

Electrochemical Detector for HPLC

For amperometric detection mode/for pulse amperometric detection mode

ED743

CE



Electrochemical Detector for HPLC ED743



The electrochemical detector is a highly sensitive and highly selective detector for compounds that easily react (oxidize / reduce) electrochemically.

GL Sciences released its first electrochemical detector, ED623, in 1996, and, through various improvements, has continued to release the successor models ED703, ED703 Pulse, and ED723.

The GL Sciences electrochemical detector has now been reborn as the fifth-generation ED743.

Based on more than 20 years of proven performance and technical capability, we have achieved higher sensitivity in the analysis of sugars through the use of a gold electrode, further improvements in ease of maintenance, and the like.

From design to manufacturing and shipment inspection, all of our processes are handled in Japan, and we have thoroughly implemented strict quality control at our ISO 9001 certified plant.

Even more evolved Electrochemical Detector ED743

▶ Highly sensitive detection for electrochemically reactive compounds (10 to 100 times more sensitive than UV detector)

▶ Highly sensitive detection of sugars (Gold electrode: Approximately 3 times higher sensitivity than our previous model)

▶ No electrode polishing required
Built-in online electrode cleaning function (diamond electrode)

▶ Improved maintainability
Pursuing further ease of use compared to conventional product

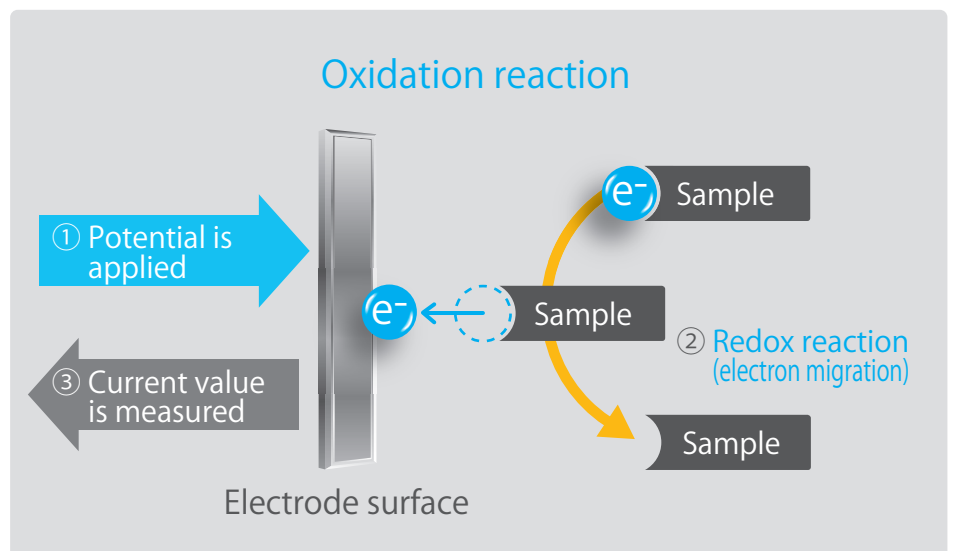
What is an electrochemical detector?

Principles of detection

- ① A potential is applied to the electrodes in the detector cell
- ② Material migrates to the electrode surface, and a redox reaction (= electron transfer) occurs.
- ③ Measure the current flow due to electron transfer. (Current values are proportional to the amount of material reacted.)



It can be used for quantitation.

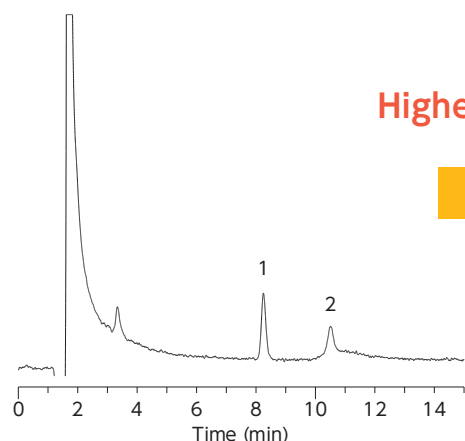


Highly sensitive and selective detector

High-sensitivity detection

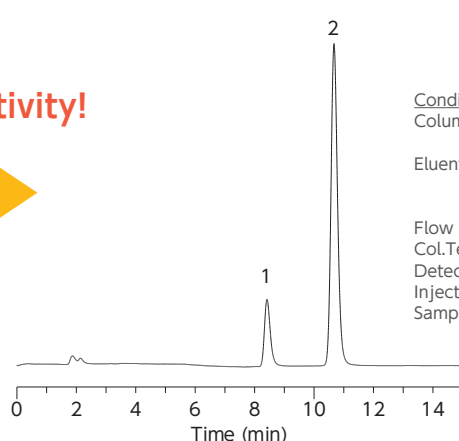
Electrochemical detectors are 10 to 100 times more sensitive than UV detectors.

