl,
Peaks in order of elution, RI vs. t_r [min]
1. citric acid
2. glucose
3. fructose

(further peaks not assigned)

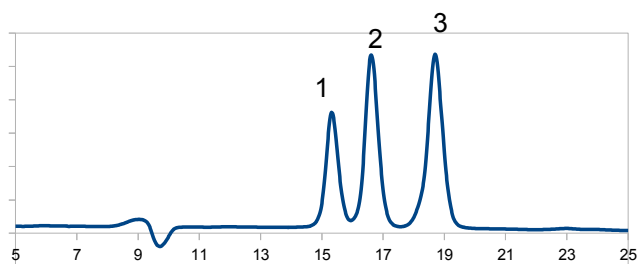
Observation:

Mellow red currants: decrease of tartratic acid concentration, increase of sugarconcentraiton.

AppliChrom® ABOA SugarSep

Analysis of mellow red currants –

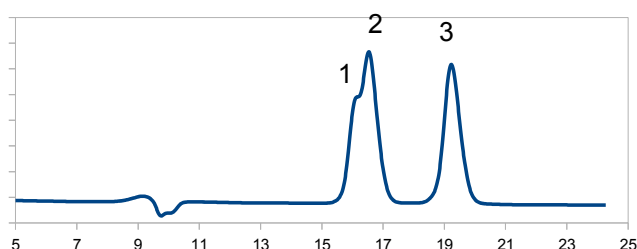
Influence of temperature, peak positions, chromatograms



Red currants,
mellow (red)
Chromatography at 80°C

AppliChrom® ABOA SugarSep-H

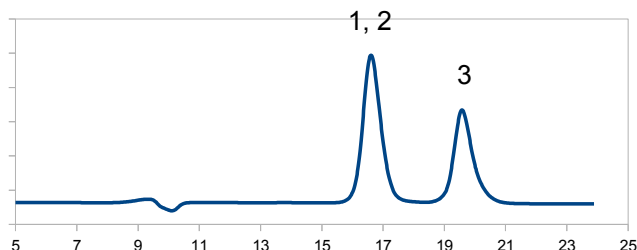
300x8mm,
0.4ml/min 0.1% H₂SO₄,
80°C
RI-detection
20µl,
Peaks in order of elution RI vs. t_r [min]
1. citric acid
2. glucose
3. fructose



Red currants,
mellow (red)
Chromatography at 55°C

AppliChrom® ABOA SugarSep-H

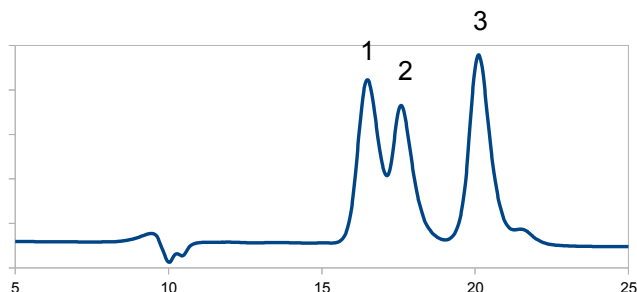
300x8mm,
0.4ml/min 0.1% H₂SO₄,
55°C
RI-detection
20µl,
Peaks in order of elution, RI vs. t_r [min]
1. citric acid
2. glucose
3. fructose



Red currants,
mellow (red)
Chromatography at 45°C

AppliChrom® ABOA SugarSep-H

300x8mm,
0.4ml/min 0.1% H₂SO₄,
45°C
RI-detection
20µl,
Peaks in order of elution, RI vs. t_r [min]
1. citric acid
2. glucose
3. fructose



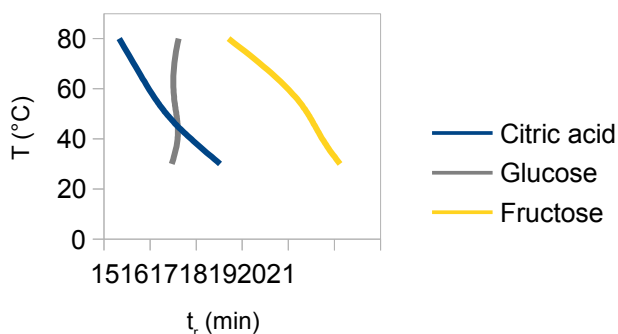
Red currants,
mellow (red)
Chromatography at 30°C

