

APPLICATION

BIOGAS TITRATION



Determination of FOS/TAC value in Biogas Reactors

Introduction

The determination of organic acids (FOS) and total inorganic carbon (TAC) is a simple way to monitor the fermentation process in biogas reactors. Acid concentration is an indicator for the production of the digester gas (Biogas). Acids must be compensated by the buffer capacity of the sample to prevent acidification in the reactor.

Determination of FOS/TAC value is performed as a two-step endpoint titration using sulphuric acid. The content of FOS (volatile fatty acids) is calculated empirically according to Nordmann.

Principle

The sample is titrated to pH 5.0 using H_2SO_4 0.1 N. TAC (carbon buffer capacity) is calculated as CaCO_3 . An additional titration step from 5.0 to 4.4 provides the total buffer capacity taking into account all organic acids in the sample. Therefore empiric factors were used for the calculation.

Measuring range

- TAC: 50-5000 mg/l CaCO_3
- FOS: 10-5000 mg/l acetic acid



Biogas Titration Manager



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Electrode and reagents

Electrode: pHC3081-8 Combined pH
Electrode with Temperature Sensor
(part no. E16M305)
Titrant: 0.1 N sulphuric acid (pn 20253)

Endpoint titration settings

ID: FOS/TAC
Mode: Endpoint
Measurement: pH
Temperature: Probe
Notification: No
Cell grounding: Reference
Blank: No

1. Method parameters

Electrode ID: pHC3081-8
Titrant: H2SO4 0.1N
Predose: pH/mV
Predose until: 5.5 pH
Start timer: 00min10s
Max. Volume: 25.000ml
Direction: decreasing pH
Back titration: No
Min. Speed: 0.40ml/min
Max. Speed: 15.00ml/min
Number of EP: 2
Auxiliary output: No

1-Endpoint: 5.0 pH
EP delay: 00min03s
Proportional band: 1.2 pH
2-Endpoint: 4.4 pH
EP delay: 00min03s
Proportional band: 2.0 pH

2. Sample

Sample unit: ml
Sample amount: 5.0 ml

3. Results

Results by: Difference

Number of results: 3
Number of equations: 2
Results factor: No
Number of digits: 3

Procedure

The substrate is filtered using a wide strainer. Large suspended solids are kept back. 5 g of the strained sample is diluted in the sample beaker with approx. 50 ml DI water. It is a two-point endpoint titration.

Calculation

TAC (total inorganic carbon) is expressed as **mg/l CaCO₃**

FOS (volatile organic acids) is expressed as **mg/l acetic acid**

Results/Equations

Result 1

ID: TAC
Result unit: mg/l
Molar weight: 100.09 g/mol
Calculate with EP no.: 1
Reaction: 2 Smp + 1 Titr

Result 2

ID: Volume A
Result unit: ml
Calculate with EP no.: 1

Result 3

ID: Volume B
Result unit: ml
Calculate with EP no.: 2

Equation 1

ID: FOS
Result unit: mg/l CH3COOH
Formula: $((R3*4*1.66)-0.15)*500$

Equation 2

ID: FOS/TAC
Result unit: none
Formula: $((R3*4*1.66)-0.15)*500/R1$

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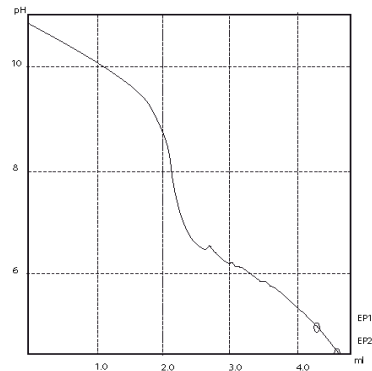
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