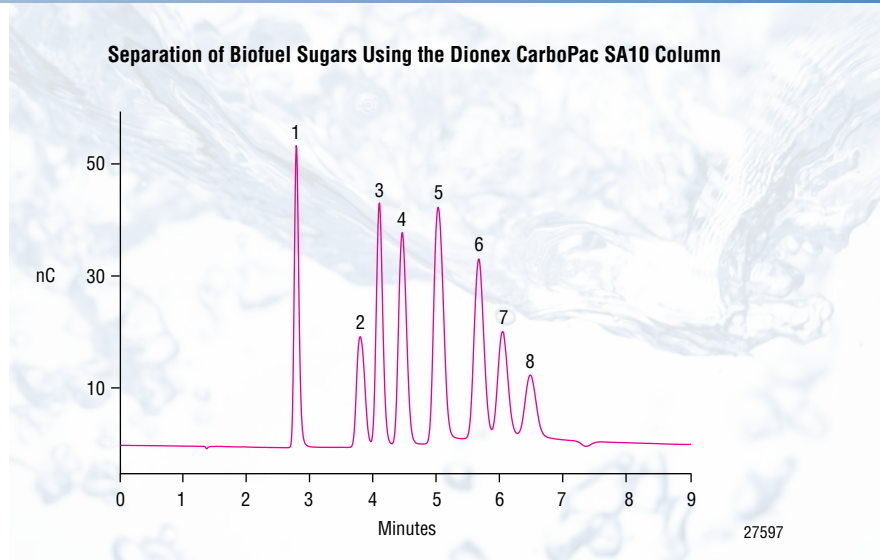


Thermo Scientific Dionex CarboPac SA10 Column for Fast, High-Resolution Mono- and Disaccharide Analysis

The Thermo Scientific™ Dionex™ CarboPac™ SA10 column is an anion-exchange column for the fast separation and accurate quantification of mono- and disaccharides in biofuels, foods, and beverages. The column provides:

- Fast analysis and short separation times
- High resolution
- High capacity
- High reproducibility



Fast, High-Resolution Determination of Mono- and Disaccharides

The Dionex CarboPac SA10 anion-exchange column is optimized for the fast chromatographic analysis of biofuels and foods for simple sugars. The fast, efficient separations of mono- and disaccharides are achieved without compromising resolution. For the eight most common biofuel mono- and disaccharides, the Dionex CarboPac SA10 column provides the unsurpassed fast separation time of less than 8 min. The six most common food sugars can be separated in the exceptionally fast time of only 10 min. Due to the high capacity of the Dionex CarboPac SA10 column, minimum sample dilution is required.

The Dionex CarboPac SA10 column is composed of a unique supermacroporous (SMP) substrate coated with a strong anion-exchange layer of latex nano beads, which provides high capacity and rapid, high-resolution separations. Excellent resolution and calibration linearity results in accurate quantitative carbohydrate analysis. The Dionex CarboPac SA10 anion-exchange column is used with pulsed amperometric detection (PAD) systems and permits the direct quantification of nonderivatized carbohydrates with minimal sample preparation. The column provides high reproducibility, and 1000 injection cycles under high pH conditions are possible. The Dionex CarboPac SA10 column is available in microbore (2 mm) and standard bore (4 mm) formats.

Biofuel and Food Applications

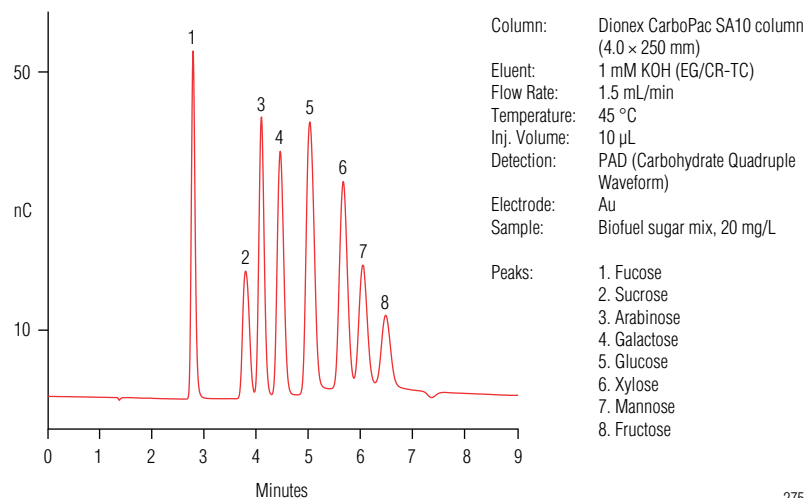
The biofuel, food, and beverage industries process very high volumes of carbohydrate samples, and require high throughput mono- and di-saccharide analysis capabilities. The Dionex CarboPac SA10 column is specifically designed for the exceptionally fast, high-resolution analysis of carbohydrate samples for biofuel and food applications. Rapid separation of the eight most common biofuel mono- and disaccharides can be achieved on the Dionex CarboPac SA10 column (Figure 1). The capability to analyze the six most common food sugars with a short separation time is important for many applications. The Dionex CarboPac SA10 column can separate these six common food sugars in about 10 min, as shown in Figure 2.

