

AQUACOUNTER Application Sheet	COM series	DATA No. J1	1st edition
Inorganic Acid		Measurement of sulfuric acid purity	

1. Measurement outline

Sulfuric acid is one of the most fundamental chemicals among industrial chemicals, and the range of fields it is used it wide with large volume of production. Due to its nature, sulfuric acid absorbs moisture in air and gradually deteriorates in purity. The method for measuring the purity of sulfuric acid is stipulated in JIS K 8951 (Reagents) (bromothymol blue reagent titration). The main impurity in sulfuric acid is water.

This section introduces an example in which the sample was weighed and collected precisely for measurement by potentiometric titration with sodium hydroxide titrant.

Though sulfuric acid is supposed to show a titration curve with 2 inflection points since it is a dibasic acid, its titration curve shows only 1 inflection point in aqueous solution. The cause for this is that the natural strength of sulfuric acid cannot be delivered due to the leveling effect of water, and the difference between the first and second dissociation steps for sulfuric acid becomes indistinguishable. To obtain 2 inflection points, it only needs to be titrated in non-aqueous solvent (alcohol, acetone, etc.). The first dissociation step can deliver its natural strength in non-aqueous solvent.



2. Reagents and Electrodes

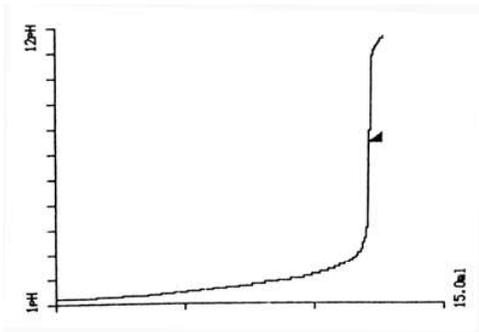
(1) Reagents	Titrant	1mol/L sodium hydroxide titrant
(2) Electrodes *standard accessories	Indicator electrode	*Glass electrode GE-101B to IE jack
	Reference electrode	*Reference electrode RE-201 to RE jack

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

Master File No.1	
Condition file: 1	
Parameters for Condition file 1	
Method	AUTO
Amp No.	1
Buret No.	1
Meas Unit	pH
S-Timer	10 sec
CP	0 mL
DP	0 mL
Direction	N/A
End Sens	500
Over mL	0.5 mL
Max Vol	40 mL
Mode No.	4
Unit	%
Formula	$(D \cdot B) \times K \times F \times M / (S \times 10)$
Blank	0
Molarity	1
Factor	Titer of titrant
K	49.035

Mode No.4	
Pre Int	0 sec
Del K	9
Del Sens	0 mV
Int Time	3 sec
Int Sens	3 mV
Brst Speed	2
Pulse	40

4. Measurement example



Measurement results on sulfuric acid purity

Sample No.	Sample volume (g)	Titration value (mL)	Concentration (%)
1	0.6155	11.950	96.478
2	0.6543	12.124	96.503
3	0.6348	12.306	96.331
Avg. (Average value)			96.437 %
Std. Dev. (Standard deviation)			0.093 %
C.V. (Coefficient of variation)			0.096 %

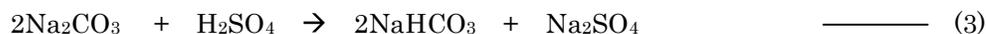
5. Outline

(1) About collection of the sample

This section adopted the sample collection method to collect approximately 0.6g directly into a 100mL beaker and weigh. Caution is required that the sample weighing precision affects the measurement precision greatly in this measurement.

(2) About control of the titrant

A high-concentration sodium hydroxide titrant is used as the titrant for this measurement. Since sodium hydroxide tends to absorb carbon dioxide gas in air (Formula 2), it is important that the carbon dioxide gas absorbent (soda lime) in the reagent bottle be replaced regularly. Titrant that has absorbed carbon dioxide gas contains sodium carbonate and delivers a titration curve that shows inflection points at around pH 4 and pH9.5 (Formulae 3 and 4).



Key words

Measurement of sulfuric acid purity, neutralization titration

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