AQUACOUNTER Application Sheet	COM series	DATA No. D5	1st edition
Environmental	Measurement of alkalinity of mineral water		

1. Measurement outline

Natural water contains alkaline components such as hydroxides and bicarbonates. Such water is alkaline and alkalinity is used as an index. Alkalinity is expressed as mg/L of calcium carbonate ($CaCO_3$) 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.

Alkalinity
- P alkalinity ..... End point pH8.3
- T (M) alkalinity ..... End point pH4.8

In the measurement method, 1/2 of the hydroxides and carbonates are measured when it is titrated to about pH8.3 with sulfuric acid titrant.

$$2OH^- + H_2SO_4 \rightarrow SO_4^{2-} + 2H_2O$$
$$2CO_3^{2-} + H_2SO_4 \rightarrow SO_4^{2-} + 2HCO_3^-$$

All of the bicarbonates are neutralized when it is titrated successively to about pH4.8.

$$HCO_3^- + H_2SO_4 \rightarrow SO_4^{2-} + 2CO_2 + H_2O$$

This section introduces a measurement example using potentiometric titration for end point detection method in conformance to the test method for drinking water.

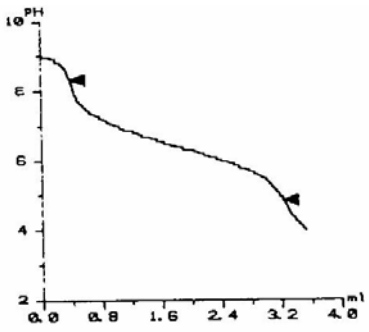
2. Reagents and Electrodes

(1) Reagents	Titrant	0.02mol/L sulfuric acid titrant
(2) Electrodes *standard accessories	Indicator electrode	*Glass electrode GE-101B
	Reference electrode	*Reference electrode RE-201 (4M potassium chloride inner solution used)

3. Measurement conditions example (for COM-1600S + 1unit of Buret B-2000-20)

Master File No.1 **Condition file : 1 + 2**					
Parameters for Condition file 1 (For 1st EP)		**Parameter for Condition file 2** (For 2nd EP)		**Mode No. 21**	
Method	Set	Method	Set	Pre Int	0 sec
Amp No.	1	Amp No.	1	Del K	5
Buret No.	1	Buret No.	1	Del Sens	0 mV
Meas Unit	pH	Meas Unit	pH	Int Time	3 sec
S Timer	10 sec	S Timer	0 sec	Int Sens	3 mV
CP pH	14.00 pH	CP pH	14.00 pH	Brt Speed	2
Direction	Down	Direction	Down	Pulse	8
DP pH	10.00 pH	DP pH	10.00 pH		
End Point	8.30 pH	End Point	4.80 pH		
Over mL	0.00 mL	Over mL	0.00 mL		
Max. Vol.	30 mL	Max. Vol.	20 mL		
Unit	mgEq/L	Unit	mgEq/L		
Size	100 g	Size	100g		
Blank	0	Blank	0		
Factor	Titer of the titrant	Factor	Titer of the titrant		
Molarity	0.02	Molarity	0.02		
K	0	K	0		
Formula	D×F×M×1000/S	Formula	D×F×M×1000/S		
Mode No.	21	Mode No.	21		

4. Measurement example

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Initial        8.99 pH
Temp           25.0 °C

EP             8.30 pH
               0.378 ml
dE/dV             1
SIZE        100.0000 g
*Conc       0.0770 mgEq/L

EP             4.80 pH
               2.842 ml
dE/dV             1
SIZE        100.0000 g
*Conc       0.5789 mgEq/L
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Measurement results on alkalinity of mineral water

Sample No.	Sample volume (mL)	P alkalinity		T (M) alkalinity	
		Titration value (mL)	P alkalinity	Titration value (mL)	T (M) alkalinity
1	100	0.380	0.0774	2.851	0.581
2	100	0.364	0.0741	2.852	0.581
3	100	0.378	0.0770	2.842	0.579
	Avg.		0.0762 $CaCO_3$mg/L		0.580 $CaCO_3$mg/L
	Std. Dev.		0.0018 $CaCO_3$mg/L		0.0012 $CaCO_3$mg/L
	C.V.		2.40 %		0.20 %

5. Note

Potentiometric titration was conducted for alkalinity measurement instead of titration with indicator, and measurement was possible with standard deviation 0.002 $CaCO_3$mg/L and coefficient of variation within 3%.

Key words

Alkalinity, P alkalinity, T (M) alkalinity

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