

Disposable Working Electrodes for HPLC Detection

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WHY DISPOSABLE ELECTRODES

- Faster equilibration than conventional electrodes
- Documented electrode-to-electrode reproducibility
- Predictable time of stable response (typical lifetime: 2 weeks)
- Inexpensive
- No polishing, no activation waveforms

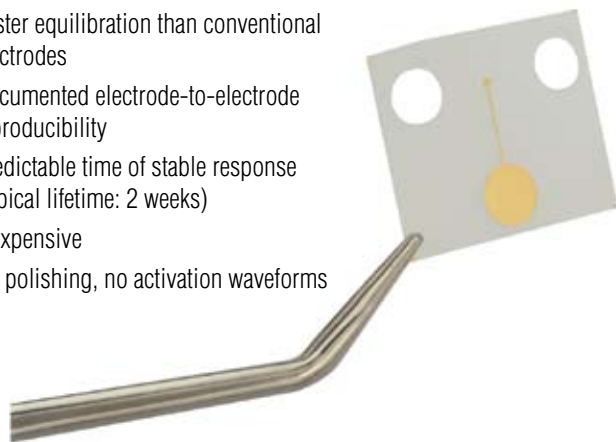


Figure 1. Components of a Three-Electrode Amperometric Cell

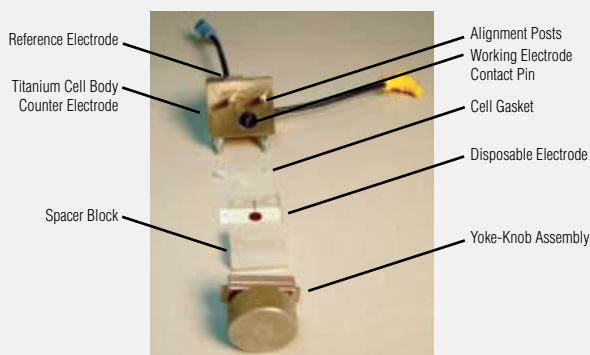


Figure 2. Disposable Working Electrodes* on a Polymeric Substrate



*Polyester substrate with platinum coating is shown in this photograph.

Figure 3. Installation of Disposable Electrode in Amperometric Cell

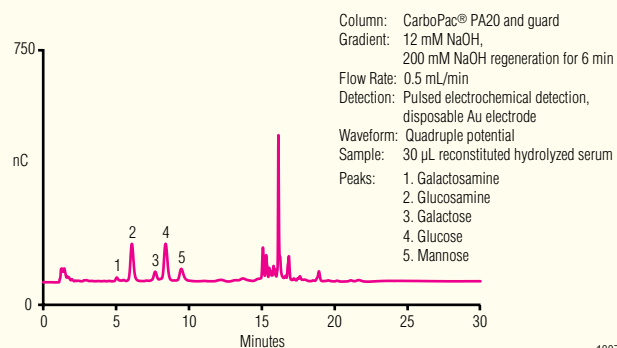


AVAILABLE DISPOSABLE ELECTRODES*

- Gold
- Silver
- Carbon
- Platinum

* All electrodes discussed in this poster are compatible with Dionex ED50 and ED amperometric detectors. ED50 and ED detection cells can be used with conventional and disposable electrodes. Please refer to referenced publications for a detailed description of chromatographic and electrochemical conditions.