AppliChrom® ABOA SugarSep-H

300x8mm,
0.4ml/min 0.1% H₂SO₄,
30°C
RI-detection
20µl,
Peaks in order of elution, RI vs. t_r [min]
1. glucose
2. citric acid
3. fructose

AppliChrom® ABOA SugarSep

Influence of temperature on peak positions:



AppliChrom® ABOA SugarSep-H

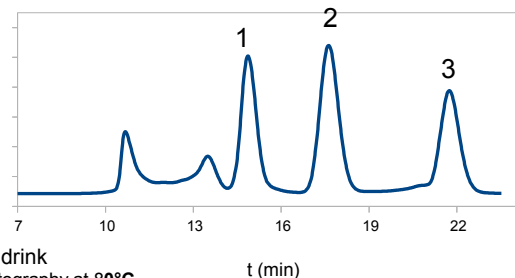
300x8mm,
0.4ml/min 0.1% H₂SO₄,
30° - 80°C
RI-detection
20µl,
Retentiontimes of
citric acid,
glucose,
fructose,
T (°C) vs. t_r [min] .

Peakpositions of analytes depend on temperature. Changes of temperature can change order of peak elution, can produce peak overlapping and can change selectivity.

=> correct and accurate column temperature is an important parameter for adjusting the correct selectivity

HPLC of a malted drink and of a pilsener beer:

AppliChrom ABOA SugarSep-Ca

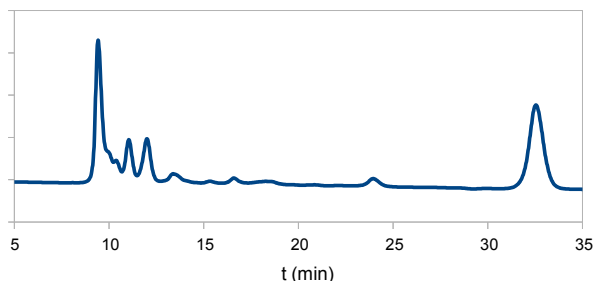


Malted drink
Chromatography at 80°C

A malted drink

AppliChrom® ABOA SugarSep-Ca

300x8mm,
0.4ml/min,
H₂O
80°C
RI-detection
20µl,
Peaks in order of elution, RI vs. t_r [min]
1. maltose (14,8min)
2. glucose (17,5min)
3. fructose (21,8min)