High Concentration Samples

The Dionex CarboPac SA10 column is capable of analyzing a broad range of sample concentrations, including high-concentration samples. Packed with highly porous resin beads, the Dionex CarboPac SA10 column has significantly higher capacity than other Dionex CarboPac columns and is the column of choice for high-concentration mono- and disaccharide sample analysis. When high-concentration simple sugar samples are separated on a Dionex CarboPac SA10 column, linearity is maintained and accurate quantitative analysis is achieved. Figures 3 and 4 demonstrate the separation of a high-concentration corn stover hydrolysate sample on the Dionex CarboPac SA10 2/4 mm column. Note excellent separation of biofuel sugars when 43 g/L corn stover hydrolysate sample was injected using 1:200 dilution of the sample and optimum gasket thickness (15 mil for the 2 mm column and 62 mil for the 4 mm column).

System Compatibility

The Dionex CarboPac SA10 column is compatible with KOH eluents prepared by Eluent Generation only. It is not compatible with manually prepared eluents. A Thermo Scientific™ Dionex™ Reagent-Free™ IC (RFIC™) System equipped with an Electrochemical Detector, such as the Thermo Scientific™ Dionex™ ICS-5000+ HPIC System, is required.



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Figure 1. Fast separation of biofuel sugars on the Dionex CarboPac SA10 column.

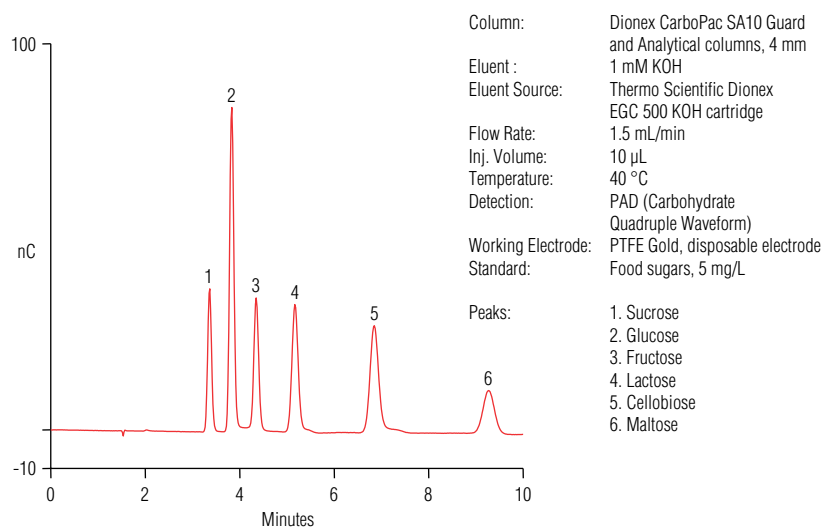


Figure 2. Fast separation of food sugars on the Dionex CarboPac SA10 column.

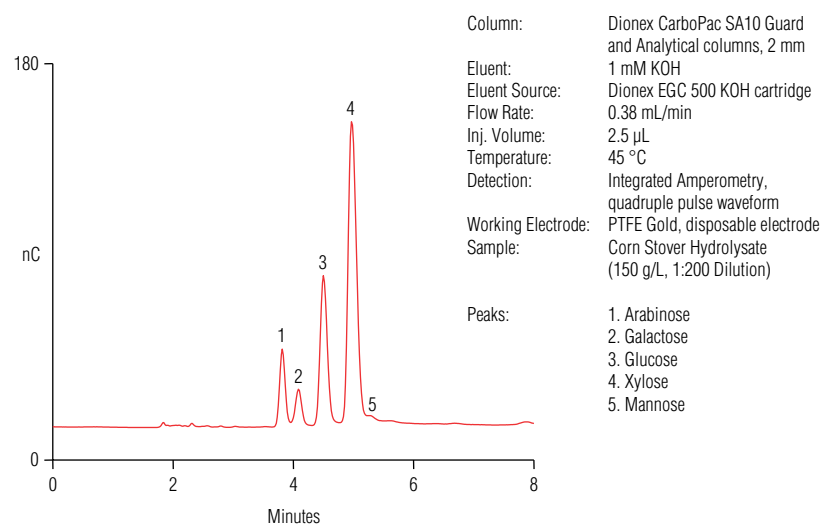


Figure 3. High-resolution separation of a high concentration corn stover hydrolysate sample using a Dionex CarboPac SA10 2 mm column and 15 mil gasket thickness.