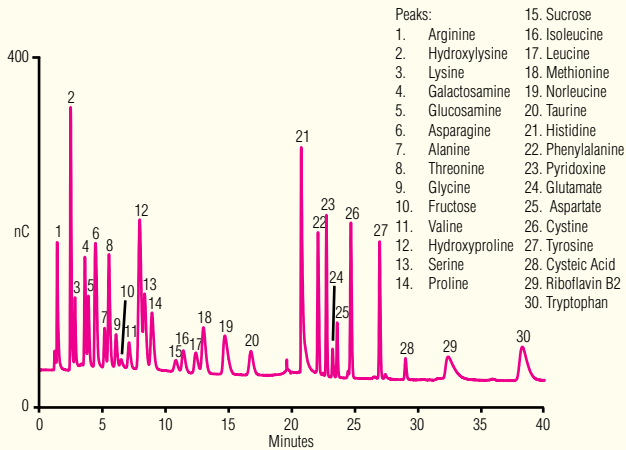
Figure 4. Analysis of Monosaccharides from Hydrolyzed Rabbit Serum Using a Disposable Gold Electrode



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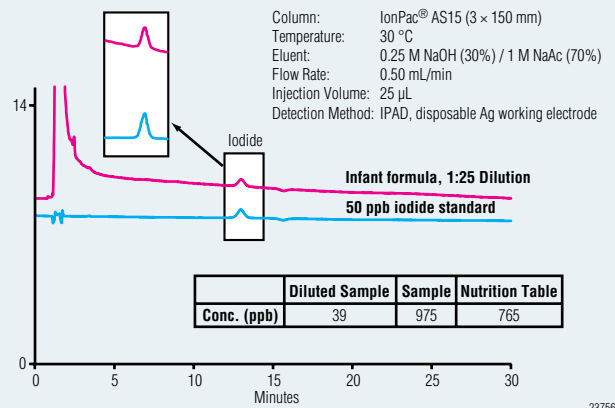
Figure 5. Simultaneous Detection of Amino Acids, Vitamins, and Carbohydrates Using a Disposable Gold Electrode



Detailed analytical conditions for this chromatogram are available in *AminoPac® PA10 Product Manual*, Dionex Doc. No. 031481.

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Figure 8. Detection of Iodide in Infant Formula Using a Disposable Silver Electrode

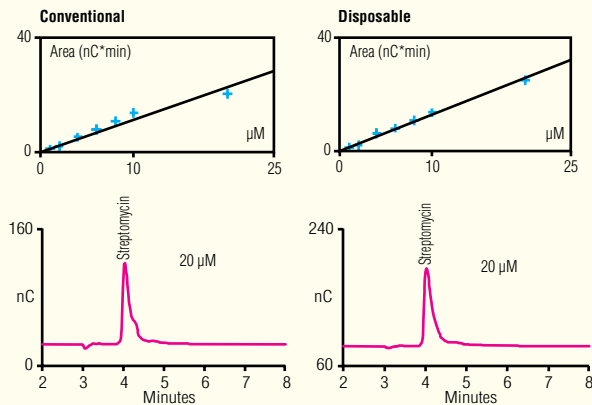


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Figure 6. Improved Peak Shape and Calibration Range of Streptomycin Using Disposable Gold Electrodes on PTFE Substrate

Column: CarboPac PA1 (4 × 250 mm) plus guard
 Temperature: 30 °C
 Eluent: 70 mM KOH
 Flow Rate: 0.50 mL/min
 Inj. Volume: 20 µL
 Detection Method: Quadruple potential waveform* / disposable Au electrode

Improved peak shape of streptomycin on disposable electrodes results in improved linearity of calibration plots.

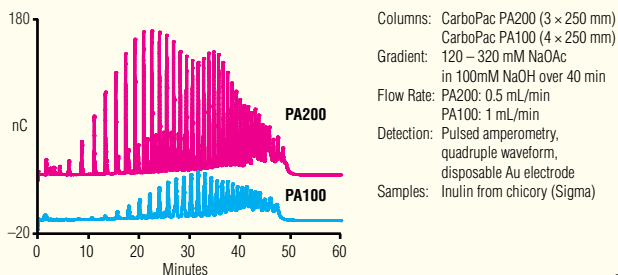


Courtesy: P. Perati, Dionex Corp.

*See Product Manual: *Disposable Electrodes* (document number 065040) for waveform information.

