

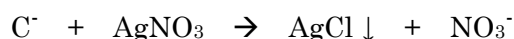
AQUACOUNTER Application Sheet	COM series	DATA No. D1	1st edition
Environmental	Quantification of chlorine ion in drinking water		

1. Measurement outline

The method for quantifying chlorine ions (chlorides) in clean water is stipulated in the test method for drinking water, Standard Methods of Analysis for Hygienic Chemists, etc.

Though a small amount of chlorine ion is contained in natural water, it is said to increase due to mixture of daily life drainage, industrial drainage, stock farm drainage, etc. Test method for drinking water adopts ion exchange chromatograph method and Mohr method (titration method) as the chlorine ion quantification method. The quantification limit for ion exchange chromatograph method is 0.2mg/L. The Mohr method is generally applied for samples including chlorine ions in mg/L or more. This section introduces the method for quantifying by potentiometric titration with silver indicator electrode instead of the color indicator titration in the test method for drinking water using the precipitation titration by Mohr method.

100mL of the sample water is collected and acidified with nitric acid for potentiometric titration with silver nitrate titrant.



2. Reagents and Electrodes

(1) Reagents	Titrant	0.01mol/L silver nitrate titrant
	Loading buffer	Nitric acid (1 + 5)
(2) Electrodes	Indicator electrode	Silver indicator electrode AG-311 to IE jack (P/N E231245-A)
	Reference electrode	Silver reference electrode MS-231 to RE jack (P/N D231243-A)
	Note) Silver reference combination electrode AGR-801 (P/N D231269-A) can also be used instead of using AG-311 and MS-231. Reference electrode RE-201 (standard accessory) cannot be used.	

3. Measurement conditions example (for COM-1600S)

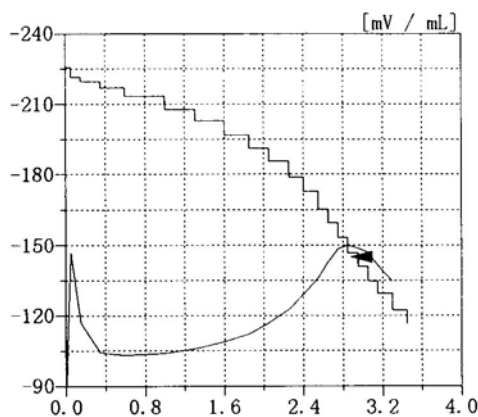
Master File No.1	
Condition file: 1	
Parameters for Condition file 1	
Method	AUTO
Amp No.	2
Buret No.	1
Meas Unit	mV
S-Timer	0 sec
CP	0 mL
DP	0 mL
Direction	N/A
End Sens	100
Over mL	0 mL
Max Vol	20 mL
Mode No.	1
Unit	ppm
Blank	0
Molarity	0.01
Factor	Titer of the titrant
K	35.453 (as Cl ⁻)

Mode No.1	
Pre Int	0 sec
Del K	9*
Del Sens	0 mV
Int Time	1 sec
Int Sens	3 mV
Brt Speed	2
Pulse	40

*Set "0" for Del K when 1ppm sample is measured.