UV detector



Electrochemical detector

Higher sensitivity!



Conditions

Column : Inertsil ODS-3
(3 μ m, 150 \times 3.0 mm I.D.)
Eluent : A) CH₃CN
 B) Phosphate buffer (IPCC-08, pH 2.2)
 A/B = 25/975, w/w
Flow Rate : 0.4 mL/min
Col.Temp. : 40 $^{\circ}$ C
Detection : ECD (ED743, Diamond)
Injection Vol. : 10 μ L
Sample : 1. Cysteine
 2. Cystine

Can analyze a variety of compounds depending on working electrode selection

Electrodes can be chosen according to the compounds to be analyzed.

Diamond electrode

(A glassy carbon electrode can also be used for some of these)

Phenols

Chlorophenols
Phenolic acids
Catechins
Bisphenols
Estradiol, etc.

Catecholamines and related substances

Noradrenaline (norepinephrine)
Adrenaline (epinephrine)
Dopamine
Serotonin, etc.

Vitamins

Ascorbic acid
Biotin, etc.

Amino acids and peptides

Tyrosine Cystine
Methionine GSH
Tryptophan GSSG
Cysteine, etc.

Gold electrode

Sugars and sugar alcohols

Glucose Xylitol
Fructose Sorbitol
Sucrose etc.
Lactose

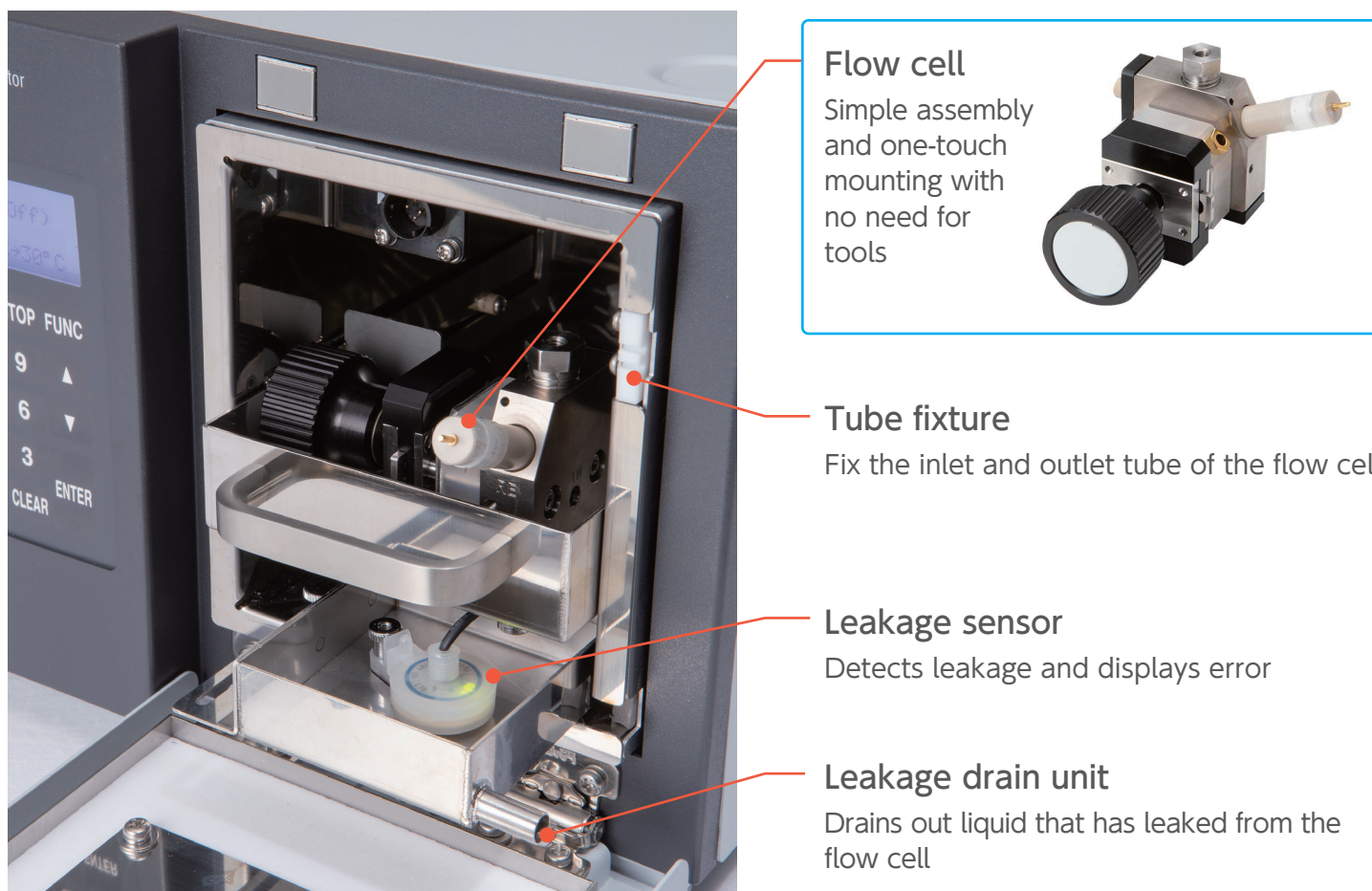
Platinum electrode

Hydrogen peroxide, etc.

Silver electrode

Iodine, etc.

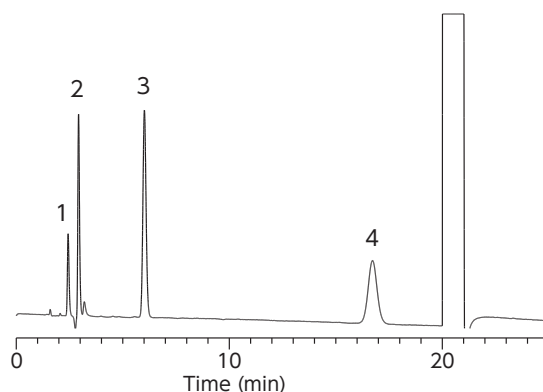
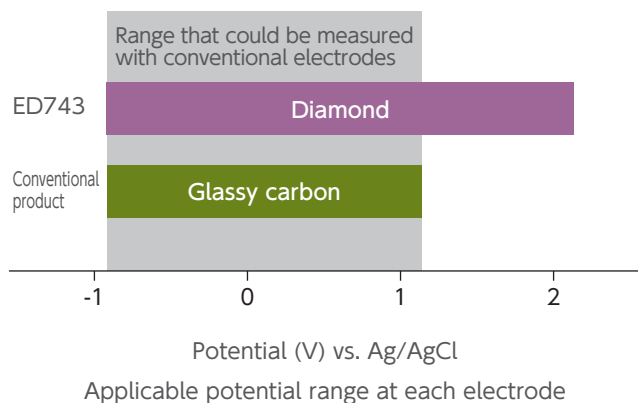
ED743 configuration



Features of diamond electrodes

● Expansion of measurement compounds

Through the use of a diamond electrode, which has a wider potential range that can be applied than common electrodes, even compounds that have high redox potential, like disulfides (for instance, oxidized glutathione and the like), can be measured.



Conditions

Column : InertSustain AQ-C18 (5 μ m, 150 \times 4.6 mm I.D.)

