Titer of 0.1 mol/L $AgNO_3$

Method for the titer determination of 0.1 mol/L silver nitrate ($AgNO_3$) using sodium chloride as the primary standard. The precipitation titration is monitored with a combined silver ring electrode.

Sample	Sodium chloride, NaCl 30-50 mg
Compound	Sodium chloride, NaCl M = 58.44 g/mol, z = 1
Chemicals	50 mL 0.02 M Nitric acid, HNO_3 Deionized water
Titrant	Silver nitrate, $AgNO_3$ $c(AgNO_3)$ = 0.1 mol/L
Standard	--
Indication	DMi141-SC Combined silver ring electrode.
Chemistry	$AgNO_3$ + NaCl → AgCl + $NaNO_3$
Calculation	R1=m/(VEQ*c*C) C=M/(10*p*z) VEQ = Titrant consumption (mL) c = Titrant concentration (mol/L) m = Sample mass (g) M = Sample molar mass (g/mol) p = Purity of the standard (%) z = Sample equivalent number
Waste disposal	Filtration; precipitate has to be classified as special waste.
Author, Version	Sohel Ansari, IMSG AnaChem, Version 2.0 Revised: C. De Caro, MSG AnaChem

Preparation and Procedures

CAUTION

- Use safety goggles, a lab coat and wear gloves.
- Ensure accurate cleaning of sensor is sufficient after each titration.

Preparation of 0.1 mol/L $AgNO_3$:

- Weigh accurately 16.987 g $AgNO_3$ in to a 1000 mL volumetric flask, dissolved it in a small amount of deionized water and make up the volume with deionized water.

Procedure :

- Weigh about 30 mg of sodium chloride and place the beaker on Rondolino sample changer.
- Add 50.0 mL of 0.02 M nitric acid.
- Titrate it with 0.1 mol/L silver nitrate.
- After completion of each sample, electrode, stirrer and titration tubes will be rinsed with deion. water by means of membrane pump.
- Electrode is cleaned in condition beaker with deionized water after each sample.

Remarks

- Prior to use, adjust the settings of Rondolino sample changer by turning the small knob on the housing to 8 for rinsing (2 s) and conditioning (120 s).
- Glass beakers are recommended in order to avoid any interference during weighing due to electrostatic effects
- The titration is done in an acidic medium at pH of about 4.5. For this, the sample is acidified with diluted nitric acid. The acidification may be done automatically by the titrator using a peristaltic pump or an additional dosing unit.
- This method allows an automated analysis procedure. The method can be easily modified for manual operation. Select “Manual Stand” in the method function “Titration stand”

Instruments	- Titration Excellence T50/T70/T90 (Other Titrators: depending on instrument type, manual operation and method changes are necessary) - XP205 Balance - Rondolino Sample Changer with PowerShower™ (ME-51108500)
Accessories	- 1 x 10 mL DV1010 glass burette (ME-51107501) - 100 mL Titration beakers (ME-00101446) - LabX® pro titration software - Spatula

Results

All results

Method-ID	AgNO3
Sample	0.03496 g (1/6)
R1 (NaCl)	1.00521
Sample	0.03608 g (2/6)
R1 (NaCl)	0.99966
Sample	0.03813 g (3/6)
R1 (NaCl)	1.00211
Sample	0.03993 g (4/6)
R1 (NaCl)	1.00142
Sample	0.03556 g (5/6)
R1 (NaCl)	1.00251
Sample	0.03677 g (6/6)
R1 (NaCl)	1.00460

Statistics

Method-ID	AgNO3
R1	Sodium Chloride (NaCl)
Samples	6
Mean	1.00258
s	0.00202
srel	0.205%

