

Thermo Scientific Dionex CarboPac Column for the Analysis of Sugar Alcohols

Reduced carbohydrates or sugar alcohols are a difficult class of carbohydrates to separate by liquid chromatography. Sugar alcohols are weaker acids than their non-reduced counterparts and are therefore poorly retained on most anion-exchange columns. The Thermo Scientific™ Dionex™ CarboPac™ MA1 column addresses this challenge by retaining and separating extremely weak acids.

- **Uses In the Food Industry:** Sugar alcohols like sorbitol and mannitol are used as sucrose replacements in confectionery products to impart a sweet taste without the associated calories. Sorbitol and mannitol are regulated as they exhibit laxative and diuretic properties.

- **Uses in the Pharmaceutical Industry:** Fermentation broths are used in the manufacture of biotherapeutics and many other biological materials. The ingredients of fermentation broths are closely monitored and characterized as the carbon sources and metabolic by-products impact the yield of the biotherapeutic. Carbohydrates like glucose, lactose, sucrose, maltose, etc. are carbon sources essential for cell growth and product synthesis, while sugar alcohols and organic anions are metabolic by-products that often reduce yields and are undesirable in the fermentation broth.

Listed in the table below are the details of the Dionex CarboPac MA1 column for the separation of sugar alcohols.

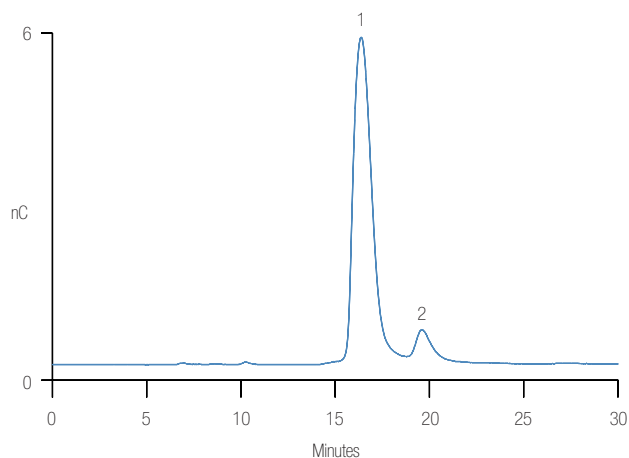
Column	Format	Use for	Eluent
Dionex CarboPac MA1	4 × 250 mm	Determination of reduced mono- and disaccharides in commercial sweeteners and other food products and reduced monosaccharides from glycoproteins and pharmaceuticals	Sodium Hydroxide

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The figures below show examples of sugar alcohols in a variety of samples.

Food Samples

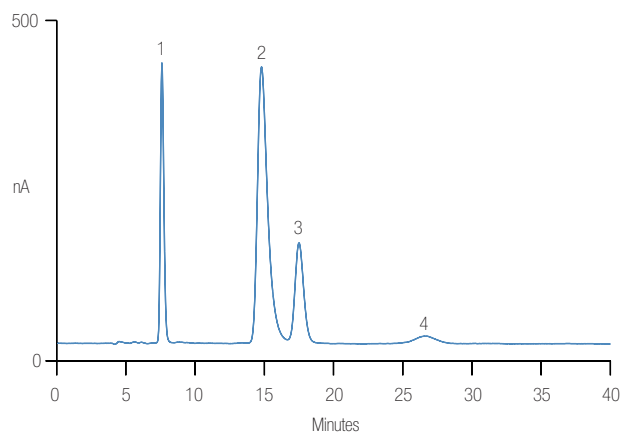
Figure 1. “Sugarless” hard candy containing sorbitol and mannitol.



Column: Dionex CarboPac MA1, 4 × 250 mm
Eluent: 500 mM Sodium Hydroxide
Flow Rate: 0.4 mL/min
Injection Volume: 10 µL
Detection: Pulsed amperometry, gold electrode

Peaks: 1. Sorbitol 106 µg/L
2. Mannitol 17

Figure 2. Chewing gum extract containing glycerol, sorbitol, and mannitol.



