

HPLC Columns for Carbohydrates

Product Specification

Within the different classes of sugars, chemical and physical properties vary only slightly. HPLC separations of carbohydrates depend on differences in conformation, configuration, and column type. Because of this complexity, no single HPLC column or method is capable of separating every carbohydrate. We offer eight SUPELCOSIL™ and SUPELCOGEL™ columns for separating mono-, di-, tri-, and oligosaccharides. To choose the best column for your carbohydrate analysis, consult Table 1 (below), the Retention Time Index (next page), and the Applications section of our catalog. For more information, request Bulletin 887 (*HPLC Carbohydrate Column Selection Guide*).

SUPELCOGEL K columns are useful for separating raffinose, sucrose, glucose, fructose, and betaine, a trimethylammonium zwitterionic compound found in beet and cane sugars and widely distributed in other plants.

The lead-form resin in **SUPELCOGEL Pb columns** provides the highest resolution and best selectivity for monosaccharides, including excellent separation of xylose, galactose, and mannose.

SUPELCOGEL Ca columns provide excellent separations of monosaccharides and sugar alcohols. Di-, tri-, and oligosaccharides are separated by class. This column often is used to separate sugars in high fructose corn syrup (HFCS).

SUPELCOGEL C-610H and H columns are ideal for separating carbohydrates, alcohols, and organic acids present in the same sample: fermentation products, fruit juices, etc.

SUPELCOGEL Column Characteristics

Particles:	sulfonated polystyrene/divinyl benzene, spherical, 9µm
Counter Ion:	varies (see Table 1)
pH Range:	1 - 13
Organic Compatibility:	<10% in mobile phase
Maximum Temperature:	varies (see Table 1)
Maximum Flow Rate:	1.5mL/min (7.8mm ID columns) 0.4mL/min (4.6mm ID columns)
Maximum Pressure:	1000psi (70 bar)

SUPELCOSIL LC-NH₂ Column Characteristics

Particles:	spherical silica, 5µm
Bonded Phase:	aminopropylsilyl
pH Range:	2 - 7.5
Organic Compatibility:	no limits (avoid aldehydes and ketones)
Maximum Flow Rate:	2mL/min (4.6mm ID columns)
Maximum Pressure:	6000psi (420 bar)

SUPELCOGEL C-611 columns contain a unique ion exchange resin containing two divalent cations, rather than one. This provides different selectivities for separating monosaccharides and sugar alcohols. Di-, tri-, and oligosaccharides are separated by class. Galactose and mannose are well separated.

SUPELCOGEL Ag columns provide rapid oligosaccharide separations. Glycerol and ethanol are well resolved.

Silica-based **SUPELCOSIL LC-NH₂ columns** separate monosaccharides, disaccharides, and some trisaccharides. Sugar retention decreases as the proportion of water : acetonitrile in the mobile phase is increased. Sugars generally will be eluted in order of increasing molecular weight.

Table 1. Carbohydrate Column Applications and Mobile Phases

Column	Application	Form	Typical Mobile Phase	Max. Temp. (°C)
SUPELCOGEL K	beet sugar, cane sugar, molasses, corn syrup	potassium	10mM K ₂ HPO ₄	90
SUPELCOGEL Pb	monosaccharides, xylose/galactose/mannose	lead	deionized water	90
SUPELCOGEL Ca	high fructose corn syrup, monosaccharides, sugar alcohols, oligosaccharides	calcium	deionized water	90
SUPELCOGEL C-610H	organic acids	hydrogen	0.1% H ₂ SO ₄ or H ₃ PO ₄	60
SUPELCOGEL H	organic acids	hydrogen	0.1% H ₂ SO ₄ or H ₃ PO ₄	90
SUPELCOGEL C-611	mono-, di-, and trisaccharides, galactose/mannose	mixed cations (Ca ⁺⁺ , Mg ⁺⁺)	10 ⁻⁴ N NaOH	85
SUPELCOGEL Ag	oligosaccharides, glycerol/ethanol, beer, corn syrup, hydrolyzed starch	silver	deionized water	90
SUPELCOSIL LC-NH ₂	mono-, di-, and trisaccharides	aminopropyl silica	75% CH ₃ CN in water	70

SUPELCOGEL and SUPELCOSIL Carbohydrate Columns and Guard Columns

Column	Length (cm)	ID (mm)	Cat. No.	Supelguard™ Guard Column	Cat. No.
SUPELCOGEL K	30	7.8	59342	K*	59344
SUPELCOGEL Pb	30	7.8	59343	Pb*	59345
SUPELCOGEL Ca	30	7.8	59305-U	Ca*	59306-U
SUPELCOGEL C-610H	30	7.8	59320-U	H*	59319
SUPELCOGEL H	30	7.8	59304-U	H*	59319
SUPELCOGEL H	25	4.6	59346	H*	59319
SUPELCOGEL C-611	30	7.8	59310-U	Ca*	59306-U
SUPELCOGEL Ag	30	7.8	59315	Ag*	59316
SUPELCOSIL LC-NH ₂	25	4.6	58338	LC-NH ₂ **	59558 (kit - column + holder) 59568 (pk. of 2 columns)

*5cm x 4.6mm ID column. **2cm x 4.6mm ID column.

