Detection of butanol, glycerol, xylitol, and xylose

Introduction:

The electrochemical detector uses a gold electrode and a pulse mode to detect many substances such as sugars, alcohols, amino acids, etc. In this article, SHINE's CIC-D200E instrument was used to detect butanol, glycerol, xylitol, and xylose.

Table 1: Detection items

Compound	Butanol	Glycerol	Xylitol	Xyose

Keywords: Electrochemical detector, sugar, alcohol.

Instruments and equipment

- **Ion chromatograph**: CIC-D200E
- **Ultra pure water machine**:EU-20

Qingdao Shenghan Chromatograph Technology Co., Ltd

Requirements

Reagents

Unless otherwise specified, all reagents used are superior grade. Commercially available certified standard for butanol, glycerol, xylitol, and xylose.

Deionized Water

When preparing standard samples manually or diluting real samples, please use ASTM filtration and deionization requirements that meet the specifications listed in the table 2.

Table 2: Deionized water specification.

Specification	
Ions Resistivity	≥18.25MΩ·cm
Organics-TOC	<10ppb
Iron/Transition Metals	<1ppb
Pyrogens	<0.03Eu/mL
Particulates（>0.2μm）	<1unit/mL
Colloids-Silica	<10ppb
Bacteria	<1cfu/mL

Chromatography conditions

Table 3: Analysis conditions

Instrument	CIC-D200E
Eluent	Solution A and B gradient
Flow rate	0.4 mL/min
Injection volume	25 μL
Analytical column	CarboPac MA1
Column oven temperature	30℃

Table 4: Solution A and B gradient program
Solution A: 1000 mM NaOH
Solution B: Deionized water

Time(min)	A(%)	B(%)
0.0	30	70
12.0	30	70
12.1	60	40
28	60	40
28.1	30	70
40.0	30	70

Table 5: Electrochemical detector conditions
Mode: Pulse Ampere
Detection frequency: 2 Hz
Reaction time: Ts=200 ms
Electrode: Flexcelll gold electrode
Attenuation: 200 μ A
Filter: 0.050 Hz

Time/s	Voltage/V	Integral state
0.00	0.10	-
0.20	0.10	Start
0.40	0.10	End
0.41	-2.0	-
0.42	-2.0	-
0.43	0.6	-
0.44	-0.10	-
0.50	-0.10	-

Standard sample preparation

Weigh 0.1g of standard substance to 100mL, dilute to an appropriate multiple, and test on the instrument.

Standard chromatogram

Standard chromatogram, As shown in below:

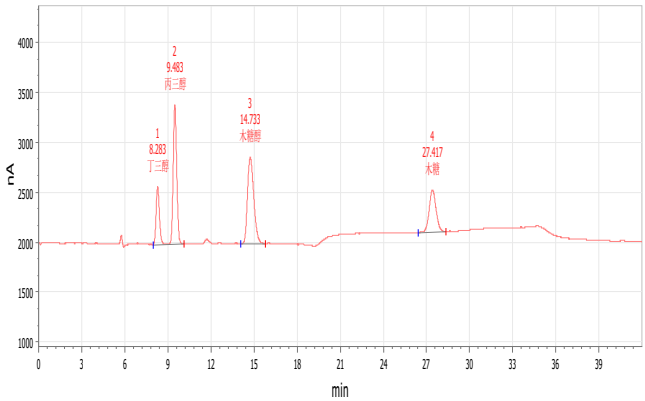

Figure 1. Chromatogram of standard sample.

