KNAUER

Application Note

Determination of organic acids for the evaluation of biogas plants

Category	Environmental
Matrix	Fermentation sludge
Method	HPLC
Keywords	Biogas, fermentation sludge, carboxylic acids, Eurokat
Analytes	Carboxylic acids, lactic acid, formic acid, acetic acid, propionic acid, iso-butyric acid, iso-valeric acid, n-valeric acid, caproic acid
ID	VEV0069N, 03/2014

Summary

This application note shows that by using a KNAUER mobile HPLC instrument, a fast and reliable analysis of organic acids in fermentation sludge is possible. Thereby the effectiveness of a biogas plant can be appraised directly on location and a loss of efficiency is obviated with the prompt entry of a mixture of enzymes NOVALIN produced by NovaBiotec® company.

Introduction

Short-chained carboxylic acids are an important parameter for the optimal controlling of a biogas plant. The acids result from hydrolysis and acidogenesis. Hence a fast and dependable monitoring of these substances is of vital importance. A peculiar problem is the sometimes long way of transport from the biogas plant to the analytical laboratory. Whilst this way a diversification in the sample can occur. In addition the samples need to be packed very careful and extensive. Since now only equivalents of acetic acid could be determined locally as sum parameter.

Presently a lot of determinations are made using gas chromatography, which causes a high effort in sample preparation. Also complicating is that reagents of derivatization with a potential danger for health have to be used during sample pretreatment in GC. Furthermore lactic acid and formic acid cannot surely be identified with gas chromatography.

The following application presents a method which allows measurement on location via HPLC. For the operator of the biogas system it is possible to interfere immediately into the fermentation process if necessary, to charge operating funds and so keep the production in an ideal and gainful range.

Sample preparation

A sample of fermentation sludge is clarified with the help of centrifugation and then charged with a suitable precipitating agent to avoid the influence of other disturbing substances. The gained supernatant is cleaned by SPE and filtered through a 0.45 µm filter.

Method parameters

Column	Eurokat H, 300 x 8 mm + 30 x 8 mm precolumn
Mobile phase	0.01 N sulfuric acid
Flow	1.0 ml/min
Injection volume	75 µl pretreated sample
Column temperature	80 °C
Detection	UV at 210 nm

Results

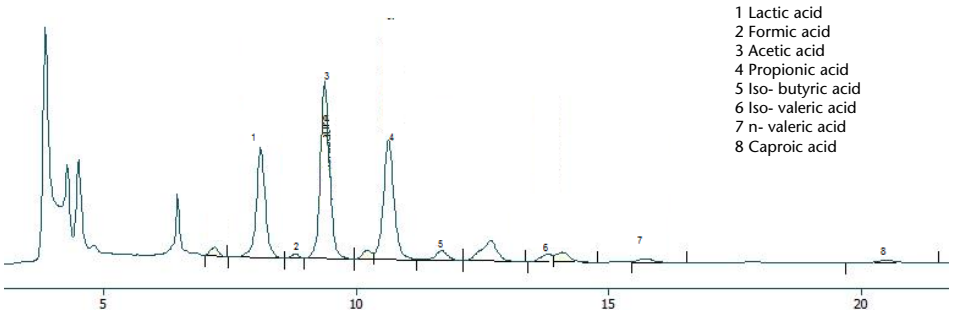

Fig. 1
Fermentation sudge sample for the determination of organic acids

Physical properties of the recommended column

Eurokat H columns are packed with sulfonated cross-linked styrene divinylbenzene copolymers in H^+-form. These columns have an excellent selectivity for the separation of short-chained organic alcohols, aldehydes and acids. The preferred mobile phase is 0.01 N sulfuric acid.

Stationary phase	Eurokat H
USP Code	L17
Pore size	-
Pore volume	10 µm
Form	Spherical
Endcapping	No
Dimensions	300 x 8 mm + 30 x 8 mm precolumn
Order number	30GX340EKN + 03GX340EKN

Recommended HPLC system

The analysis was performed with an isocratic Azura compact system equipped with degasser, column oven, manual injection valve and UV detector. Other configurations are also available. Please contact KNAUER to configure a system that's perfect for your needs.

Description	Order No.
AZURA Compact HPLC isocratic Including UVD 2.1S	AYIABACA
Manual injection valve	A1357
Column Thermostat	A0585
UV measuring cell (10 mm), analytical	A4061XB

Authors

René Borstel, Application and columns department, KNAUER
Marcel Spahr, Subject coordinator Biogas, NovaBiotec, reference laboratory

Contact

Wissenschaftliche Gerätebau
Dr. Ing. Herbert Knauer GmbH
Hegauer Weg 38
14163 Berlin, Germany

Tel: +49 30 809727-0
Fax: +49 30 8015010
E-Mail: info@knauer.net
Internet: www.knauer.net