Eluent : A) CH₃CN
B) Phosphate buffer (IPCC-06, pH 2.2)
A/B = 25/975, w/w

Flow Rate : 1.0 mL/min

Col.Temp. : 40 $^{\circ}$ C

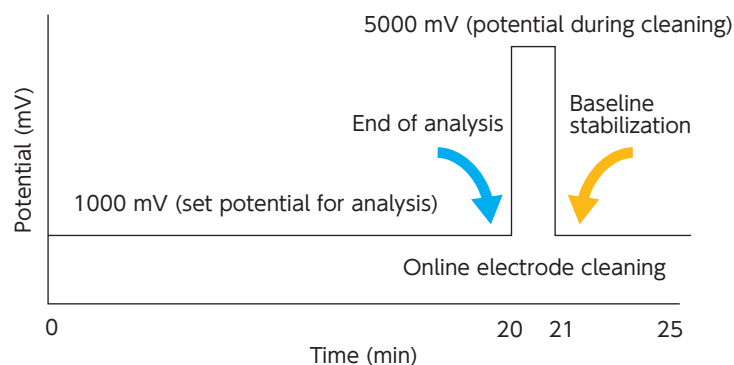
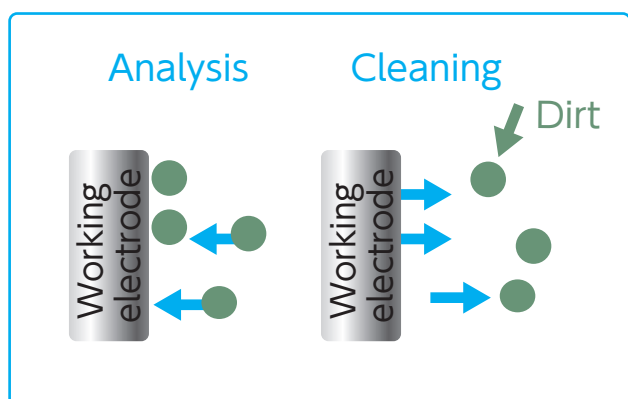
Detection : ECD (ED743, Diamond, 1800 mV)

Injection Vol. : 10 μ L

Sample : 1. Cystine 3. Glutathione, Reduced Form (GSH)
2. Cysteine 4. Glutathione, Oxidized Form (GSSG)

● Online electrode cleaning

By applying a very high potential to the diamond electrode, the deposits on the electrode surface can be removed. Therefore, unlike the conventional working electrode, highly reproducible data can be obtained without performing complicated operations such as removing from the flow cell and polishing.



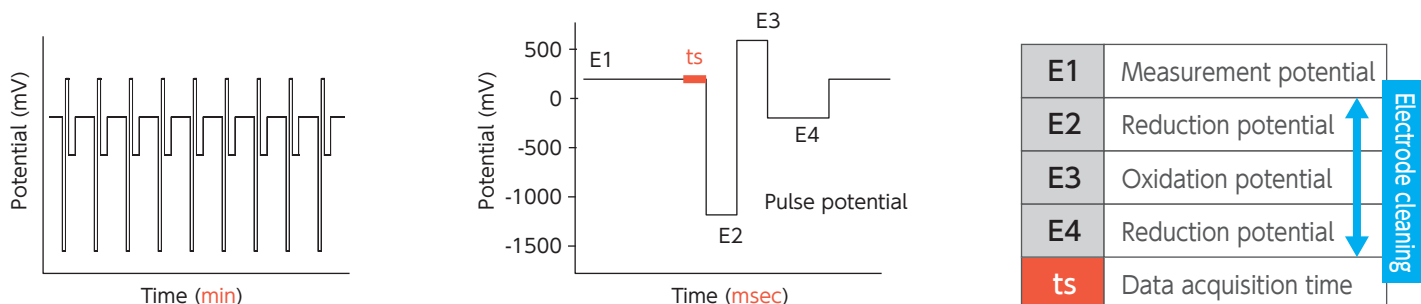
Features of gold electrodes

● High-sensitivity analysis of sugars is possible

With ED743, a gold electrode can also be selected. Gold electrodes can analyze sugars with higher sensitivity than RI detectors and fluorescence detectors. The pulse potential as shown in the figure below is repeatedly applied to measure while constantly removing dirt adhering to the electrode surface.

● Electrochemical detection using pulsed amperometric detection (PAD) mode

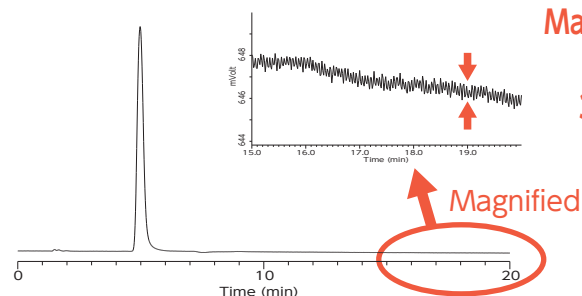
A set pulse potential is repeatedly applied.