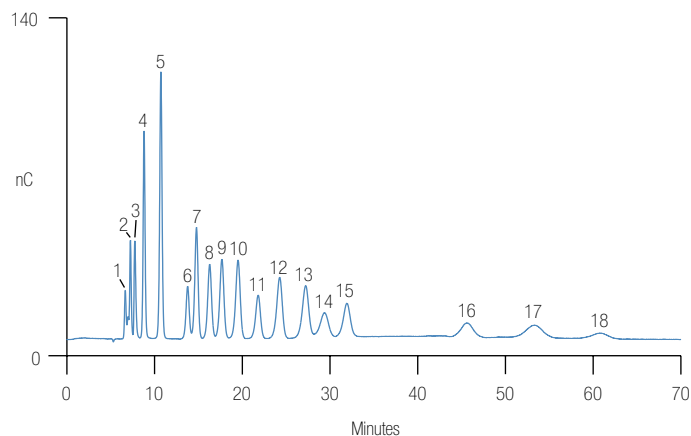
Column: Dionex CarboPac MA1, 4 × 250 mm
Eluent: 500 mM Sodium Hydroxide
Flow Rate: 0.4 mL/min
Injection Volume: 10 µL
Detection: Pulsed amperometry, gold electrode

Peaks: 1. Glycerol 0.39 µg/L
2. Sorbitol 1.1
3. Mannitol 0.3
4. Glucose 0.6

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Pharmaceuticals

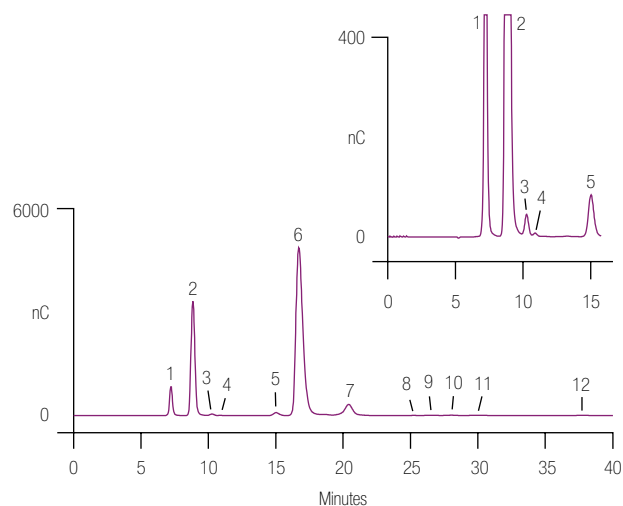
Figure 3. Common carbohydrates, alditols, alcohols, and glycols found in fermentation broths separated on the Dionex CarboPac MA1 column with pulsed amperometric detection.



Column: Dionex CarboPac MA1/MA1 guard
 Eluent: 480 mM Sodium hydroxide
 Flow Rate: 0.4 mL/min
 Inj. Volume: 10 μ L
 Detection: Pulsed amperometry, gold electrode

Peaks:	1. 2,3-Butanediol	10. Mannitol
	2. Ethanol	11. Arabinose
	3. Methanol	12. Glucose
	4. Glycerol	13. Galactose
	5. Erythritol	14. Lactose
	6. Rhamnose	15. Ribose
	7. Arabitol	16. Sucrose
	8. Sorbitol	17. Raffinose
	9. Galactitol	18. Maltose

Figure 4. Separation of sugar alcohols and glycols in a cough suppressant using the Dionex CarboPac MA1 column.



Column: Dionex CarboPac MA1/MA1 guard
 Eluent: 480 mM Sodium hydroxide
 Flow Rate: 0.4 mL/min
 Inj. Volume: 10 μ L
 Detection: Pulsed amperometry, gold electrode
 Sample: 100-fold dilution (w/w)

Peaks:	1. Propylene glycol	1.1 g/L
	2. Glycerol	0.6
	3. Unidentified	—
	4. Unidentified	—
	5. Unidentified	—
	6. Sorbitol	1.5
	7. Mannitol	0.1
	8. Unidentified	—
	9. Unidentified	—
	10. Unidentified	—
	11. Maltitol	0.005
	12. Unidentified	—