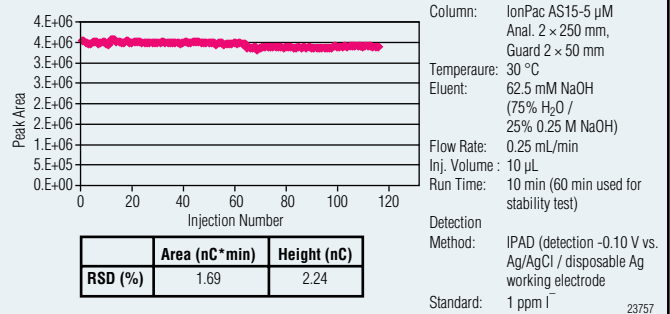
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Figure 7. Inulin Profiles: CarboPac PA200 vs. CarboPac PA100



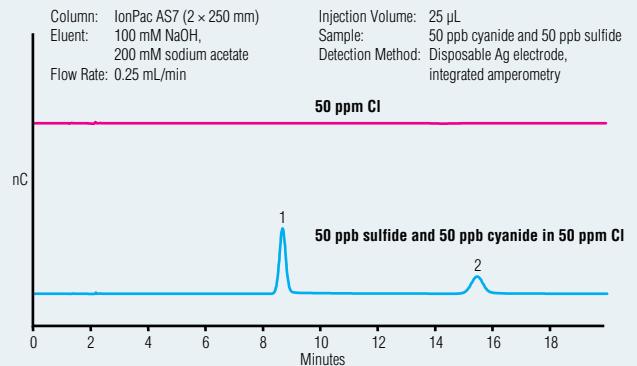
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Figure 9. Long Term (One-Week) Stability of Iodide Detection Using Disposable Silver Electrodes



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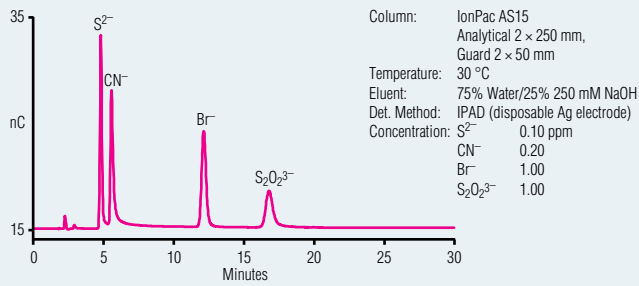
Figure 10. Selective Detection of Sulfide and Cyanide in Samples with High Concentration of Chloride Using a Disposable Silver Electrode



For complete chromatographic conditions see Cheng, J. et al. *Anal. Chim. Acta* 2005, 536, 267–274.

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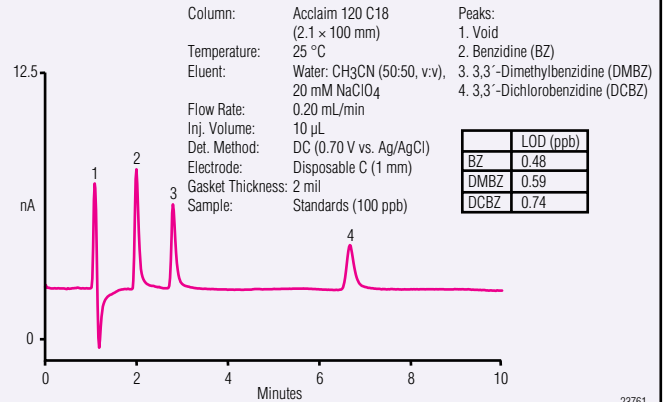
Figure 11. Detection of Sulfide and Cyanide Simultaneously with Bromide and Thiosulfate Using a Disposable Silver Electrode



For complete chromatographic conditions see Cheng, J. et al. *Anal. Chim. Acta* **2005**, 536, 267–274.

