



Total Titratable Acidity in Vinegar

Introduction

Besides the taste, the quality of a vinegar depends on various factors such as pH and total titratable acidity. As this determination is run by titration with a strong basic solution (NaOH 1 or 0.5 M), the end point titration is between pH 8.0 and pH 8.8 depending on the manufacturing conditions.

Principle

The end point titration for this application note, based on experiments at pH 8.2, is very easy to run. Vinegar is diluted before analysis with freshly distilled water; the titrant is NaOH 1M or 0.5 M. The result is expressed in g/100 ml (or %) of CH₃COOH (MW=60 g/mol)

Electrode and reagents

pHC2401-8 Combined pH Electrode

NaOH 0.5 or 1 eq/l solution in distilled water

Distilled water

IUPAC Series pH standards

pH 4.005 (part no. S11M002) or

pH 7.00 (part no. S11M004) and

pH 10.012 (part no. S11M007).

End Point titration settings

Burette volume:	25 ml
Stirring speed:	400 rpm
Working mode:	pH
Number of end points:	1
End point:	8.20 pH
Stirring delay:	30 seconds
Minimum speed:	0.2 ml/min
Maximum speed:	10 ml/min
Proportional band:	3.00 pH
End point delay:	5 seconds
Sample unit:	ml
Sample amount:	10
Titration:	Increasing pH
Result:	g/l

Procedure

As the end point of the titration depends on the vinegar, refer to your local procedure or determine the end point value by means of a manual titration (manual dosing).

Calibrate the pHC2401-8 electrode using 2 of the 3 above-mentioned IUPAC standards.

Prepare the burette with the 1M or 0.5M NaOH titrant.

Pipette 10 ml of sample.

Add 50 ml of freshly distilled water. Dip electrode and delivery tip in the solution.

Start method by pressing the RUN key.

Results

Expressed as g/100 ml (or %) of CH₃COOH

$$R = V(\text{titr}) * C(\text{titr}) * 60 * 100 / V(\text{smp}) * 1000$$

-V(titr) = total volume of titrant to reach the end point in ml

-C(titr) = Titrant concentration in eq/l (currently 0.1)

-V(smp) = sample volume in ml 60 = molecular weight of CH₃COOH

For a result in %

Enter

A first result unit as g/l

The actual sample amount in the SAMPLE screen

The titrant concentration in the TITRANT screen

1 Titrant and 1 Sample in the COEFFICIENTS display

60 as molecular weight

As the Titration Manager cannot give a result as a % if the sample unit is a volumetric unit, use the equation feature:

Equation number:	1
Equation result :	% CH ₃ COOH
Equation formula	R1 / 10

R1 is the titration result calculated in g/l.

For 5 determinations

Mean (as g/100 ml of CH ₃ COOH):	7.2 g/100 ml
Standard deviation:	0.058 g/100 ml
Rel. standard deviation:	0.8%

Working Range

Irrespective of manufacturing differences, commercially available vinegars generally have a total titratable acidity of between 4 and 8%. For a 10 ml sample amount, this corresponds to 0.4 to 0.8 g of acetic acid and 1 ml of NaOH 1M corresponds to 0.06 g of CH₃COOH.

Notes

Differences in standards or procedures may lead the end point to be fixed at a pH higher than 9.5. In this case, use the pH2011-8 Combined pH Electrode (part no. E16M317) instead of the pH2401-8.