● Sensitivity improvement of Gold electrode

Through intensive efforts to reduce noise, ED743 succeeded in reducing the noise with gold electrodes to approximately 1/8 and in improving the SN ratio by approximately 3 times compared to our previous products.*

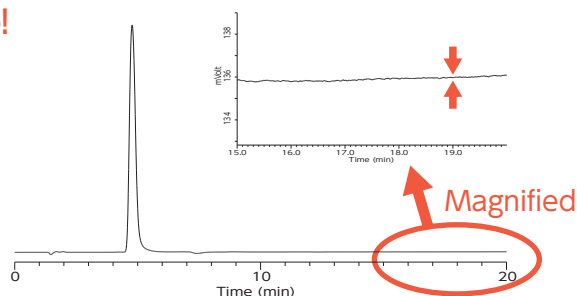
ED723 (our previous product)



Major reduction in noise!
Approximately
3 times the SN ratio!



ED743



* Comparison in glucose analysis (Sensitivity may vary depending on target compounds and analysis conditions.)

Introducing an HPLC column for sugar analysis

InertSphere Sugar-1, an anion exchange column for sugar analysis, packed with a quaternary ammonium group-bonded polymer is available.

- Ideal for analysis of monosaccharides and disaccharides
- High-sensitivity analysis of sugars is possible by combining with an electrochemical detector
- Can be cleaned with a 100% organic solvent (methanol)
- Allows for analysis using strongly alkaline eluents



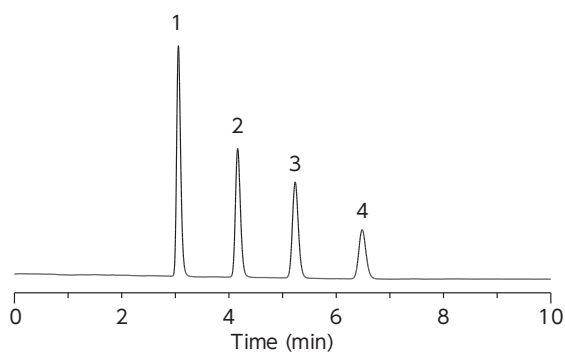
Product name	Size (Particle size, Length × I.D.)	Cat.No.
InertSphere Sugar-1	5 μm, 150 × 4.6 mm I.D.	5020-11001

Note: Recommended for use in combination with a solvent bottle with CO₂ trap cartridge. For further information, please contact us

ED743 applications

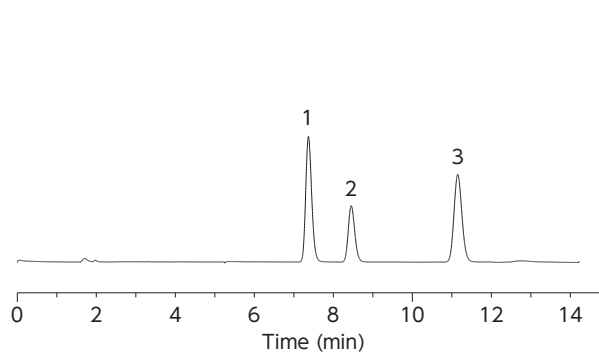
● Diamond electrode: Applications

Analysis of phenols



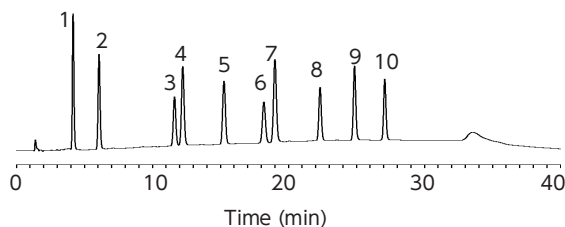
Conditions
 Column : InertSustain AQ-C18 (5 μ m, 150 \times 4.6 mm I.D.)
 Eluent : 0.1 % H₃PO₄ in 50% CH₃CN
 Flow Rate : 1.0 mL/min
 Col.Temp. : 30 $^{\circ}$ C
 Detection : ECD (ED743, Diamond)
 Injection Vol. : 5 μ L
 Sample : 1. Phenol
 2. 2-Chlorophenol
 3. 2,4-Dimethylphenol
 4. 2,4-Dichlorophenol