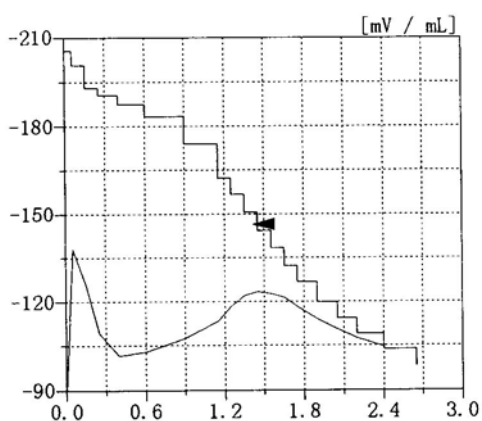
4. Measurement example

(1) Example of chlorine ion standard solution



Measurement results on 10ppm chlorine ion sample

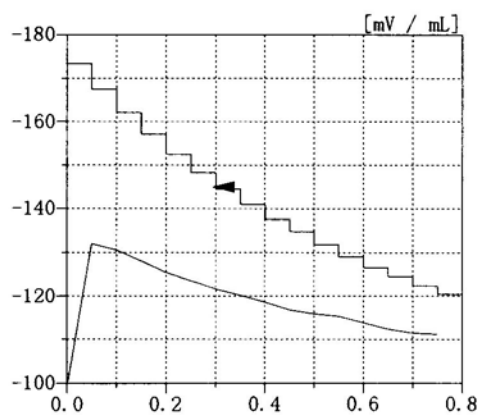
Sample No.	Sample volume (mL)	Titration value (mL)	Concentration (ppm)
1	100	2.882	10.22
2	100	2.889	10.24
3	100	2.883	10.22
Avg. (Average value)			10.23 ppm
Std. Dev. (Standard deviation)			0.012 ppm
C.V. (Coefficient of variation)			0.11 %



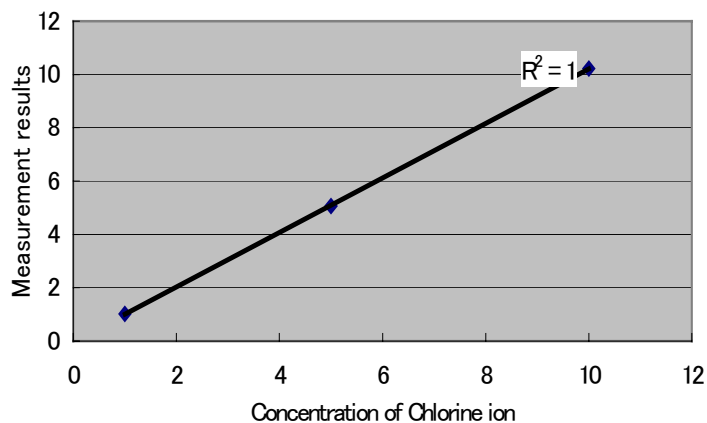
Measurement results on 5ppm chlorine ion sample

Sample No.	Sample volume (g)	Titration value (mL)	Concentration (ppm)
1	100	1.417	5.02
2	100	1.439	5.10
3	100	1.437	5.09
Avg. (Average value)			5.07 ppm
Std. Dev. (Standard deviation)			0.044 ppm
C.V. (Coefficient of variation)			0.87 %

Measurement results on 1ppm chlorine ion sample

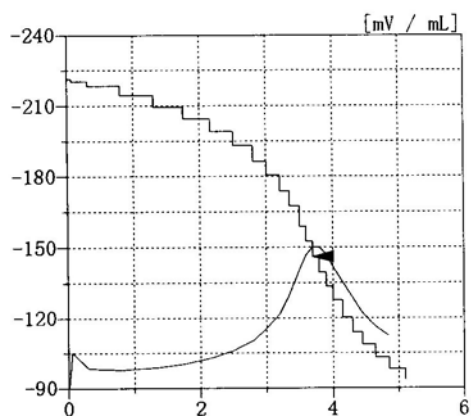


Sample No.	Sample volume (g)	Titration value (mL)	Concentration (ppm)
1	100	0.269	0.954
2	100	0.295	1.05
3	100	0.295	1.05
Avg. (Average value)			1.02 ppm
Std. Dev. (Standard deviation)			0.055 ppm
C.V. (Coefficient of variation)			5.43 %



(2) Example of chlorine ion measurement in running water

Measurement results on chlorine ion in running water



Sample No.	Sample volume (g)	Titration value (mL)	Concentration (ppm)
1	100	3.739	13.25
2	100	3.726	13.21
3	100	3.716	13.17
Avg. (Average value)			13.22 ppm
Std. Dev. (Standard deviation)			0.031 ppm
C.V. (Coefficient of variation)			0.23 %

5. Note

1) Potentiometric titration by Mohr method was conducted instead of color indicator titration to titrate the sample with 1 – 10ppm chlorine ion and results were obtained with relatively high precision. It is assumed that the limit of determination by this method is approximately 1ppm.

2) About control mode

The titration curve for this measurement may not deliver clear inflection point due to the low concentration of chlorine ion in the sample. As one measure against this, this section used set point detection (Set) as the titration method. Inflection point detection (Auto) can be used as the titration method for samples with approximately 5ppm or higher.

Key words

Chlorine ion, silver nitrate titration, precipitation titration, Mohr method

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