A pilsener beer
Chromatography at 80°C

A pilsener beer

AppliChrom® ABOA SugarSep-Ca

300x8mm,
0.4ml/min,
H₂O
80°C
RI-detection
20µl

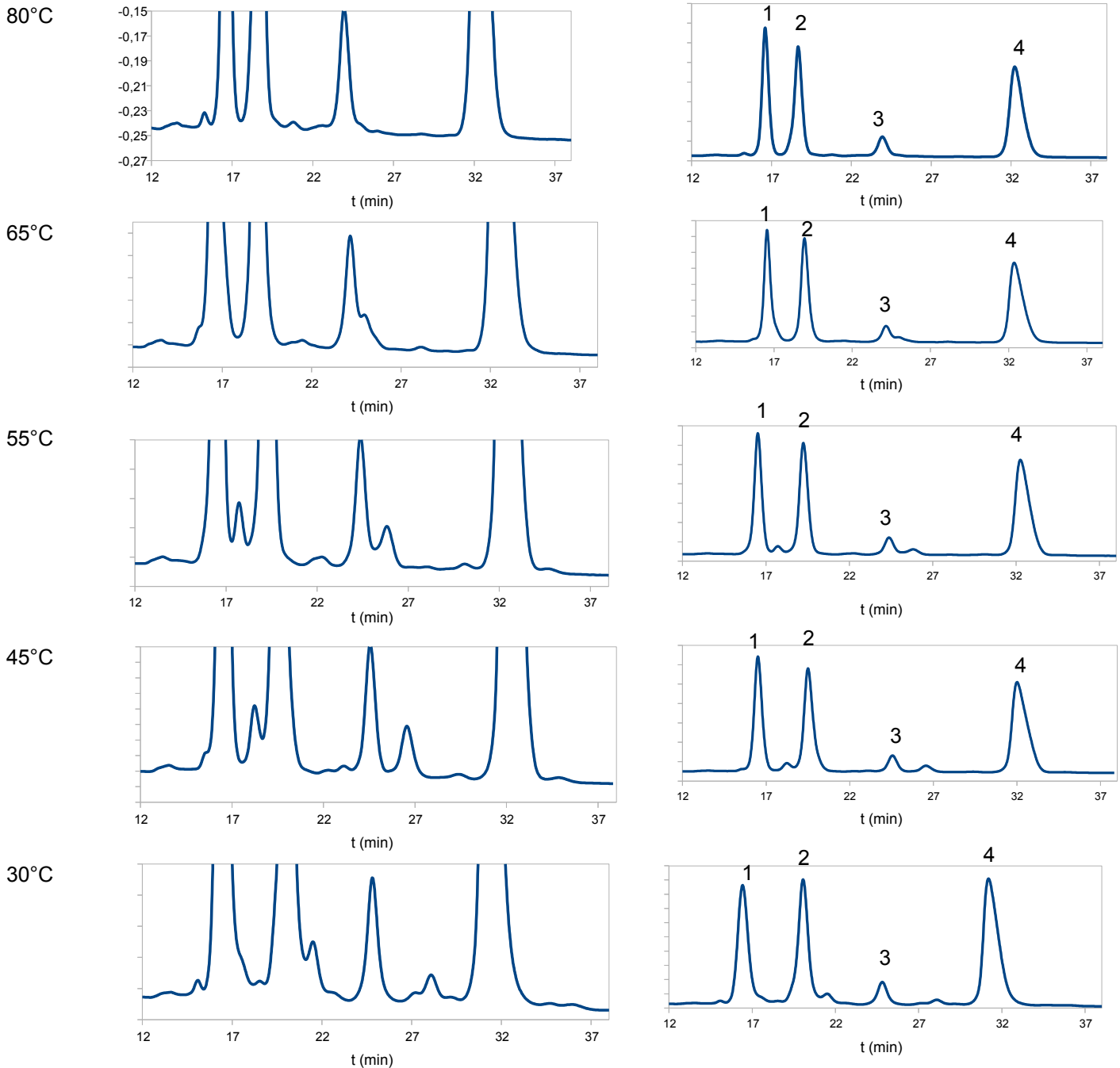
AppliChrom® ABOA SugarSep

HPLC analysis: standard solution for wine analysis
(obtained from: Deutsche Weinanalytiker e.V., lot 1050807 (blue label).

HPLC-column-temperature

Detail enlargement

overview



AppliChrom® ABOA SugarSep-H

300x8mm,
0.4ml/min,
0.1% H₂SO₄,
30°C- 80°C

RI-detection

20µl, standard solution for wine analysis of: Deutsche Weinanalytiker e.V.,
lot 1050807 (blue label).

Mainpeaks in order of elution RI vs. t_r [min]

1. glucose
2. fructose
3. glycerin
4. ethanol

=> HPLC-selectivity is adjusted by column temperature.

Plus further wine typical fruit acids

Result: HPLC-selectivity of AppliChrom ABOA SugarSep column can be adjusted by variation of column temperature to actual analytical sample.

AppliChrom® ABOA SugarSep

Further analytes that are analysed:

Urea, allantoin, acrylamid, methacrylamid,...

Effects:

=> Retentiontimes of some analytes depend on temperature.

=> Hydrolysis of some analytes occur at elevated temperatures if eluent H₂SO₄ is used

(e.g. sucrose => glucose + fructose). If sugars are analysed that can hydrolyse it can be good to test additional AppliChrom ABOA SugarSep-Ca in pure water to see if the results are equal.

=> Not only sugars and alcohols can be HPLC analysed with AppliChrom ABOA SugarSep-H, also additional carboxylic acids and fruit acids can be analysed.

