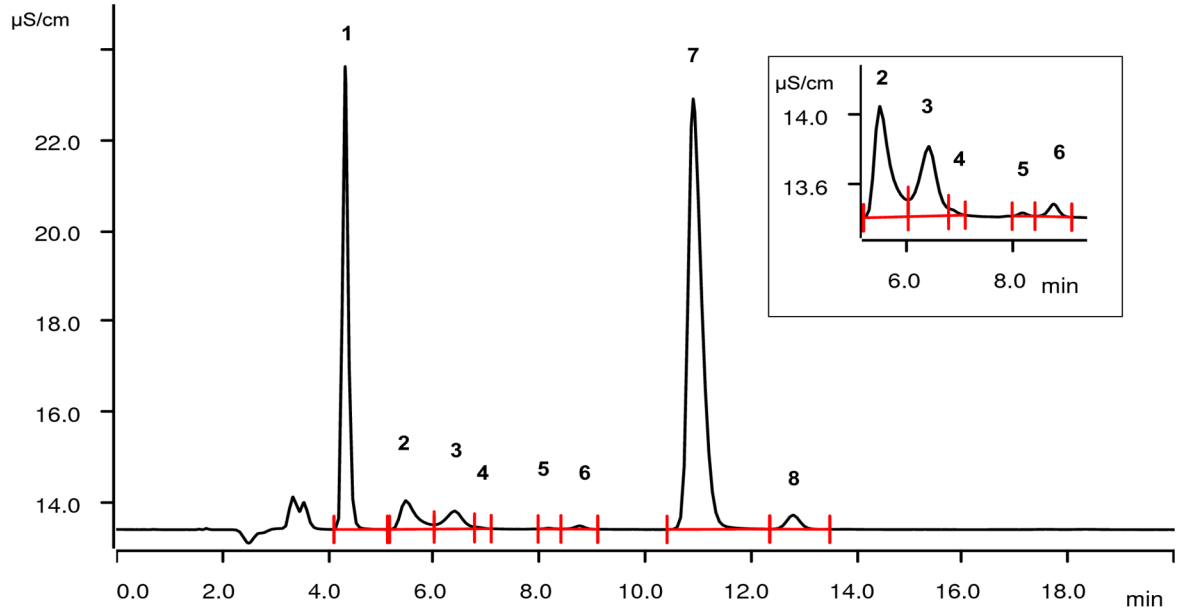
IC Application Note S–381

Phenylacetate in biogas production process

Determination of phenylacetate besides other inorganic anions in a fermentation broth for biogas production



Chromatogram of the sample solution.

Food waste is an important raw material for biogas production. However, during the fermentation process, phenylacetate can be produced from phenylalanine. As phenylacetate inhibits bacterial growth and their metabolism, it is an important parameter to monitor in order to guarantee a successful fermentation process. Aside from phenylacetate, chloride, nitrate, sulfite, sulfate, phosphate, and thiosulfate are also determined in the fermentation broth sample.

Results

	Anion	Result [mg/kg]		Anion	Result [mg/kg]
1	Chloride	709	5	Sulfite	< 50
2	Phenylacetate	162	6	Sulfate	< 50
3	System peak	-	7	Phosphate	538
4	Nitrate	n.q.	8	Thiosulfate	89

Metrohm

Sample

Fermentation broth

Sample preparation

Dissolve 1.0 g sample in 50 mL diluent for sulfite stabilization. Further dilute with ultrapure water to 100 mL. Filtration prior to injection through a 0.45 µm filter.

Columns

Metrosep A Supp 5 - 150/4.0	6.1006.530
Metrosep A Supp 5 Guard/4.0	6.1006.500
Metrosep RP 2 Guard/3.5	6.1011.030

Solutions

Eluent	4.8 mmol/L sodium carbonate 3.0 mmol/L sodium hydroxide 5 % acetone
Regenerant	100 mmol/L sulfuric acid
Rinsing	STREAM
Diluent	998 mL 4 mmol/L sodium hydroxide 2 mL 37 % formaldehyde

Instrumentation

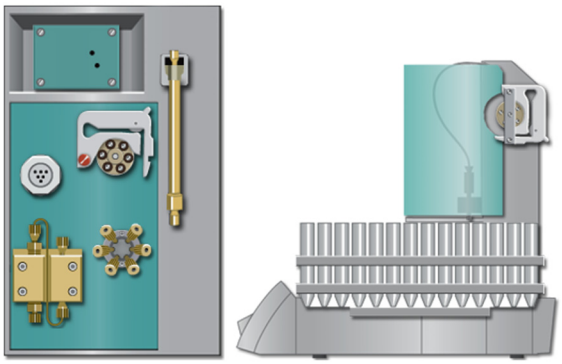
Eco IC	2.925.0020
IC Conductivity Detector	2.850.9010
863 Compact IC Autosampler	2.863.0010
MSM Rotor A	6.2832.000
Adapter sleeve for Suppressor Vario	6.2842.020

Analysis

Conductivity detection after chemical suppression

Parameters IC

Flow rate	0.7 mL/min
Injection volume (MiPT)	20 µL
P_{max}	15 MPa
Column temperature	Ambient
Recording time	30 min



Remarks

The system peak (or carbonate peak) interferes with the nitrate peak. If nitrate needs to be determined, an IC Instrument with MCS (Metrohm CO_2 Suppressor) is recommended.

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Metrohm