

AQUACOUNTER Application Sheet	COM series	DATA No. H8	1st edition
Paper and Pulp		Quantification of sodium oxide (Na₂S) and silicic acid (SiO₂) in sodium silicate	

1. Measurement outline

Sodium silicate for industrial purposes comprises of sodium oxide (Na₂S) and silicic acid (SiO₂), and each component is quantified by neutralization titration with hydrochloric acid titrant.

(1) Measurement of oxidized sodium oxide (Na₂O)

Sodium oxide reacts with water and forms sodium hydroxide and water (Formula 1). It is quantified by titrating the formed sodium hydroxide with hydrochloric acid.



(2) Measurement of silicon dioxide (SiO₂)

It is titrated in succession to the previous titration on sodium oxide. When titration of sodium oxide is completed, sodium fluoride is added to react with silicon dioxide and form sodium hydroxide again. In a similar fashion to sodium oxide, it is quantified by titrating it with hydrochloric acid.



This section introduces an example in which sodium oxide and silicon dioxide were titrated successively using potentiometric titration method.

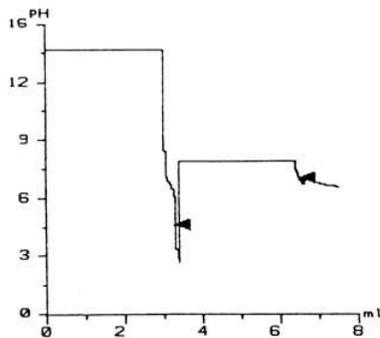
2. Reagents and Electrodes

(1) Reagents	Titrant	2mol/L hydrochloric acid titrant
	Added reagent	5g sodium fluoride for 1 measurement
(2) Electrodes *standard accessories	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 Na ₂ O determination)		Parameters for condition file 2 (For pH measurement)			Parameters for condition file 3 (For SiO ₂ determination)	
Method	AUTO	Method	pH Meas		Method	AUTO
Amp No.	1	Amp No.	1		Amp No.	1
Buret No.	1	Meas Unit	pH		Buret No.	1
Meas Unit	pH	S Timer	30 sec		Meas Unit	pH
S Timer	10 sec				S Timer	45 sec
CP mL	3 mL				CP mL	3 mL
DP mL	0 mL				DP mL	0 mL
End Sens	3000				End Sens	500
Over mL	0 mL				Over mL	1 mL
Max. Vol.	20 mL				Max. Vol.	20 mL
Unit	%	Mode No.	8	21	Unit	%
Blank	0	Pre Int	0	0	Blank	0
Factor	Titer of the titrant	Del K	5	0	Factor	Titer of the titrant
Molarity	2	Del Sens	0	0	Molarity	2
K	0	Int Time	5	3	K	0
L	0	Int Sens	3	3	L	0
Formula	D×F×6.2/S	Brt Speed	2	2	Formula	D×F×3.0/S
Mode No.	8	Pulse	40	20	Mode No.	21

4. Measurement example



Measurement results on Na₂O

Sample No.	Sample volume (g)	Titration value (mL)	Concentration (%)
1	0.4728	3.263	42.8745
2	0.4713	3.266	43.0505
3	0.4739	3.269	42.8536
Avg.			42.93 %
Std. Dev.			0.11 %
C.V.			0.25 %

Measurement results on SiO₂

Sample No.	Sample volume (g)	Titration value (mL)	Concentration (%)
1	0.4728	3.467	22.0427
2	0.4713	3.465	22.1001
3	0.4739	3.469	22.0043
Avg.			22.05 %
Std. Dev.			0.0048 %
C.V.			0.22 %

5. Outline

Precautions in measurement

About measurement of silicon dioxide

When sodium fluoride was added in a volume that was approximately twice the silicon dioxide content, reaction between silicon dioxide and sodium fluoride was facilitated and a clear inflection point was obtained at the titration end point.

In addition, color change from vermilion to pink occurred after the inflection point when it is compared with the end point by methyl red indicator, and the end point by indicator method indicated the tendency to be overtitrated.

Key words

Sodium silicate, silicon dioxide, sodium oxide, sodium fluoride, neutralization titration, successive titration

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