Analysis of catecholamines



Conditions
 Column : Inertsil ODS-4 (5 μ m, 250 \times 3.0 mm I.D.)
 Eluent : A) Acetate-citrate buffer
 B) CH₃CN
 A/B = 100/16, v/v
 Flow Rate : 0.5 mL/min
 Col.Temp. : 35 $^{\circ}$ C
 Detection : ECD (ED743, Diamond)
 Injection Vol. : 20 μ L
 Sample : 1. Norepinephrine (NE)
 2. Epinephrine (E)
 3. Dopamine (DA)

Analysis of ten catechins

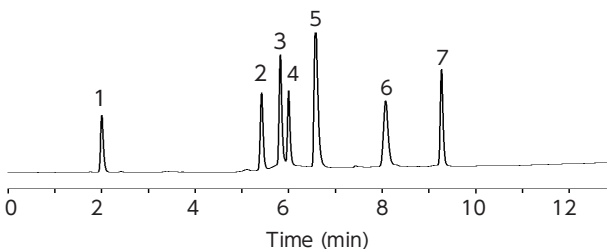


Conditions
 Column : InertSustain C18 (5 μ m, 150 \times 4.6 mm I.D.)
 Eluent : A) 0.1 % H₃PO₄ in H₂O
 B) CH₃CN/ CH₃OH = 9/1, v/v

Time(min)	A (vol%)	B (vol%)
0.0	90	10
15.0	80	20
30.0	60	40
30.1	90	10
40.0	90	10

Flow Rate : 1.0 mL/min
 Col.Temp. : 40 $^{\circ}$ C
 Detection : ECD (ED743, Diamond)
 Injection Vol. : 10 μ L
 Sample : 1. Gallic acid (GA)
 2. Gallo catechin (GC)
 3. Epigallocatechin (EGC)
 4. Catechin (C)
 5. Caffeine
 6. Epigallocatechin gallate (EGCG)
 7. Epicatechin (EC)
 8. Gallo catechin gallate (GCG)
 9. Epicatechin gallate (ECG)
 10. Catechin gallate (CG)
 1 mg/mL each

Analysis of water-soluble vitamins



Conditions
 Column : Inertsil ODS-3 (5 μ m, 150 \times 4.6 mm I.D.)
 Eluent : A) 0.1% H₃PO₄ + 5 mM sodium 1-pentanesulfonate in H₂O
 B) 0.1% H₃PO₄ + 5 mM sodium 1-pentanesulfonate in (H₂O/CH₃CN = 50/50, v/v)

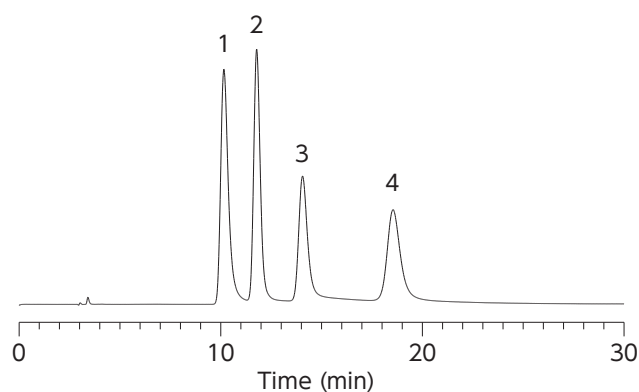
Time(min)	A (vol%)	B (vol%)
0.0	90	10
12.0	80	20

Flow Rate : 1.0 mL/min
 Col.Temp. : 40 $^{\circ}$ C
 Detection : ECD (ED743, Diamond)
 Injection Vol. : 10 μ L
 Sample : 1. L-Ascorbic acid
 2. Pyridoxal
 3. Pyridoxamine
 4. Pyridoxine
 5. Thiamine
 6. Cyanocobalamin
 7. Biotin
 1 mg/mL each

