DENVER INSTRUMENT



Chloride in Food Products

Introduction

Salt (NaCl) is present in many foods such as ham, sausage, canned products, dried soups and meats. As NaCl is soluble in water, the most common way to determine the amount of salt is a titration with silver nitrate after sample dissolution in water.

Principle

The titrant reagent for chloride determination is silver nitrate (AgNO3); using end point titration for food products, the titrant concentration is generally 0.1 eq/l. The sample solution must have an acid pH. 1 M/l nitric acid is generally used.
The reaction corresponds to:

$Ag+ + Cl- AgCl$ (precipitate)

Results are normally expressed as a % of sodium chloride (NaCl with MW= 58.45 g/mol).

Electrode and reagents

MC6091Ag Combined Metal Electrode, silver/mercurous sulphate (part no. E34M004) with CL114 cable (part No. A94L114).

$AgNO_3$ 0.1 eq/l solution

Dissolve 16.988 g of analytical gradeAgNO3 in distilled water and dilute to 1000 ml using a volumetric flask. As AgNO3 can be found as very pure grade, it can be considered as reference material.

HNO_3 1M solution

Dilute 78 ml of concentrated HNO3 in 500 ml of distilled water, let it cool to room temperature and dilute to 1000 ml using a volumetric flask.

End Point titration settings

Burette volume:	25 ml
Stirring speed:	400 rpm
Working mode:	mV
Number of end points:	1
End point:	-100 mV
Stirring delay:	30 seconds
Minimum speed:	0.1 ml/min
Maximum speed:	5.0 ml/min
Proportional band:	200 mV
End point delay:	10 seconds
Direction:	Increasing mV
Sample unit:	g
Sample amount:	(see below)
Result:	%

Procedure

Sample preparation

Sample preparation varies according to the product.

Ham (preserved meats): Mix 10 g of product with 190 g of distilled water and weigh an aliquot (around 50 g) for the titration.

Dried soup: Dilute 5 g of product with 250 ml of hot distilled water, allow to cool to room temperature and dilute to 1000 ml in a volumetric flask. Pipette an aliquot (around 20 ml) for titration.

Canned food: Shake the can and open it. Weigh 100 g of the product, mix with 900 g of distilled water and weigh an aliquot(around 5 g) for titration.

These are general recommendations. Use your own particular procedures for special samples.

Titration procedure

Take the required amount of the aliquot sample.

As sample amount, enter either the current amount, or the total amount and also the dilution factor, allowing a result corresponding exactly to the real sample amount.

Add 5 ml of HNO3 1M and, if necessary, distilled water. Connect the combined metal electrode to the titration manager.

Dip electrode and delivery tip in the solution.

Start method by pressing the RUN key.

Results

As in this case 1 molecule of titrant reacts with 1 molecule of Cl-

Generally expressed as % of salt (NaCl) (MW = 58.44 g/mol)

R = V(titr) * C (titr) * 58.44 * 100 / SA * 1000

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

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

-SA = sample amount used during the titration (in g)

58.44 = Molar weight of NaCl

For a result as a %
Enter

The actual sample amount in the SAMPLE screen

The titrant concentration in the TITRANT screen, 1 Titrant and 1 Sample in the COEFFICIENTS display

58.44 as molecular weight (for NaCl)

The Titration Manager gives a result according to the above formula.

If necessary, you can also use the dilution calculation formula of the titration manager.

In the SAMPLE screen

Dilution YES

Enter the total sample amount

Enter the final dilution weight (in g) as final dilution volume in ml

Enter the aliquot weight (in g) as
aliquot volume in ml

The Titration Manager does not use g or mg as units for dilution. In this case, you can use volumetric units instead.

For 5 determinations on a dried beef soup

Mean:	45.3%
Standard deviation:	0.45
Rel. standard deviation:	1%

Working Range

Depending on the type of sample, the result will vary.

Examples

For canned food: around 2%
For preserved meat: between 2 and 5%
For dried soups: around 45%

For the application note conditions (titrant concentration of 0.1M) and for 1 g of titrated sample, 1 ml of titrant corresponds to 0.58% of NaCl in the food product.

Notes

The main differences between local procedures concern sample preparation procedures.

For example, for sausage, some procedures make use of Soxlet extraction with boiling distilled water instead of mixing, as indicated above.