Titration curve

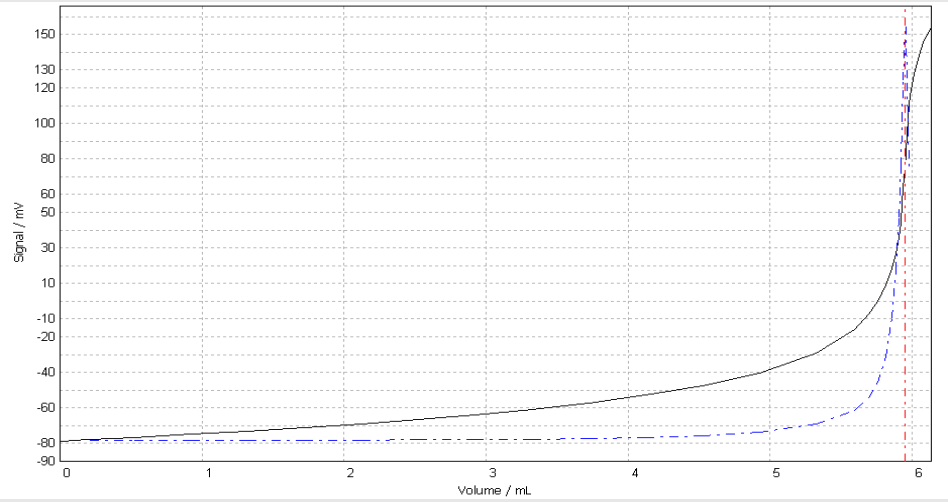

Table of measured values

	Volume mL	Increment mL	Signal mV	Change mV	1st deriv. mV/mL	Time s	Temperature °C
	0.0000	NaN	-78.5	NaN	NaN	0	25.0
	0.0080	0.0080	-78.6	-0.1	NaN	3	25.0
	0.0160	0.0080	-78.6	0.0	NaN	6	25.0
	0.0360	0.0200	-78.6	0.0	NaN	9	25.0
	0.0860	0.0500	-78.4	0.2	NaN	12	25.0
	0.2110	0.1250	-77.8	0.6	4.06	15	25.0
	0.5235	0.3125	-76.5	1.3	4.30	18	25.0
	0.9235	0.4000	-74.7	1.8	4.45	21	25.0
	1.3235	0.4000	-72.9	1.8	4.66	24	25.0
	1.7235	0.4000	-70.9	2.0	5.04	27	25.0
	2.1235	0.4000	-68.8	2.1	5.54	30	25.0
	2.5235	0.4000	-66.5	2.3	6.15	34	25.0
	2.9235	0.4000	-63.8	2.7	6.92	36	25.0
	3.3235	0.4000	-60.7	3.1	7.79	40	25.0
	3.7235	0.4000	-57.2	3.5	8.98	43	25.0
	4.1235	0.4000	-52.9	4.3	11.58	46	25.0
	4.5235	0.4000	-47.5	5.4	16.74	49	25.0
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	5.9190	0.0145	44.2	8.3	782.79	81	25.0
	5.9310	0.0120	55.0	10.8	910.16	85	25.0
	5.9390	0.0080	63.9	8.9	1023.69	90	25.0
	5.9470	0.0080	74.0	10.1	1173.04	94	25.0
EQP1	5.951190	NaN	79.4	NaN	1175.06	NaN	NaN
	5.9950	0.0080	84.3	10.3	1171.53	98	25.0
	5.9630	0.0080	94.0	9.7	1013.74	102	25.0
	5.9710	0.0080	102.3	8.3	885.59	105	25.0
	5.9810	0.0100	110.6	8.3	777.95	108	25.0
	5.9945	0.0135	119.0	8.4	NaN	111	25.0
	6.0135	0.0190	127.7	8.7	NaN	114	25.0
	6.0400	0.0265	136.2	8.5	NaN	118	25.0
	6.0805	0.0405	145.6	9.4	NaN	120	25.0
	6.1345	0.0540	154.4	8.8	NaN	124	25.0

Comments

- The mean value of the titer is automatically stored as part of the setup by the function TITER.
- Purity of the primary standard, sodium chloride = 100%
- The determination of the silver content with sodium chloride as a titrant can be done with the same control parameters (function "Titration"). These method parameters are also suitable to achieve high reproducibility. Good sample preparation is then a prerequisite.

Literature:

Mettler-Toledo Application M006 (V1.0)

Method

001 Title

Type	Titer determination
Compatiblewith	T50 / T70 / T90
Method ID	$AgNO_3$
Title	$AgNO_3$
Author	Administrator
.....	

002 Sample(Titer)

Titrant	$AgNO_3$
Concentration[mol/L]	0.1
Standard	NaCl
Type of standard	Weight
Entry Type	solid
Lower limit[g]	0.0
Upper limit[g]	5.0
Correction factor[g/ml]	1.0
Temperature	25.0°C
Entry	Arbitrary

003 Titration stand (Rondolino TTL)

Type	Rondolino TTL
Titration stand	Rondolino TTL 1

004 Stir

Speed	40 %
Duration	60 s
Condition	No

005 Titration (EQP) [1]

Titrant

Titrant	$AgNO_3$
Concentration[mol/L]	1.0

Sensor

Type	mV
Sensor	DG141-SC
Unit	mV

Temperature acquisition

Temperature acquisition	No

Stir

Speed	40%

Predispense

Mode	None
Wait time	0 s

Control

Control	User
Titrant addition	Dynamic
dE (set value)[mV]	9.0
dV (min)[mL]	0.008
dV (max)[mL]	0.4
Mode	Equilibrium controlled
dE[mV]	0.5
dt[s]	1
t (min)[s]	3
t (max)[s]	30

Evaluation and recognition

Procedure	Standard
Threshold[mV/mL]	200.0
Tendency	Positive
Ranges	0
Add. EQP criteria	No

Termination

At Vmax[mL]	10.0
At potential	No
At slope	No
After number of recognized EQPs	Yes
Number of EQPs	1
Combined termination criteria	No

Accompanying stating

Accompanying stating	No

Condition

Condition	No

006 Calculation R1

Result	Titer
Result unit	--
Formula	R1= m/(VEQ*c*C)
Constant	C= M/(10*p*z)
M	M[NaCl]
z	z[NaCl]
Decimal places	5
Result limits	No
Record statistics	No
Extra statistical func.	No
Send to buffer	No
Condition	No

007 End of Sample

008 Titer

Titrant	$AgNO_3$
Concentration[mol/L]	0.1
TITER	Mean [R1]
Limits	No
Condition	No

009 Calculation

Result	Mean Titer
Result unit	--
Formula	R2=Mean[R1]
M	M[None]
z	z[None]
Decimal places	5
Result limits	No
Record statistics	Yes
Extra statistical func.	No
Send to buffer	No
Condition	No