

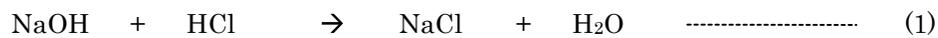
AQUACOUNTER Application Sheet	COM series	DATA No. H2	1st edition
Paper and Pulp	Fractionation quantification of mixture of sodium hydroxide (NaOH) and sodium carbonate (Na₂CO₃)		

1. Measurement outline

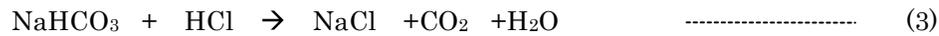
Sodium hydroxide and sodium carbonate play important roles as alkaline chemicals, and are used in wide range of fields. Since the two are often used in mixture, necessity to measure the concentration of each component arises.

This section introduces an example in which the mixture of sodium hydroxide and sodium carbonate is measured by successive fractionation titration using potentiometric titration method.

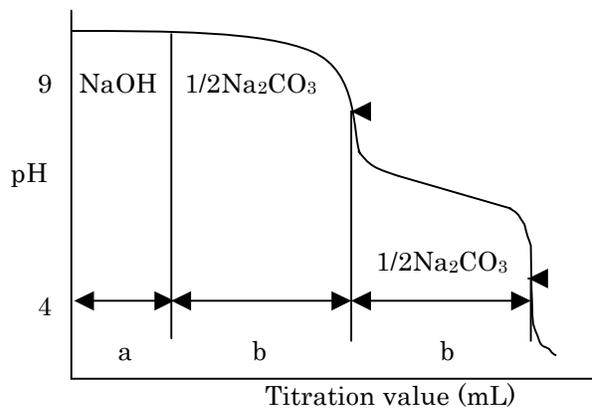
Titration of sodium hydroxide and sodium carbonate by hydrochloric acid advances according to the reaction formulas provided below:



The reactions of formulas (1) and (2) reach end point by approximately pH9. For sodium carbonate, NaHCO₃ formed in Formula (2) is successively titrated by hydrochloric acid and reaches end point at approximately pH4.



The relationship between the titration curve and Formulas (1), (2) and (3) is illustrated as follows:



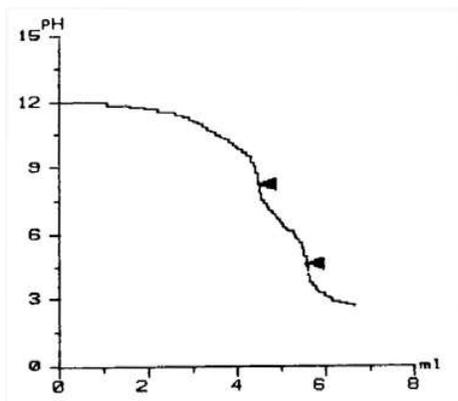
2. Reagents and Electrodes

(1) Reagents	Titrant	0.1mol/L hydrochloric acid titrant
(2) Electrodes <small>*standard accessories</small>	Indicator electrode	*Glass electrode GE-101B to IE jack
	Reference electrode	*Reference electrode RE-201 to RE jack

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

Master file 1					
Condition file: 1 + 2 + 3					
Parameters for condition file 1 (For NaOH + 1/2 Na ₂ CO ₃)		Parameters for condition file 2 (For 1/2 Na ₂ CO ₃)		Parameters for condition file 3 (For calculation)	
Method	AUTO	Method	AUTO	Method	Calc
Amp No.	1	Amp No.	1	Unit	%
Buret No.	1	Buret No.	1	Size	5 g
Meas Unit	pH	Meas Unit	pH	Blank	0
S Timer	10 sec	S Timer	0 sec	Factor	Titre of the titrant
CP mL	0 mL	CP mL	0 mL	K	40
DP mL	1 mL	DP mL	0 mL	Formula	(x·y)×K×F×M/(S×10)
End Sens	1000	End Sens	1000		
Over mL	0 mL	Over mL	1 mL	Mode No.	1
Max. Vol.	20 mL	Max. Vol.	20 mL	Pre Int	0 sec
Unit	%	Unit	%	Del K	9
Blank	0	Blank	0	Del Sens	0 mV
Factor	Titre of the titrant	Factor	Titre of the titrant	Int Time	1 sec
Molarity	0.1	Molarity	0.1	Int Sens	3 mV
K	40	K	40	Brst Speed	2
Formula	(D-B)×K×F×M/(S×10)	Formula	(x+y)×K×F×M/(S×10)	Pulse	40
Mode No.	1	Mode No.	1		

4. Measurement example



Measurement results on NaOH

Sample No.	Sample volume (mL)	Titration value (mL)	Concentration (%)
1	20	4.524	0.2720
2	20	4.510	0.2720
3	20	4.503	0.2711
Avg.			0.2717 %
Std. Dev.			0.00052 %
C.V.			0.19 %

Measurement results on Na₂CO₃

Sample No.	Sample volume (mL)	Titration value (mL)	Concentration (%)
1	20	1.144	0.06330
2	20	1.130	0.06252
3	20	11.35	0.06280
Avg.			0.06287 %
Std. Dev.			0.00040 %
C.V.			0.63 %

5. Outline

(1) About titration method for sodium carbonate

In this section, sodium carbonate was directly titrated with hydrochloric acid titrant. There is another method for titration in which titration is conducted by adding barium chloride in advance to form barium carbonate. The feature of this method is that it is effective when the concentration of sodium carbonate is small. Barium chloride addition method whose titration value is twice is more advantageous in measurement of low-concentration sodium carbonate. However, this method is not suited when the concentration of sodium carbonate is high since the precipitation of barium carbonate formed becomes large and thus leads to slow titration speed.

(2) About titration environment

Since approximately 0.03% CO₂ is contained in air, CO₂ is absorbed and the titration value for NaOH decreases and the titration value for Na₂CO₃ increases during titration on NaOH. As a measure against this, the nitrogen gas purging method that was adopted in this section is valid. Favorable results are also possible by using air that has passed the absorption tube with soda lime instead of nitrogen gas.

Key words

Quantification of sodium hydroxide, quantification of sodium carbonate, neutralization titration, barium chloride

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