HIRANUMA APPLICATION DATA	Automatic Titrator	Data No.	H4	Apr. 13, 2022
SODA PULP INDUSTRY	**Determination of available chlorine in sodium hypochlorite**			

1. Abstract

Sodium hypochlorite is used for bleaching and sterilization of tap water because of its strong oxidizing and disinfecting properties. Sodium hypochlorite is relatively stable at the alkaline region. However, it is unstable at the acidic region and becomes hypochlorous acid (HClO). It oxidizes water and generates chlorine (Cl_2). The concentration of available chlorine has to be measured regularly because sodium hypochlorite degrades slowly and generates sodium chloride.

This report introduces an example for determination of available chlorine as follows:.

1) Add potassium iodide to sodium hypochlorite to generate free iodine.

2) Titrate the free iodine generated from the reaction (1) with sodium thiosulfate to determine available chlorine (2) by redox titration.

$$Cl_2 + 2KI \rightarrow I_2 + 2KCl \quad \cdots\cdots \quad (1)$$

$$I_2 + 2Na_2S_2O_3 \rightarrow 2NaI + Na_2S_4O_6 \quad \cdots\cdots \quad (2)$$

2. Configuration of instruments and reagents

(1) Configuration

Main unit : Hiranuma Automatic Titrator COM series

Electrodes : Platinum electrode PT-301

: Reference electrode RE-201Z

※Instead of above electrodes, the following electrodes are usable.

・PR-701BZ (Platinum reference combination electrode)

・Combination of PT-301 (Platinum Electrode) and GR-501BZ (Glass reference electrode)

<Remark> Measurement of alkaline component in sodium hypochlorite will be possible with the combination of PT-301 and GR-501BZ.

(2) Regents

Titrant : 0.3 mol/L Sodium thiosulfate standard solution

Additive solution : 10 mL of 20% potassium iodide solution

Buffer solution : 10 mL of 50 % acetic acid solution

3. Measurement procedure

(1) Dispense 2 mL of sample and accurately weigh it.

(2) Add about 10 mL of 20 % potassium iodide solution.

(3) Add about 30 mL of DI water.

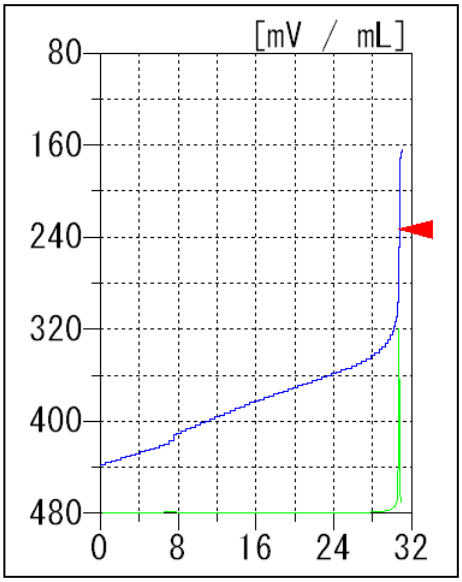
(4) Add about 10 mL of 50 % acetic acid solution.

(5) Immerse electrodes and titrate with 0.3 mol/L sodium thiosulfate standard solution.

4. Measurement conditions and results

Example of titration conditions

Cnd. No.	1							
Method	Auto		Constant No.	1		Mode No.	5	
Buret No.	1		Size	0	g	Pre Int	0	sec
Amp No.	2		Blank	0	mL	Del K	5	
D.Unit	mV		Morality	0.3	mol/L	Del Sens	0	mV
S- Timer	15	sec	Factor	1.013		Int Time	3	sec
C.P. mL	0	mL	K	35.45		Int Sens	3	mV
T.Timer	0	sec	L	0		Brt Speed	2	
D.P. mL	0	mL	Unit	%		Pulse	40	
End Sens	200		Formula				0.05	mL
Over mL	1	mL	(D-B)*K*F*M/(S×10)					
Max Vol.	20	mL	Decimal Places	4				
			Auto input parameter		None			



Example of titration curve

Measurement results

Number of Measurement	Size (g)	Titrant Volume (mL)	Concentration (%)
1	2.6123	30.710	12.6650
2	2.5984	30.528	12.6572
3	2.5988	30.572	12.6735
Statistic calculation		Avg.	12.67 %
		SD	0.01 %
		RSD	0.06 %

5. Note

Please refer to the following points to improve the measurement accuracy.

1) Weigh a sample size quickly because available chlorine is unstable.

2) Titrate free iodine immediately because the iodine generated by addition of potassium iodide readily volatilizes.

Addition of plenty potassium iodide is required because the volatilization of iodine depends on the concentration of the added potassium iodide.

Keywords: Sodium hypochlorite, Available chlorine, Redox titration

*Some measurement would not be possible depending on optional configuration of system.