Application Note

Standardization of potassium bromide-potassium bromate standard solution

Industry	Petrochemicals
Instrument	Automatic potentiometric titrator
Measurement method	Redox titration
Standards	UOP Method 304, ASTM D1159, JIS K2605

1. Scope

Potassium bromide-potassium bromate standard solution is used as a titrant for measuring bromine number and bromine index. This application note describes the standardization of 0.25mol/L potassium bromide potassium bromate standard solution according to the UOP Method 304. These reactions involved in the standardization are outlined below.

$KBrO_3 + 5KBr + 6HCl \rightarrow 3Br_2 + 6KCl + 3H_2O$	Generation of bromine
$Br_2 + 2KI \rightarrow I_2 + 2KBr$	Generation of iodine
$I_2 + 2Na_2S_2O_3 \rightarrow 2NaI + Na_2S_4O_6$	Reaction of iodine and sodium thiosulfate

2. Precautions

・Prior to the first titration, prepare the burette by dispensing and aspirating the titrant between it and the reagent bottle several times. Once done, dispense approximately 10mL of the titrant.
・The inner electrolyte of the combined platinum electrode should be changed every two weeks.

3. Apparatus

Main unit	Automatic potentiometric titrator (Preamplifier STD)
Electrode	Combined platinum electrode (Inner electrolyte：3.3mol/L Potassium chloride solution)

4. Reagents

Titrant	0.1mol/L Sodium thiosulfate solution
Additive reagents	15% Potassium iodide solution
Reagents	Glacial acetic acid, Concentrated hydrochloric acid

5. Procedures

1) Combine 50 mL of glacial acetic acid and 1 mL of concentrated hydrochloric acid into a glass stoppered Erlenmeyer flask, and cool in an ice bath for 10 minutes while stirring.
2) Add 5 mL of 0.25 mol/L potassium bromide-potassium bromate solution, 1 or 2 drops per second while stirring.
3) Stopper the flask and cool in an ice bath for 5 minutes.
4) Add 5mL of 15% KI solution and shake vigorously.
5) Transfer the reaction mixture to a beaker, rinse the inside of the flask and glass stopper with 100mL of pure water and then transfer this rinse water to the same beaker.
6) Titrate the solution with 0.1mol/L sodium thiosulfate solution.

6. Calculation

$$\text{Factor} = EP1 \times C1 \times FA / S$$

EP1	Titration amount (mL)
C1	Concentration conversion coefficient (0.2)
FA	Factor of 0.1 mol/L sodium thiosulfate solution (1.0043)
S	Quantity of sample (mL)

7. Example

-Parameter-

<Titr. Mode>	Auto Int.
<Titr. Form>	EP Stop
<Titr. Para.>	
Max. Volume (mL)	30
Channel / Unit (Ctrl.)	Ch1, mV
Channel / Unit (Ref.)	Off
pH Polarity	Standard
Type of Titration	Not check
EP Direction	Auto
Wait Time (s)	0
Dose Mode	Volume Stop
Stop Volume (mL)	20
Cut Off Time	0
Disp. Speed (s/mL)	1
Wait Time (s)	0

<Ctrl. Para.>	
Number of EP	1
End Sense	Auto
Gain	1
Data Sampling	Auto
Ctrl. Speed Mode	Standard
Other Control	Standard
Auto Int. Mode	Standard
Stirrer Speed	4

(Listed above are example settings. Availability of settings may vary by instrument model.)

-Example of titration curve-

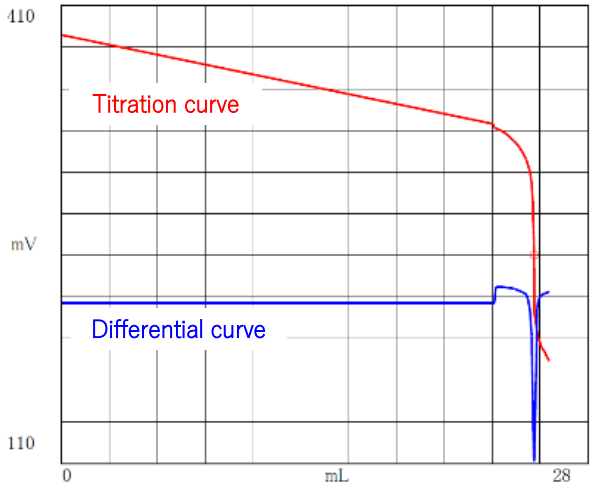

Table 1 Standardization of 0.25mol/L potassium bromide - potassium bromate solution

	Titration (mL)	Factor
1	25.1950	1.0121
2	25.1841	1.0117
3	25.1726	1.0112
Mean	-	1.0117
SD	-	0.0005
RSD (%)	-	0.05

8. Reference

UOP Method 304　BROMINE NUMBER AND BROMINE INDEX OF HYDROCARBONS BY POTENTIOMETRIC TITRATION