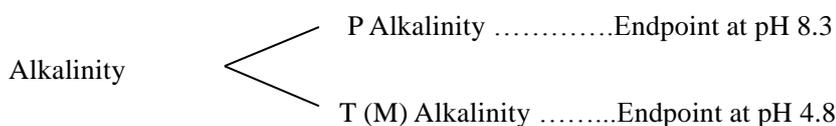


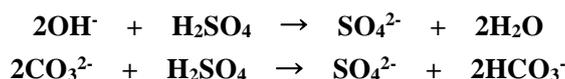
HIRANUMA APPLICATION DATA	Automatic Titrator	Data No.	D5	Nov. 14, 2018
Environment	Determination of alkalinity in bottled water			

1. Abstract

Natural water contains alkaline components such as hydroxides and carbonates. Such water indicates alkaline pH, the alkalinity is used as an index. The alkalinity is expressed as mg/L of calcium carbonate (CaCO₃) equivalent for these alkaline components. Alkalinity is divided into phenolphthalein alkalinity (P alkalinity) and total alkalinity (T alkalinity or M alkalinity) by the pH value of neutralization point.



Total amount of the hydroxides and half amount of carbonates are measured when it is titrated to about pH 8.3 with sulfuric acid titrant.



All of the bicarbonates are neutralized when it is titrated successively to about pH 4.8.



This report introduces a measurement example for bottled water using potentiometric titration as end point detection method according to *Standard Methods for the Examination of Water*.

2. Configuration of instruments and reagents

(1) Configuration of instruments

Main unit	:	Hiranuma Automatic Titrator COM series
Electrodes	:	Glass electrode GE-101B
		Reference electrode RE-201Z
		Thermistor electrode TE-403

*Instead of above electrode, the following electrodes are usable.

- Glass reference combination electrode GR-501B···Fixed sleeve type
- Glass reference combination electrode GR-511B···Moveable sleeve type

(2) Reagents

 Titrant : 0.01 mol/L Sulfuric acid standard solution

3. Measurement procedure

- (1) Dispense 100 mL of sample into a 200 mL beaker with volumetric pipette.
- (2) Immerse electrodes and start titration with 0.01 mol/L sulfuric acid standard solution.

4. Measurement conditions and results

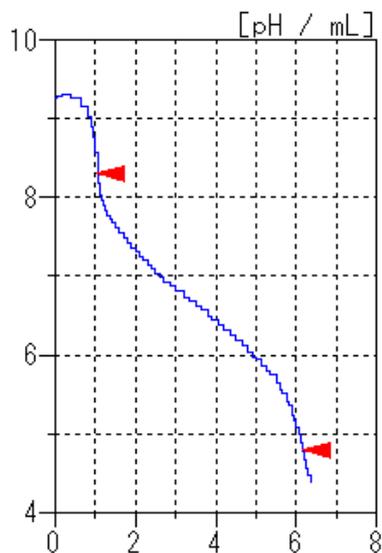
Example of titration condition

(1) Titration of P alkalinity

Cndt No.	1	ConstantNo.	1	Mode No.	5
Method	Set	Size	100 mL	Pre Int	0 sec
Buret No.	1	Blank	0 mL	Del K	5
Amp No.	1	Molarity	0.01 mol/L	Del Sens	0 mV
D. Unit	pH	Factor	1.004	Int Time	3 sec
S-Timer	5 sec	K	100.00	Int Sens	3 mV
C.P. mL	0 mL	L	0.000	Brst Speed	2
Direction	↓	Unit	PPM	Pulse	40
T Timer	0 sec	Formula			
D.P. mL	0 mL		$(D-B)*K*F*M*1000/S$		
Endpoint pH	8.3	Digits	3		
Over mL	0 mL	Auto In Pram.	Non		
Max.Vol.	5 mL				

(2) Titration of T (M) alkalinity

Cndt No.	2	ConstantNo.	2	Mode No.	5
Method	Set	Size	100 mL	Pre Int	0 sec
Buret No.	1	Blank	0 mL	Del K	5
Amp No.	1	Molarity	0.01 mol/L	Del Sens	0 mV
D. Unit	pH	Factor	1.004	Int Time	3 sec
S-Timer	0 sec	K	100.00	Int Sens	3 mV
C.P. mL	0 mL	L	0	Brst Speed	2
Direction	↓	Unit	PPM	Pulse	40
T Timer	0 sec	Formula			
D.P. mL	0 mL		$(VA+VB)*K*F*M*1000/S$		
Endpoint pH	4.8	Digits	3		
Over mL	0.2 mL	Auto In Pram.	Non		
Max.Vol.	10 mL				



Example of titration curve

Measurement results

Results of P Alkalinity

Number of Measurement	Size (mL)	Titrant Volume (mL)	Concentration (CaCO ₃ mg/L)
1	100	1.024	10.281
2	100	1.017	10.211
3	100	1.034	10.381
Statistic calculation		Avg.	10.2 mg/L
		SD	0.0854 mg/L
		RSD	0.83 %

Results of T (M) Alkalinity

Number of Measurement	Size (mL)	Titrant Volume (mL)	Concentration (CaCO ₃ mg/L)
1	100	5.117	61.656
2	100	5.120	61.615
3	100	5.108	61.666
Statistic calculation		Avg.	61.6 mg/L
		SD	0.0270 mg/L
		RSD	0.04 %

5. Note

The alkalinity is accurately determined by potentiometric titration instead of color indicator titration.

Owing to function of conditions connection, the successive titration of P alkalinity and T (M) alkalinity can be efficiently performed.

Setting for endpoint detection is “Set” method on this titration. Since the specified pH is detected as endpoint, the exact pH detection is required. Therefore pH calibration with pH standard solutions is necessary before the measurement.

Keywords: Bottled water, Alkalinity, P alkalinity, T (M) alkalinity, *Standard Methods for the Examination of Water*