

Rapid Method for Estimating Total Free Mono-saccharide Content in Corn Stover Hydrolysate Using HPAE-PAD

Carbohydrate content analysis of biocrop feedstocks during the production of cellulosic ethanol is necessary to make sure only fermentable carbohydrates are fed to microbial organisms for maximum ethanol conversion. This requires analyzing complex, highly concentrated carbohydrate mixtures containing multiple co-eluting compounds. The power of high-performance anion-exchange chromatography with pulsed amperometric detection (HPAE-PAD) coupled with a novel, automated micro-valve injector permits baseline separation of the highly concentrated monosaccharides in acid-hydrolyzed corn stover in 10 minutes. A High Concentration Carbohydrate System, optimized for rapid analysis of biocrop feedstocks, consists of a 0.2 μL micro-valve injector loop and 15 mil electrochemical detector gasket.

CONDITIONS:

System: ICS-3000
 Columns: CarboPac[®] PA1 Analytical, 4 x 250 mm
 Eluent: 200 mM NaOH; isocratic, ≥ 10 min run time if needed
 Flow Rate: 1.0 mL/min
 Inj. Volume: 0.2 μL (full loop)
 Detection: Pulsed amperometry, gold working electrode, 15 mil gasket, Ag/AgCl reference

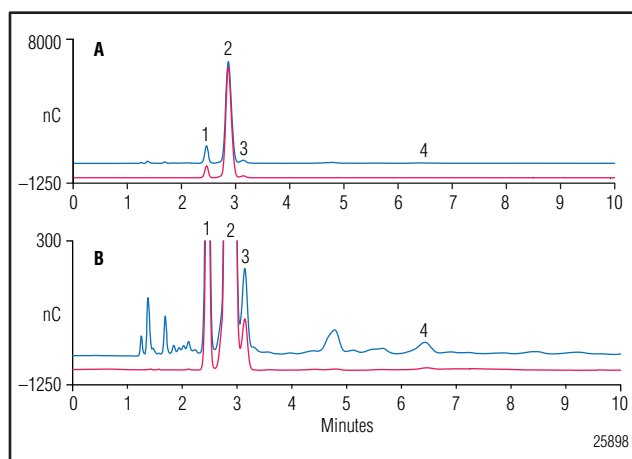


Figure 1. Separation of undiluted acid-hydrolyzed corn stover sugars using the High Concentration Carbohydrate System, with 15 mil electrochemical detector gaskets and the 0.2 μL injection loop. Panel B is an enlargement of panel A. Arabinose (peak 1); mannose, glucose, xylose, galactose (peak 2); fructose (peak 3); and, cellobiose (peak 4).

Potential	Duration
+0.1 V	0.00 - 0.40 s
-2.0 V	0.41 - 0.42 s
+0.60 V	0.43 s
-0.1 V	0.44 - 0.50 s

CONCLUSION:

This fast and robust method provides superior separation with greater specificity for highly concentrated biomass sugars as compared to reversed-phase HPLC with RI or ELSD detection techniques.

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Dionex Corporation

1228 Titan Way
 P.O. Box 3603
 Sunnyvale, CA
 94088-3603
 (408) 737-0700

North America

U.S. (847) 295-7500

South America

Brazil (55) 11 3731 5140

Europe

Austria (43) 1 616 51 25 Benelux (31) 20 683 9768; (32) 3 353 4294
 Denmark (45) 36 36 90 90 France (33) 1 39 30 01 10 Germany (49) 6126 991 0
 Ireland (353) 1 644 0064 Italy (39) 02 51 62 1267 Sweden (46) 8 473 3380
 Switzerland (41) 62 205 9966 United Kingdom (44) 1276 691722

Asia Pacific

Australia (61) 2 9420 5233 China (852) 2428 3282 India (91) 22 2764 2735
 Japan (81) 6 6885 1213 Korea (82) 2 2653 2580 Singapore (65) 6289 1190
 Taiwan (886) 2 8751 6655

www.dionex.com



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