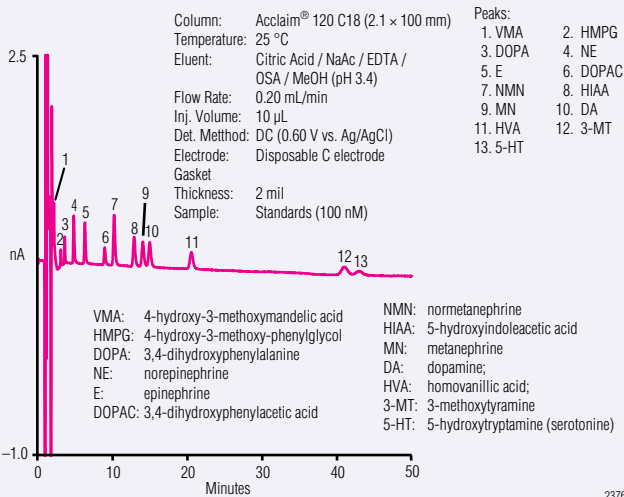
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Figure 13. Detection of Benzidines Using a Disposable Carbon Electrode



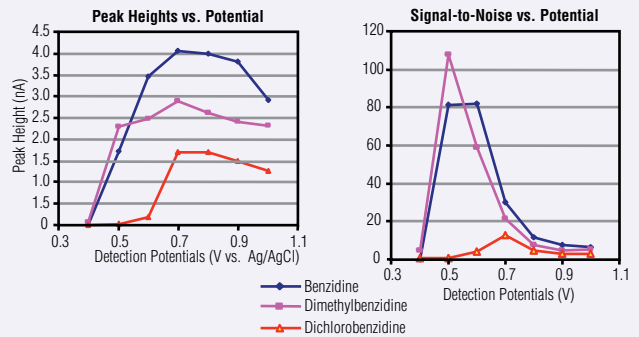
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Figure 12. Detection of Catecholamines and Their Metabolites Using a Disposable Carbon Electrode



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Figure 14. Hydrodynamic Voltammograms* of Benzidines Using a Disposable Carbon Electrode



* 10 µL of 100 ppb standard injected at seven different detection potentials.

Conclusion: Optimal detection potentials are 0.70 V (all three) or 0.50 V (benzidine and dimethylbenzidine only)

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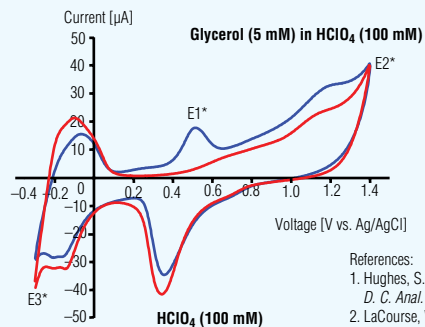
Table 1. Comparison of Analytical Performance: Disposable (Dis. C) and Non-disposable (GC) Carbon Electrodes

		LOD* (nM)	Linear Range (nM)**	Correlation Coefficient
NE	GC	0.72	1 – 100,000	0.9984
	Dis. C	0.33	1 – 100,000	0.9999
E	GC	0.85	1 – 100,000	0.9984
	Dis. C	0.40	1 – 100,000	0.9999
DHBA	GC	1.03	1 – 100,000	0.9986
	Dis. C	0.48	1 – 100,000	0.9999
DA	GC	1.62	1 – 100,000	0.9990
	Dis. C	0.74	1 – 100,000	1.0000

* Injection volume: 10 µL.