**Table 2. Retention Time Index for Carbohydrate Columns
(For optimal separations, allow at least 1 minute between compounds.)**

	SUPELCOGEL Columns							SUPELCOSIL	
	Ca	C-610H	H	H	Pb	C-611	K	Ag	LC-NH ₂
Cat. No.:	59305-U	59320-U	59304-U	59346	59343	59310-U	59342	59315	58338
Dimensions (mm):	300 x 7.8	300 x 7.8	300 x 7.8	250 x 4.6	300 x 7.8	300 x 7.8	300 x 7.8	300 x 7.8	250 x 4.6
Temperature:	80°C	30°C	30°C	30°C	85°C	60°C	85°C	85°C	ambient
Mobile Phase:	DH ₂ O	0.1% H ₃ PO ₄	0.1% H ₃ PO ₄	0.1% H ₃ PO ₄	DH ₂ O	10 ⁻⁴ N NaOH	15mMK ₂ HPO ₄	DH ₂ O	ACN:DH ₂ O (3:1)
Flow Rate (mL/min):	0.5	0.5	0.5	0.17	0.5	0.5	0.5	0.5	1.0
Detection: refractive index									
Compound	Retention Times (min)								
Arabinose	15.3	13.9	14.3	13.8	19.2	19.6	16.8	17.1	7.5
Arabitol	19.8	14.1	14.9	14.3	32.3	22.8	13.5	16.0	7.2
Betaine	ND	ND	ND	ND	NR	ND	13.0	ND	ND
Dulcitol	22.3	13.4	14.2	13.7	43.4	25.7	12.9	15.9	9.0
Erythritol	17.7	15.0	15.6	14.8	24.5	20.2	14.0	16.1	5.9
Ethanol	19.4	25.6	ND	ND	ND	21.0	ND	18.4	NR
Fructose	14.9	13.1	13.3	12.9	20.8	20.7	15.2	16.0	8.3
Galactose	13.4	12.9	13.0	12.6	17.6	17.6	15.1	15.8	10.3
Glucose	12.0	12.1	11.9	11.7	14.9	15.8	14.0	14.6	9.8
Glycerol	18.7	16.8	17.6	16.6	23.8	20.9	15.2	17.1	NR
Inositol	14.9	12.6	12.7	12.4	24.5	20.1	15.7	17.4	ND
Isomaltose	9.6	10.3	ND	ND	ND	13.8	ND	11.6	19.4
Isomaltotriose	8.5	9.5	ND	ND	ND	12.6	ND	9.8	NR
Lactitol	ND	ND	11.1	11.0	26.5	ND	10.6	ND	ND
Lactose	10.2	10.8	10.2	10.2	13.5	14.3	10.9	11.8	19.5
Maltitol	13.6	11.0	10.7	10.7	23.8	17.7	10.2	15.0	15.5
Maltoheptaose	7.5	8.8	7.6	7.9	9.2	11.6	7.2	7.3	NR
Maltohexaose	7.7	8.9	7.7	8.1	9.7	12.0	7.4	7.6	NR
Maltopentaose	7.9	9.1	7.9	8.2	10.5	12.6	7.8	8.1	NR
Maltose	9.8	10.5	9.9	9.9	13.0	14.2	10.7	11.5	17.4
Maltotetraose	8.3	9.3	8.2	8.5	11.2	13.2	8.4	8.8	NR
Maltotriose	8.8	9.7	8.8	9.0	12.0	13.6	9.2	9.8	31.0
Mannitol	19.2	13.2	13.7	13.2	32.5	22.1	12.6	15.2	9.2
Mannose	13.7	12.8	12.9	12.5	19.8	18.9	15.6	15.9	9.1
Melezitose	8.7	9.7	8.8	9.0	10.8	12.4	8.6	9.3	24.5
Psicose	22.5	13.4	14.5	13.9	36.5	32.9	15.5	17.2	6.6
Raffinose	8.7	9.7	8.7	8.9	11.2	12.6	8.7	9.6	29.7
Ribitol	16.7	13.7	14.2	13.6	25.1	19.5	13.1	15.3	ND
Ribose	24.3	14.2	15.8	15.0	40.7	34.6	17.7	19.1	6.0
Sorbitol	23.4	13.4	14.4	13.9	46.9	28.3	13.3	16.3	9.0
Stachyose	8.1	9.3	8.1	8.4	10.4	11.9	7.9	8.5	67.3
Sucrose	9.8	10.6	9.9	9.9	12.2	13.6	10.1	11.2	14.0
Xylitol	23.3	14.4	15.7	15.0	42.1	28.0	14.2	17.1	7.3
Xylose	13.2	12.8	12.8	12.6	16.1	17.2	15.3	15.6	6.8

NR - not recommended ND - no data available

Trademarks

SUPELCOGEL, SUPELCOSIL, Supelguard — Sigma-Aldrich Co.

For resins used in processing sugars and foods refer to the low pressure LC media section of our catalog.

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