Fields of application for HPLC-column AppliChrom ABOA SugarSep-H:

=> analysis of monosaccharides, alcohols, fruit acids, lactic acid,... at lower temperature also of disaccharides.

Order Informations:

SASH102508	HPLC-Column AppliChrom® ABOA SugarSep-H, 10µ 250mm x 8mm	Price available upon request
SASH103008	HPLC-Column AppliChrom® ABOA SugarSep-H, 10µ 300mm x 8mm	Price available upon request
SASPB102508	HPLC-Column AppliChrom® ABOA SugarSep-Pb, 10µ 250mm x 8mm	Price available upon request
SASPB103008	HPLC-Column AppliChrom® ABOA SugarSep-Pb, 10µ 300mm x 8mm	Price available upon request
SASCA102508	HPLC-Column AppliChrom® ABOA SugarSep-Ca, 10µ 250mm x 8mm	Price available upon request
SASCA103008	HPLC-Column AppliChrom® ABOA SugarSep-Ca, 10µ 300mm x 8mm	Price available upon request

Precolumns, other column dimensions, other counterions (AppliChrom ABOA SugarSep-Na,...), OEM columns or OEM bulkmedia on request. .

How can we serve you?

AppliChrom products for sugar & polysaccharid characterisation available (HPLC, HILIC, GPC/SEC)

- Monomers, sugars, sugaralcohols
- Dimeric sugars and oligomeric sugars
- Oligomeric and polymeric sugars, polysaccharidderivatives

HPLC &HILIC methods for saccharides

AppliChrom OTU Amino columns for sugar-HPLC:

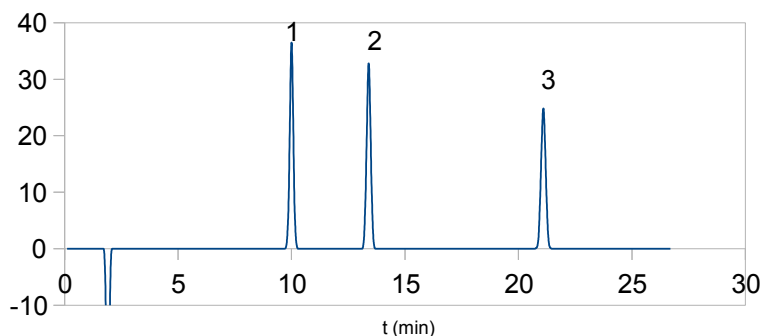
HPLC analysis of mono- and disaccharides, of oligosaccharides in ACN/H₂O (70/30) – alternative selectivity to AppliChrom ABOA SugarSep series.

AppliChrom OTU DioHILIC Columns for sugar-HPLC:

HPLC analysis of mono- and disaccharides, of oligosaccharides in ACN/H₂O – alternative selectivity to AppliChrom OTU Amino columns.

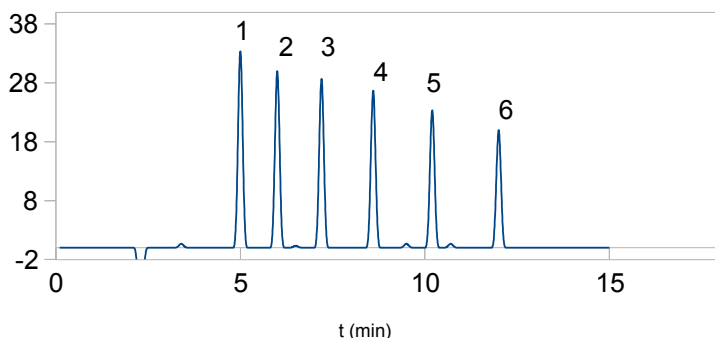
HPLC Analysis of low molecular weight sugars & oligosaccharides:

AppliChrom® ABOA Amino



250x4,6mm
0.5ml/min ACN/H₂O 75/25
25°C
RI-Detection, (alternative ELSD)
20µl
Peaks in order of elution, RI vs. t_r [min]
1. fructose
2. glucose
3. sucrose