Innovative Resin Technology

The Dionex CarboPac SA10 resin consists of 6 µm diameter SMP resin beads covered with the quaternary ammonium ion functionalized nano beads. This wide-pore resin structure permits fast mass transfer, resulting in high-resolution chromatography. The highly porous beads have large surface areas, providing high capacity. Together, the morphology of the porous substrate and agglomerated functionalized nano beads results in fast, high-resolution separations of common sugars with exceptionally short analysis times.

High Reproducibility

The Dionex CarboPac SA10 column provides consistent chromatographic performance and highly reproducible analysis. Figure 5 shows the high reproducibility of the column, with consistent separation results obtained after 1000 runs of a biofuel sugar sample. The Dionex CarboPac SA10 column needs to be used with the on-line eluent generator, (EG), which produces carbonate-free hydroxide eluent to ensure reproducible separations.

Disposable Gold Electrodes

Pulsed amperometric detection (PAD) permits detection of carbohydrates with excellent signal-to-noise ratios down to approximately 10 picomoles without requiring derivitization. Carbohydrates are detected by measuring the electrical current generated by their oxidation at the surface of a gold electrode. A gold electrode is commonly used for determination of monosaccharides and disaccharides.

Although carbohydrates can be oxidized at a gold working electrode, over time the products of oxidation reactions can foul the surface of the electrode, inhibiting analyte oxidation. Electrode fouling with oxidation byproducts or sample components will reduce response, requiring working electrode polishing to restore the surface. Thermo Scientific Dionex disposable gold electrodes eliminate the need for electrode reconditioning (i.e. polishing). Disposable electrodes are economical, and thus can be replaced frequently while delivering peak area reproducibility superior to conventional Au working electrodes. The peak area reproducibility for five disposable electrodes is shown in Table 1.

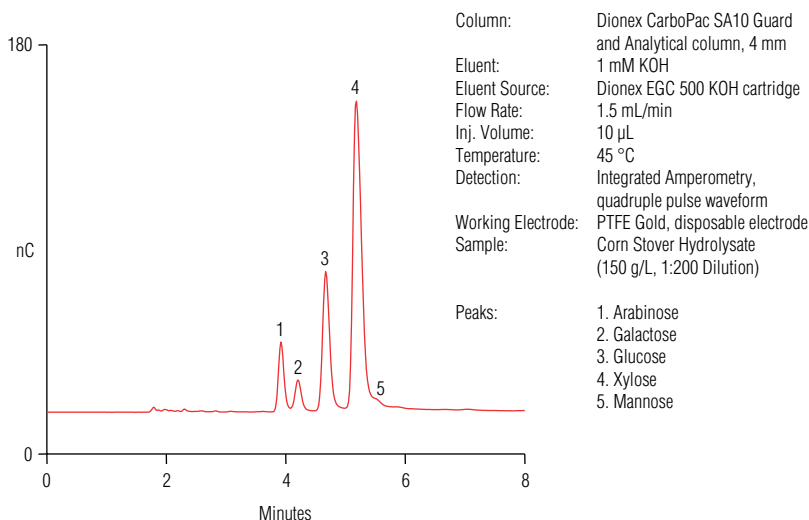
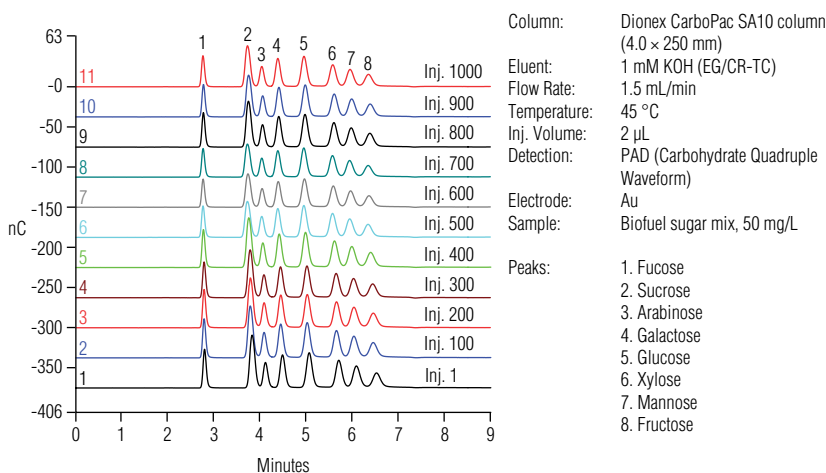