Standard linearity

Concentration range:0.05-3ppm

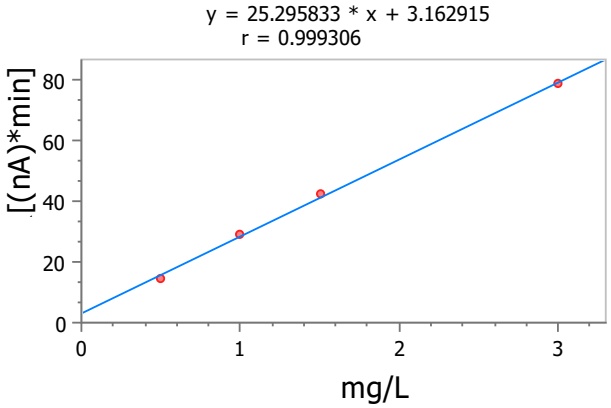

Figure 3. Calibration curve of Butanol

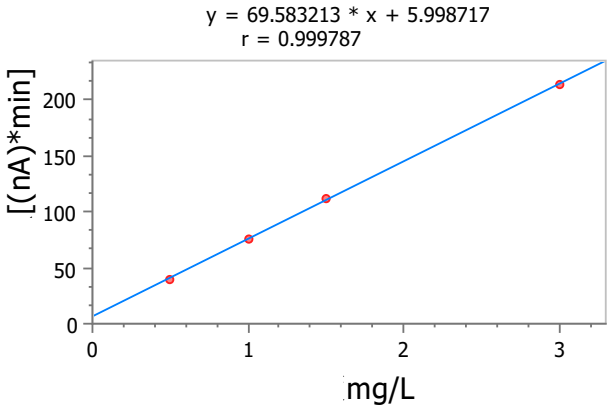

Figure 3. Calibration curve of Glycerol

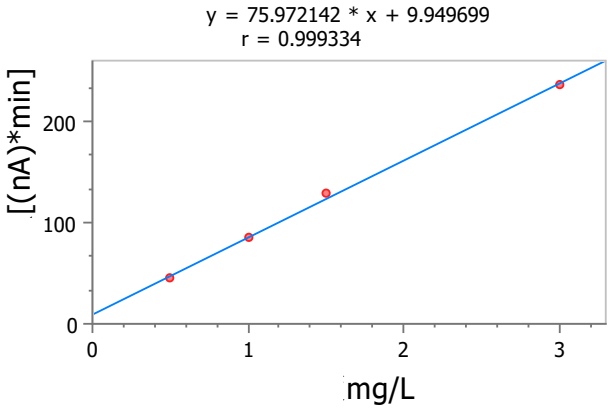

Figure 3. Calibration curve of Xylitol

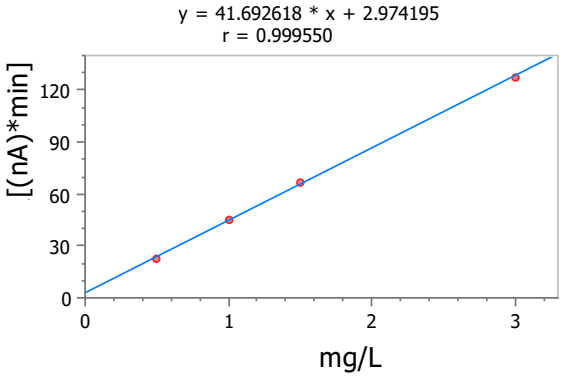

Figure 3. Calibration curve of Xyose

Chromatogram overlay

3ppm five injection overlay (RSD<3%)

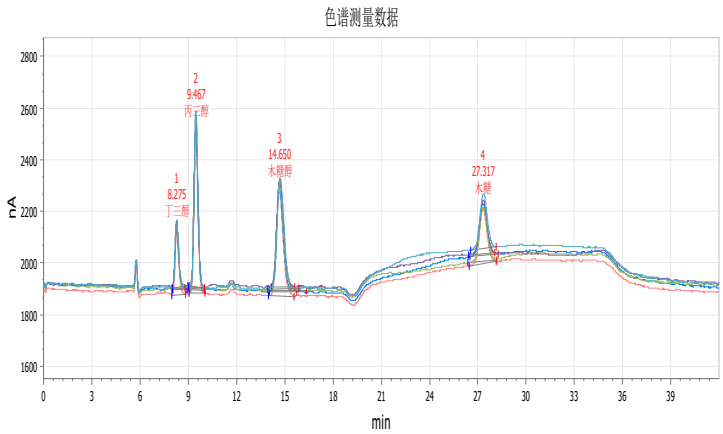

Figure 4. Chromatogram of 3ppm standard sample

Calculations

During the experiment, it is easy to be contaminated, and experimental personnel are required to strictly follow the operating procedures.

Feasibility analysis and conclusion

The above experiments prove that the detection method has good resolution and is suitable for the determination of the content of the components to be measured in the sample.