AppliChrom® ABOA SugarSep



AppliChrom® ABOA Amino

250x4,6mm
 0.5ml/min ACN/H₂O 55/45
 27°C
 1ml/min
 RI-Detection, (alternative ELSD)
 20µl
 Peaks in order of elution, RI vs. t_r [min]
 1. maltose
 2. maltotriose
 3. maltotetraose
 4. maltopentose
 5. maltohexose
 6. maltoheptose

GPC/SEC-methods for saccharides

AppliChrom GPC columns for water soluble samples:

AppliChrom ABOA SuperOH-P-series for GPC: polymeric polar aqueous GPC/SEC columns for oligomeric/polymeric sugars resp. Polysaccharides, 100 - > 20Mio dalton, fields of application: molecular weight distribution, oligomeric and polymeric saccharides, Starchderivatives, starchdegradationproducts, pectins, pullulan, alginat, dextran, dextransulfat, hyaluronic acid, heparin,... - Measurements in water. .

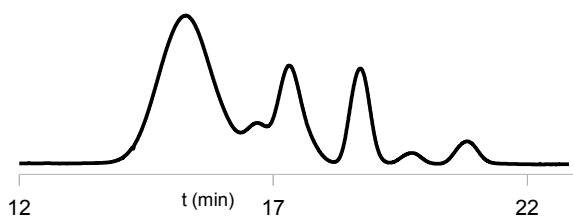
AppliChrom ABOA SuperOH-P-serie for GPC: polymeric aqueous GPC/SEC columns for the molecular weight range of 100 - > 10Mio dalton, including polyamines, polycations and polyelectrolytes like Polyethylenimin, chitosan, p-DADMAc, measurments in water – no ion-exclusion mechanism, pure SEC/GPC!

AppliChrom ABOA DMSO-Phil-P-series for GPC: columns for DMSO soluble samples:

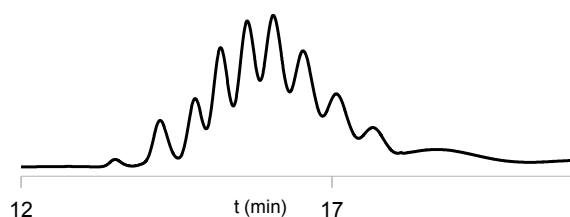
Applications: high molecular weight starch, lignins, humic substances, UF-resin, MUF-resin, urea resin, melamin resin.

GPC/SEC-methods for saccharides:

GPC-analysis of polysaccharid degradation product & HPLC-analysis with GPC column



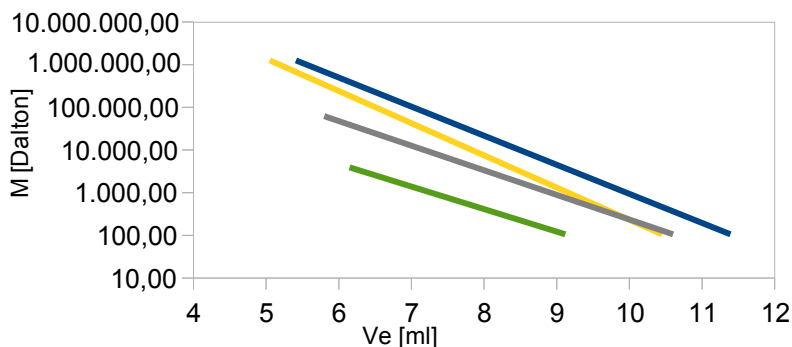
AppliChrom ABOA SuperOH series:
 GPC oligosaccharid analysis, aqueous



AppliChrom DMac-Phil series:
 PEG300 analysis in water/methanol

Poresizes:

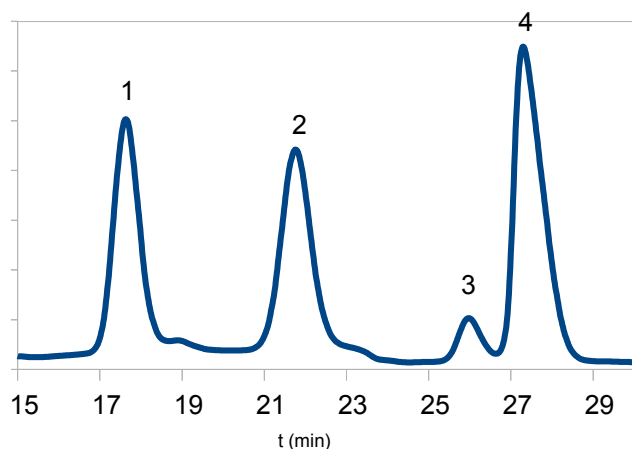
Ranges of **AppliChrom ABOA SuperOH** GPC/SEC-columns, 300x8mm measured in water using PEG/PEO-standards: porosities 100, 200, 300, 400



Poresizes for different ranges of Molecular weights are availablelle.

AppliChrom® ABOA SugarSep

HPLC-analysis of a standardsolution for wine analysis using AppliChrom ABOA SugarSep-Ca column



AppliChrom® ABOA SugarSep-Ca

300x8mm,
0.4ml/min,
H₂O
80°C
RI-detection
20µl, Standardlösung zur Weinanalytik der Deutschen Weinanalytiker e.V.,
lot 1050807 (blue label).
Peaks in order of elution, RI vs. t_r [min]
1. glucose
2. fructose
3. glycerin
4. ethanol

Analytes that are analysed using HPLC-column AppliChrom ABOA SugarSep-Ca or AppliChrom ABOA SugarSep-Pb:

Sugars:

In order of elution for AppliChrom ABOA SugarSep-Ca:

Stachyose, melezitose, raffinose, gentiobiose, cellobiose, trehalose, isomaltose, sucrose, maltose, melibiose, mactose, maltulose, lactulose, glucose, xylose, galactose, mannose, rhamnose, fructose, inositol, arabinose, digitoxose, adonitol, erythritol, mannitol, salicin, dulcitol, xylitol, sorbitol, ribose

Alcohols:

Methanol, ethanol, iso-propanol, 1,2-butandiol, 1,3-butandiol, 1,4-butandiol, ethylenglycol, diethylenglycol, triethylenglycol, 1,2,3-propantriol, glycerin, 1-propanol, 1,2-propandiol, 1,3-propandiol, tert-butanol, 2-butanol, iso-butanol, 1-butanol

Analyte that are analysed using HPLC column AppliChrom ABOA SugarSep-H:

Acids:

L-Malic acid, D-lactic acid, L-lactic acid, citric acid, ascorbic acid, vitamin C, fumaric acid, shikimi acid, succinic acid, acetic acid, oxalic acid, acrylic acid, adipic acid, furan-2-carboxylic acid, galacturonic acid, gluconic acid, glutaric acid, glycolic acid, pyruvic acid, maleic acid, malonic acid, hydroxy butyric acid, propionic acid, formic acid, beta-keto glutaric acid, hippuric acid, iso-valerianic acid, n-butyric acid, n-valerianic acid, pyroglutaminic acid, 2-oxoisovalerianic acid, N-acetylneuraminic acid, iso-butyric acid, 3-phenyl propionic acid,

Alkohole:

Methanol, ethanol, iso-propanol, 1,2-butandiol, 1,3-butandiol, 1,4-butandiol, ethylenglycol, diethylenglycol, triethylenglycol, 1,2,3-propantriol, glycerin, 1-propanol, 1,2-propandiol, 1,3-propandiol,

Saccharides:

Arabinose, arabitol, cellobiose, digitoxose, fucose, fructose, galactose, glucose, isomaltose, lactose, lactulose, maltose, maltotriose, manntiol, mannose, melezitose, melibiose, meso-erythritol, N-acetylglucosamin, N-acetylgalactosamin, raffinose, rhamnose, ribose, ribitol, sorbitol, sorbose, stachyose, sucrose/saccharose, trehalose, xylitol, xylose.

*) Di- and oligosaccharides can be analysed in many cases using AppliChrom ABOA SugarSep-H with the eluent 0.1% H₂SO₄ - but in this case the Column temperature should be (instead of 60-90°C) lowered to approx. 30°C to avoid decomposition of oligosaccharides. It has to be tested.