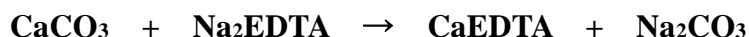


HIRANUMA APPLICATION DATA	Automatic Titrator	Data No.	D3	Nov. 14, 2018
Environment	Calcium hardness in tap water			

1. Abstract

There are determination methods for hardness in tap water as follows: (1) Total hardness defined as the sum of calcium and magnesium ion converted to mg/L as calcium carbonate (CaCO₃), (2) Calcium hardness determined by calcium ion concentration.

The measurement method for calcium hardness is similar to that of total hardness. Adjust the pH of sample water to higher than pH 12 with sodium hydroxide to mask the reaction of magnesium and EDTA. Start titration with 2-hydroxy-1-(2-hydroxy-4-sulfo-1-naphthylazo)-3-naphthoic acid (NN) indicator. Its color changes from red to blue.



This report introduces an example of calcium hardness measurement for tap water with photometric titration method using EDTA standard solution according to the *Standard Methods for the Examination of Water*.

2. Configuration of instruments and reagents

(1) Configuration of instruments

Main unit : Hiranuma Automatic Titrator COM Series
(M type photometric unit for photometric titration with 650 nm optical filter)

(2) Reagents

Titrant : 0.01 mol/L EDTA standard solution
Buffer solution : 28 % [w/v] Sodium hydroxide
Indicator : NN Indicator
Mix 0.5 g of NN and 50 g of powdered potassium sulfate and grind them until uniform.

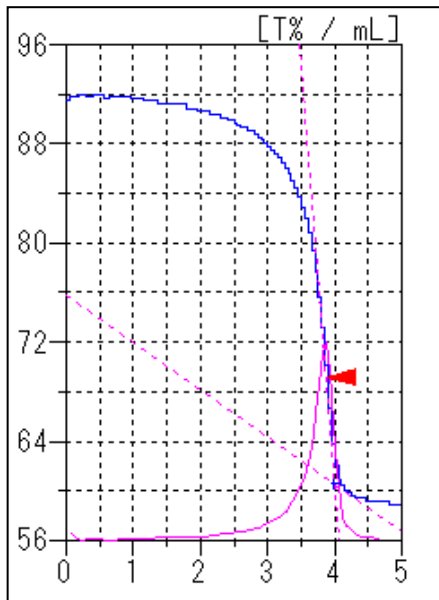
3. Measurement procedure

- (1) Dispense 100 mL of sample into a 200 mL beaker with volumetric pipette.
- (2) Add 9 mL of 28 % [w/v] sodium hydroxide.
- (3) Add 0.1 g of NN indicator.
- (4) Immerse photometric probe and start titration with 0.01 mol/L EDTA standard solution.

4. Measurement conditions and results

Example of titration condition

Cndt No.	1	ConstantNo.	1	Mode No.	8
Method	B cross	Size	100 mL	Pre Int	0 sec
Buret No.	1	Blank	0 mL	Del K	5
Amp No.	2	Molarity	0.01 mol/L	Del Sens	0 mV
D. Unit	T%	Factor	1.001	Int Time	5 sec
S-Timer	60 sec	K	100	Int Sens	3 mV
C.P. mL	0 mL	L	0	BrT Speed	2
T Timer	0 sec	Unit	PPM	Pulse	40
D.P. mL	0 mL	Formula	(D-B)*K*F*M*1000/S		
End Sens	300	Digits	4		
Over mL	1 mL	Auto In Pram.	Non		
Max.Vol.	20 mL				



Example of titration curve

Measurement results

Number of Measurement	Size (mL)	Titrant Volume (mL)	Calcium Hardness (ppm)
1	100	3.989	39.930
2	100	4.003	40.070
3	100	3.992	39.960
Statistic calculation		Avg.	40.0 ppm
		SD	0.074 ppm
		RSD	0.18 %

5. Note

(1) Measurement

The calcium hardness in tap water can accurately be determined by photometric titration method using photometric probe with NN indicator.

(2) Magnesium hardness

Magnesium hardness can be calculated by subtracting the calcium hardness from total hardness determined by other method. (Refer to the application data-D2 for the detail of total hardness.)

Magnesium hardness (CaCO₃ mg/L) = Total hardness (CaCO₃ mg/L) - Calcium hardness (CaCO₃ mg/L)

Keywords: Tap water, Calcium hardness, Magnesium hardness, Photometric titration, EDTA standard solution