HIRANUMA APPLICATION DATA	Automatic Titrator	Data No.	O4	Feb. 03, 2022
Factor standardization	**Standardization of silver nitrate titrant**			

1. Abstract

The measurement method of chloride ions or salt content by precipitation titration using a silver nitrate standard solution is widely used in the titration analysis. Factors are indicated on the commercially available standard solution for volumetric analysis. The factor determination is required when the standard solutions are prepared in the laboratory. Also it is effective to check the repeatability by the factor measurement using a standard material to check the performance of titrator system. *Japanese Industrial Standard* JIS K 8001 and the *Japanese Pharmacopoeia* describe that sodium chloride, which is a standard material for a volumetric analysis, should be used for the factor determination of silver nitrate standard solution.

In this report, sodium chloride, which is a standard material, was dissolved in pure water, and potentiometric titration was performed with 0.1 mol/L silver nitrate standard solution to determine the factor. 1 mol of sodium chloride and 1 mol of silver nitrate react quantitatively according to Eq. (1), and the titration curve shows an inflection point at the end point.

$$NaCl + AgNO_3 \rightarrow AgCl\downarrow + NaNO_3 \quad \cdots(1)$$

1) Japanese Pharmacopoeia Eighteenth Edition
2) Japanese Industrial Standard JIS K8001 General rules for test methods of reagents

2. Configuration of instruments and reagents

(1) Configuration of instruments

Main unit	: Automatic Titrator	COM Series
Electrodes	: Silver-reference combination electrode	AGR-811Z*

* It can also be applied to combinations of other silver electrodes such as AG-311 and silver comparison electrodes such as RE-241Z.

(2) Reagents

Titrant	: 0.1 mol/L (0.1 N) silver nitrate standard solution (Buret No. 1)
Standard material	: Sodium chloride, standard material for volumetric analysis (Certified value of purity in this report: 100.00 %)

3. Measurement procedure

(1) Take about 0.1 g of sodium chloride into a 100 mL beaker and weigh it accurately to 0.1 mg digits.
(2) Add 50 mL of DI water and a stirrer bar to the 100 mL beaker.
(3) Immerse the electrodes and start the measurement. Titration is performed with a 0.1 mol/L silver nitrate standard solution, and the inflection point on the titration curve is detected as the end point.
(4) Perform the blank test with the same procedure of sample measurement.

4. Measurement conditions and results

Examples of titration conditions

Blank measurement

Cndt No.	1							
Method	Auto		ConstantNo.	1		Mode No.	16	*1
Buret No.	1		Size	0	g	Pre Int	0	sec
Amp No.	2		Blank	0	mL	Del K	0	
D. Unit	mV		Molarity	0.1	mol/L	Del Sens	0	mV
S-Timer	60	sec	Factor	0		Int Time	3	sec
C.P. mL	0	mL	K	0		Int Sens	3	mV
T Timer	0	sec	L	0		Brt Speed	2	
D.P. mL	0	mL				Pulse	16	
End Sens	300		Unit	mL				
Over mL	0.5	mL	Formula	D				
Max.Vol.	1	mL	Digits	3				

*1: Since the maximum change in electrode potential is shown at the first drop of this blank titration, the end point is detected in the first drop or less volume. To detect this end point, set Mode No. to which the blank mode function is assigned, Mode No.12-19 for COM-A19.

Factor standardization measurement with sodium chloride

Cndt No.	2							
Method	Auto		ConstantNo.	2		Mode No.	4	
Buret No.	1		Size	0	g	Pre Int	0	sec
Amp No.	2		Blank	0.01	mL	Del K	9	
D. Unit	mV		Molarity	0.1	mol/L	Del Sens	0	mV
S-Timer	60	sec	Factor	1.0000	*2	Int Time	3	sec
C.P. mL	0	mL	K	58.44	*3	Int Sens	3	mV
T Timer	0	sec	L	0		Brt Speed	2	
D.P. mL	1.0	mL				Pulse	40	
End Sens	300		Unit	Fact2				
Over mL	0.5	mL	Formula					
Max.Vol.	20	mL	S*F*1000/(K*M*(D-B))					
			Digits	4				

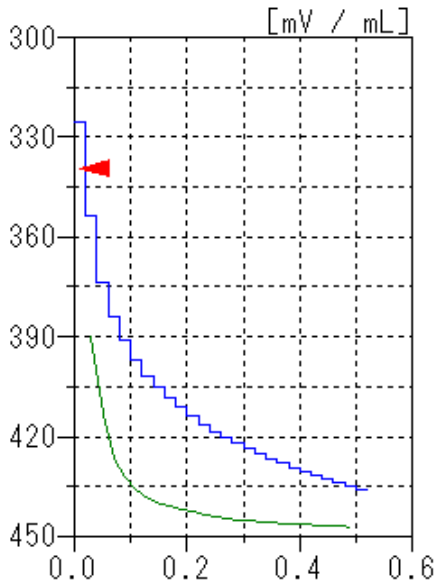
*2: Purity of sodium chloride / 100

*3: It is the mass (g) of sodium chloride that reacts with 1 mol of silver nitrate by the reaction formula (1), which is 58.44 of the formula amount of sodium chloride.

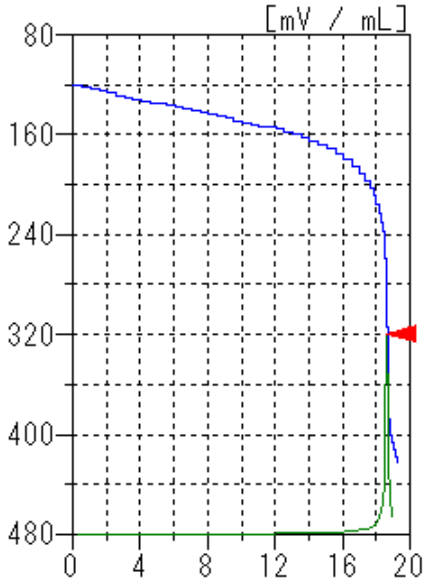
Measurement results

Measurement results of factor standardization

Sample	Measurement No.	Sample size (g)	Titrant volume (mL)	Factor	Statistical results		
Blank	1	-	0.010	-	Avg.	0.01	mL
	2	-	0.010	-			
Sodium chloride	1	0.1028	17.678	0.9956	Avg.	0.995	
	2	0.1050	18.076	0.9945	SD	0.001	
	3	0.1082	18.605	0.9957	RSD	0.07	%



Blank measurement



Factor standardization measurement

Examples of titration curves

5. Note

(1) About the standard material

Sodium chloride is used for the standardization of silver nitrate standard solution in precipitation titration. The standard material for volumetric analysis comes with a certificate value of the purity and uncertainty. If these certification and traceability are required for the management of test result, such as quality records, the standard material for volumetric analysis is used. It is necessary to prepare the standard material with pretreatment such as drying as described in its instructions before use.

Keywords：Factor standardization, Precipitation titration, Silver nitrate, Sodium chloride