ED743 applications

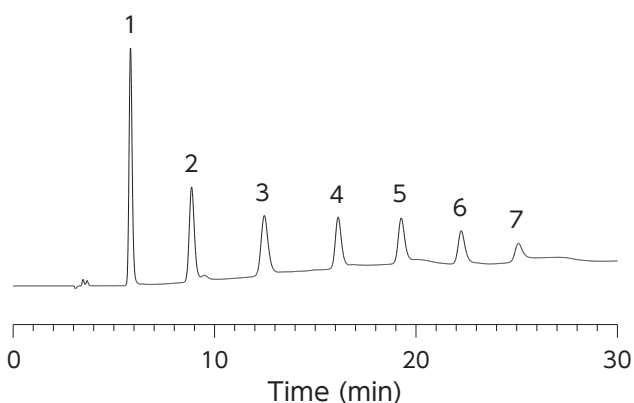
● Gold electrode: Applications

Analysis of saccharides



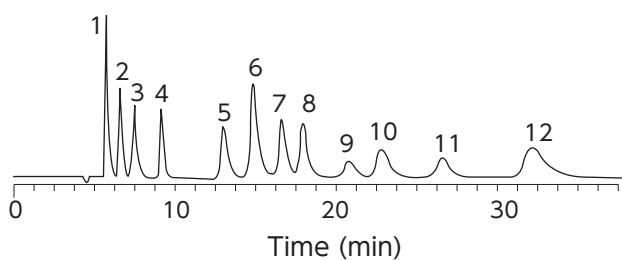
Conditions
Column : InertSphere Sugar-1 (5 μ m, 150 \times 4.6 mm I.D.)
Eluent : 100 mmol/L NaOH in H₂O
Flow Rate : 0.5 mL/min
Col.Temp. : 30 $^{\circ}$ C
Detection : ECD (ED743, Gold)
Injection Vol. : 10 μ L
Sample : 1. Fucose
2. Glucose
3. Fructose
4. Lactose

Analysis of maltooligosaccharides



Conditions
Column : InertSphere Sugar-1 (5 μ m, 150 \times 4.6 mm I.D.)
Eluent : A) 50 mmol/L NaOH in H₂O
B) (50 mmol/L NaOH + 400 mmol/L CH₃COONa) in H₂O
A/B = 85/15 - 30 min - 50/50, v/v
Flow Rate : 0.5 mL/min
Col.Temp. : 30 $^{\circ}$ C
Detection : ECD (ED743, Gold)
Injection Vol. : 10 μ L
Sample : 1. Glucose
2. Maltose
3. Maltotriose
4. Maltotetraose
5. Maltopentaose
6. Maltohexaose
7. Maltoheptaose

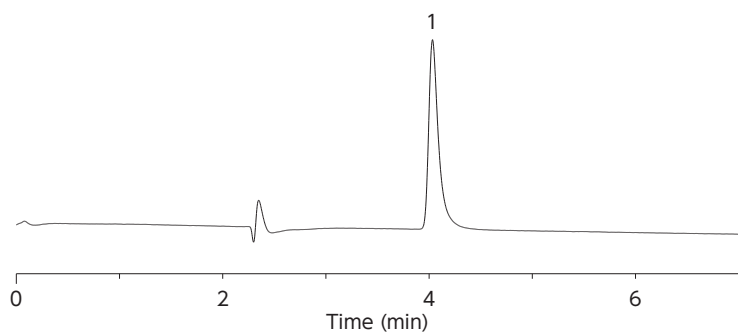
Analysis of twelve sugar-related compounds



Conditions
Column : InertSphere Sugar-1 (5 μ m, 150 \times 4.6 mm I.D.)
Eluent : 20 mM NaOH + 8 mM CH₃COONa in H₂O
Flow Rate : 0.3 mL/min
Col.Temp. : 25 $^{\circ}$ C
Detection : ECD (ED743, Gold)
Injection Vol. : 20 μ L
Sample : 1. Inositol
2. Arabitol
3. Mannitol
4. Ethanol
5. Fucose
6. Galactosamine
7. Galactose
8. Glucose
9. Sorbose
10. Lactose
11. Threose
12. Talose
5 mg/mL each