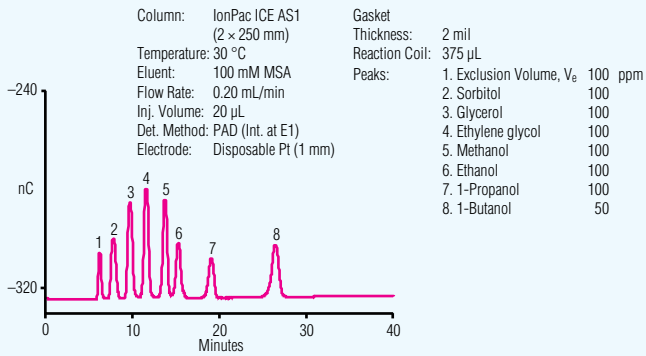
** Peak areas were used to obtain calibration data.

Figure 15. Cyclic Voltammetry with Disposable Platinum Electrode Performed Inside a Chromatographic Detection Cell of Dionex ICS-3000, Scan Rate: 28.3 mV/s



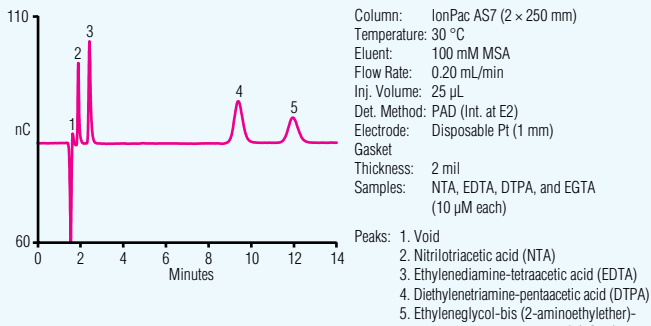
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Figure 16. Detection of Alcohols Using a Disposable Platinum Electrode



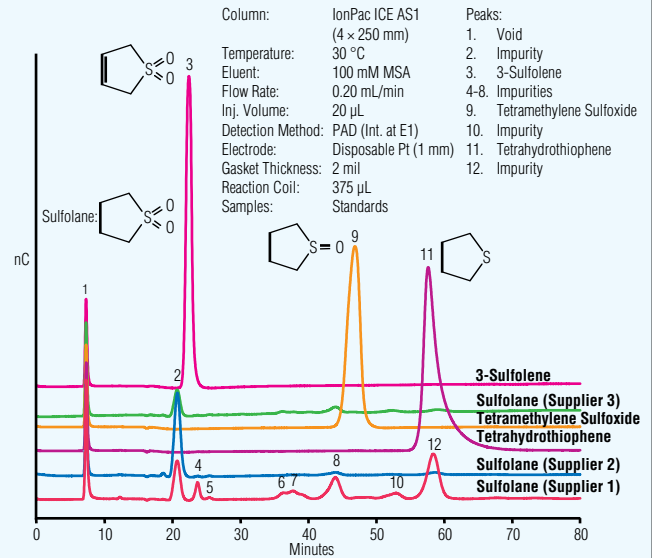
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Figure 17. Detection of Chelates Using a Disposable Platinum Electrode



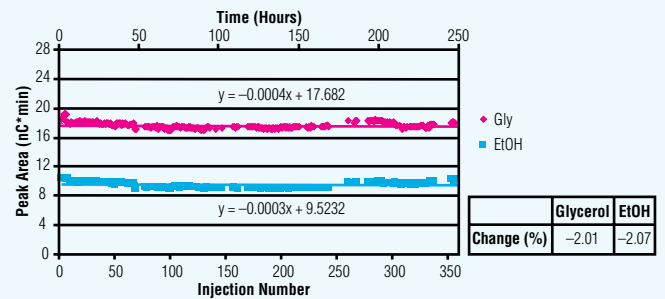
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Figure 18. Analyzing Impurities in Sulfolane Samples Using a Disposable Platinum Electrode



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Figure 19. Long-Term Reproducibility of Alcohol Detection Using Disposable Platinum Electrodes



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CONCLUSIONS

- Four disposable electrode types are available for a variety of applications.
- Reproducibility is improved with disposable electrodes in comparison with non-disposable electrodes.
- Typical electrode lifetime is two weeks.

Passion. Power. Productivity.



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