Figure 4. High-resolution separation of a high concentration corn stover hydrolysate sample using a Dionex CarboPac SA10 4 mm column and 62 mil gasket thickness.



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Figure 5. Consistent separation results obtained after 1000 separations of a biofuel sugar sample using a Dionex CarboPac SA10 column.

Table 1. Peak area reproducibility: electrode-to-electrode for five disposable electrodes.

Electrode	Average	Fuc	GalN	GlcN	Gal	Glc	Man
1	n = 12	3.09	7.05	5.58	4.92	5.82	4.22
2	n = 12	3.13	7.49	5.95	4.68	6.24	4.25
3	n = 12	3.35	7.65	6.04	5.32	6.23	4.52
4	n = 12	3.12	6.76	5.33	4.70	5.52	4.18
5	n = 12	3.12	6.93	5.46	4.83	5.54	4.20
	Average	3.16	7.18	5.67	4.89	5.87	4.27
	S.D	0.11	0.38	0.31	0.26	0.36	0.14
Elec-to-Elec	RSD	3.41%	5.30%	5.44%	4.35%	6.05%	3.28%
Perm. Elec	n = 12	2.91	5.79	4.36	4.84	4.51	3.64

DIONEX CARBOPAC SA10 COLUMN SPECIFICATIONS

Resin Characteristics	
Particle Size	6 µm Supermacroporous
Pore Size	2000 Å
Substrate	Ethylvinylbenzene crosslinked with divinylbenzene
Crosslinking	55%
Ion-Exchange Capacity	290 µeq per 4.0 × 250 mm column 72.5 µeq per 2.0 × 250 mm column
Latex Nano Bead Characteristics	
Functional Group	Difunctional quaternary ammonium ion
Latex Diameter	55 nm
Latex Crosslinking	4.5%
Typical Operating Parameters	
pH Range	0–14
Temperature Range	4–60 °C
Recommended Flow Rate	1.5 mL/min (4 × 250 mm column) 0.38 mL/min (2 × 250 mm column)
Flow Rate Range	1.0–2.0 mL/min (4 × 250 mm column) 0.25–0.50 mL/min (2 × 250 mm column)
Pressure Limit	3500 psi
Organic Solvent Limit	100% compatible
Typical Eluents	Potassium hydroxide or sodium hydroxide

Ordering Information

In the U.S., call (800) 346-6390 or contact the Thermo Fisher Scientific Regional Office nearest you. Outside the U.S., order through your local Thermo Fisher Scientific office or distributor. Refer to the following part numbers.

Analytical and Guard Columns	Part Number
Dionex CarboPac SA10 Analytical Column (4 × 250 mm)	074641
Dionex CarboPac SA10 Guard Column (4 × 50 mm)	074902
Dionex CarboPac SA10 Analytical Column (2 × 250 mm)	082322
Dionex CarboPac SA10 Guard Column (2 × 50 mm)	082323
Electrodes	Part Number
Disposable Electrodes for Carbohydrates, Pack of six Au (Polyester), two 0.002" gaskets	060139
Disposable Au (PTFE) Electrodes for Carbohydrates, Pack of six Au (PTFE), four, 0.002" gaskets	066480
Polypropylene Support Block, ED cell for use with Disposable Electrodes	062158
Gaskets, (PTFE) for Disposable Electrode 0.001" Pack of two	072117
Gaskets, (PTFE) for Disposable Electrode 0.002" Pack of four	060141
Gaskets, (ULTEM) for Disposable Electrodes 0.001" Pack of four	069339
Gasket, (HDPE) for Disposable Electrodes 0.015"	057364
Gasket, (UHMW PE) for Disposable Electrodes, 0.062"	075499
Polypropylene Support Block, for use with 0.062" gasket, ED Cell, for Disposable Electrodes	075501
ED Kit with 62 mil gasket, Polypropylene Support Block, for use with Disposable Electrodes	075502
Polypropylene Support Block, ED50A/50/40 cell for use with Disposable Electrodes	060297

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