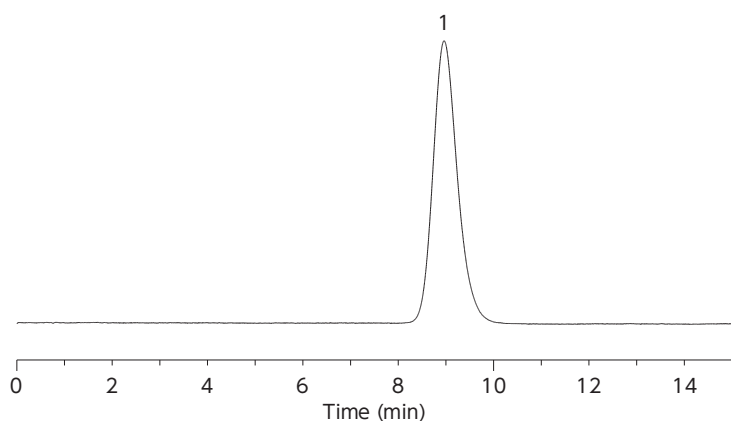
ED743 applications

● Platinum electrode: Analysis of hydrogen peroxide



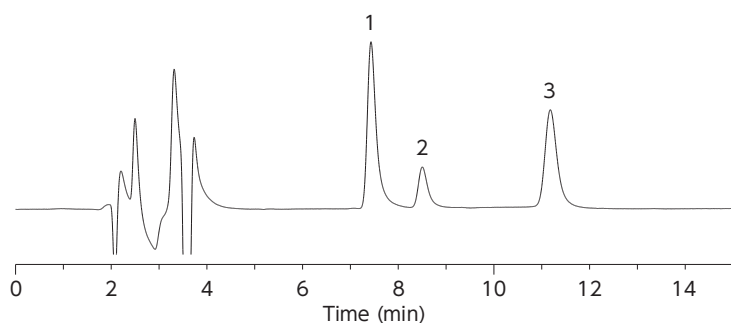
Conditions:
Column : Inertsil CX (5 µm, 250 × 4.6 mm I.D.)
Eluent : 10 mmol/L Na₂SO₄
Flow Rate : 0.8 mL/min
Col.Temp. : 30 °C
Detection : ECD (ED743, Platinum)
Injection Vol. : 10 µL
Sample : 1. Hydrogen peroxide

● Silver electrode: Analysis of sodium iodide



Conditions:
Column : Shodex IC I-524A (12 µm, 100 × 4.6 mm I.D.)
Eluent : 100 mmol/L NaH₂PO₄ + 5 mmol/L Ethylenediamine (pH 5.9)
Flow Rate : 1.5 mL/min
Col.Temp. : 40 °C
Detection : ECD (ED743, Silver)
Injection Vol. : 5 µL
Sample : 1. Sodium iodide

● Glassy carbon electrode: Analysis of catecholamines



Conditions:
Column : Inertsil ODS-4 (5 µm, 250 × 3.0 mm I.D.)
Eluent : A) Acetate-citrate buffer
 B) CH₃CN
 A/B=100/16, v/v
Flow Rate : 0.5 mL/min
Col.Temp. : 35 °C
Detection : ECD (ED743, Glassy Carbon)
Injection Vol. : 20 µL
Sample : 1. Norepinephrine (NE)
 2. Epinephrine (E)
 3. Dopamine (DA)

ED743 specifications and product lineup

Specifications

Measurement method	Amperometric, pulsed amperometric
Working electrode	Diamond, gold, glassy carbon, platinum, silver (select at time of purchase)
Reference electrode	Silver-silver chloride
Auxiliary electrode	Titanium
Flow cell pressure resistance	1 MPa
Potential setting range	±5 V (10 mV steps)
Measurement range	10, 100, 1000 nA, 10, 100, 1000 μA/V
Response	0.1, 0.5, 1.0, 3.0, 6.0, 10.0 sec
Polarity switching	Possible
Constant-temperature function	20–45°C
Time program	30 steps, 10 files (stored in flash memory)
Input signal	AUTO ZERO, START, STOP
Output signal	Analog output (1 V, 10 mV), digital output (1 V, 10 mV), EVENT, ERROR, READY
Size	Main unit: 260 (W) × 420 (D) × 196 (H) mm Constant temperature bath: 100 (W) × 300 (D) × 113 (H) mm
Weight	Approximately 10 kg
Operating temperature	4–35°C
Operating humidity	30–80%
Power	AC 100–240 V, 50/60 Hz, 150 VA
Communication	USB

Product lineup

Product name	Cat.No.
ED743 diamond, with flow cell	6001-74310
ED743 gold, with flow cell	6001-74311
ED743 glassy carbon, with flow cell	6001-74312
ED743 silver, with flow cell	6001-74313
ED743 platinum, with flow cell	6001-74314



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