Application Note

Determination of Chloride Ions in Water Using the Silver Nitrate Titration Method

Industry	Chemicals
Instrument	Automatic potentiometric titrator
Measurement method	Potentiometry / Precipitation titration,
Standards	ASTM D512

1. Scope

This Application Note describes an example of the measurement of chloride ions based on test method B (silver nitrate titration) in “ASTM D512 Standard Test Methods for Chloride Ion In Water.” Note that these standards are stipulated only for manual analysis. However, the same measurements can be performed utilizing a potentiometric titrator.

2. Precautions

If the silver area on the silver electrode loses its metallic luster, the potential during titration could become unstable, leading to a loss of measurement accuracy. If necessary, polish the silver area using polishing paper and check the metallic luster before performing measurements.
If the test solution has a pH of 10 or higher, the silver ions will become silver hydroxide, making accurate measurements impossible. In this case, add sulfuric acid (1 + 19) to lower the pH to below 10.

3. Post-measurement procedure

To prevent the internal solution from flowing out and concentrating, seal the internal solution filling port on the reference electrode with a rubber stopper.

4. Apparatus

Main unit	Automatic potentiometric titrator (preamplifier : STD)
Electrode	Combined silver electrode (Internal solution in the outer cylinder : 1mol / L Potassium nitrate)

5. Reagents

Titrant	0.025mol / L Silver nitrate solution
Additional reagent	Hydrogen peroxide (30%), Sulfuric acid (1+19)

6. Procedure

1) Place exactly 50 mL of the sample in a beaker.
2) Add 0.5 mL of a 30 % hydrogen peroxide solution. Stir the mixture and let stand for 1 minute.
3) Add sulfuric acid (1 + 19) to lower the pH to below 10.
4) Titrate the mixture with 0.025 mol/L of an aqueous silver nitrate solution.

7. Calculation

Chloride (mg / L) = (EP1 – BL1) × TF × C1 × K1 / S

EP1	Titration volume (mL)
BL1	Titration volume (mL) of blank test = 0
TF	Factor of Titrant = 0.9823
C1	Concentration conversion coefficient(mg/mL) = 0.88625
K1	Unit Conversion coefficient =1000
S	Sample volume (mL)

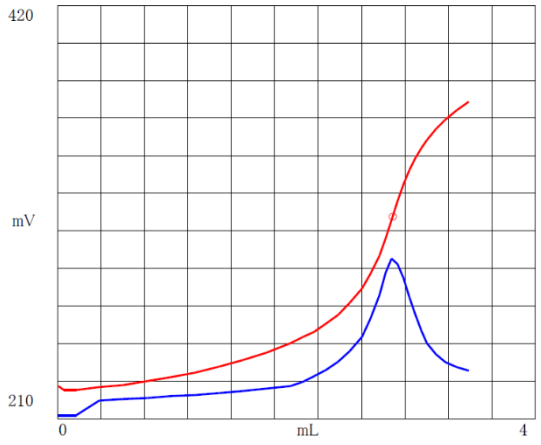
8. Example

— Parameter —

<Titr. Mode>	Auto Int.	**<Ctrl. Para.>**	
<Titr. Form>	EP Stop	Number of EP	1
		End Sense	Auto
<Titr. Para.>		Gain	1
Max Volume	30 (mL)	Data Sampling	Auto
Channel/Unit (Ctrl.)	ch1, mV	Ctrl. Speed	Auto
Wait Time	60 (s)	Other Control	Standard
Dose Mode	None	Stirrer Speed	4
		Auto Intermit mode	Standard

（The above condition is an example. The setting condition depends on the model.）

— Example of Titration curve —



— Measurement results —

Table 1 Measurement results of chloride ion

	Sample (mL)	Titration volume (mL)	Titration time (h:m:s)	Chloride ion (mg/L)
1	25.0	2.8057	00:02:09	97.70
2	25.0	2.8093	00:01:59	97.83
3	25.0	2.8143	00:02:15	98.00
Mean	-	-		97.84
SD	-	-		0.15
RSD (%)	-	-		0.15

9. Summary

Excellent accuracy was obtained with a relative standard deviation (RSD) of less than 0.5 %. If there are no sulfite ions in the sample, adding the hydrogen peroxide solution is not required. General samples must be examined to determine the feasibility of measurement, so in this case, contact us for more information.

10. Reference

ASTM D512 standard test methods for chloride ion in water. Test method B (Silver nitrate titration).