AQUACOUNTER Application Sheet	COM series	DATA No. C8	1st edition

Cosmetics — Quantification of hydrogen peroxide in hair dye

1. Measurement outline

Hydrogen peroxide contained in hair dye is quantified by potentiometric titration. Hydrogen peroxide oxidizes iodine ion and forms iodine (I_2) in acidic solution (Formula 1). This reaction occurs at a relatively slow speed.

$$2I^- + H_2O_2 \rightarrow I_2 + 2OH^- \quad \cdots\cdots (1)$$

The level of formed iodine is titrated with sodium thiosulfate titrant.

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

2. Reagents and Electrodes

(1) Reagents	Titrant	0.1mol/L sodium thiosulfate titrant
	Loading buffer	Sulfuric acid (1 + 10)
		10% potassium iodide solution
	Carbon tetrachloride	10mL (as an alternative to carbon tetrachloride, use a solvent which dissolves samples such as chloroform well.)
(2) Electrodes	Platinum reference combination electrode PR-731B (P/N D252341-1)	
	*Thermistor electrode TE-401	*standard accessory

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

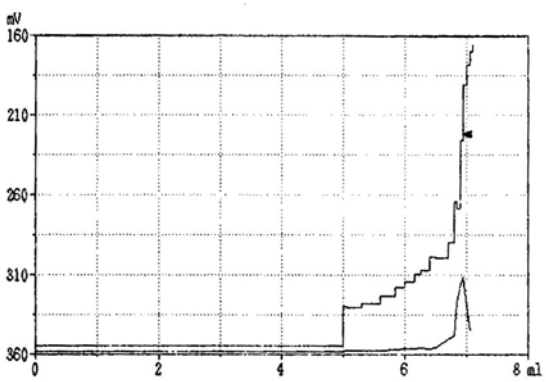
Master File No.1 Condition file: 1	
Parameters for Condition file 1	
Method	AUTO
Amp No.	1
Buret No.	1
Meas Unit	mV
S Timer	0 sec
CP	5.00 mL
T Timer	30 sec
DP	0 mL
End Sens	400
Over mL	0.00 mL
Max Vol	20 mL
Mode No.	8
Unit	%
Formula	(D-B)×F×K×M/(S×10)
Blank	*BLANK result value
Molarity	0.1
Factor	Titer of the titrant
K	1.700700 (1mL of 0.1mol/L sodium thiosulfate = 1.7007mgH_2O_2)

Mode No.8	
Pre Int	0 sec
Del K	5
Del Sens	0 mV
Int Time	5 sec
Int Sens	3 mV
Brt Speed	2
Pulse	40

4. Procedure

1) Introduce approximately 0.2g of the sample (weighed accurately) into a 200mL Erlenmeyer flask with stopper.
2) Add 10mL of carbon tetrachloride, 10mL of sulfuric acid (1 + 10) and 10mL of 10% potassium iodide solution to shake and mix well.
3) After 15 minutes, titrate the sample solution with 0.1mol/L sodium thiosulfate titrant.

5. Measurement example



Measurement results

Sample No.	Sample volume (g)	Titration value (mL)	Contentration (%)
1	0.1936	6.561	5.721
2	0.2130	7.240	5.724
3	0.2093	7.089	5.720
	Avg.		5.727 %
	Std. Dev.		0.01 %
	C.V.		0.18 %

6. Note

1) Electrode setting position

Since the sample solution includes organic solvent and is heterogeneous mixture, potential tends to fluctuate. It is important to adjust the position of the platinum electrode so as not to touch the organic solvent phase.

2) Stirring speed and titration control mode

The stirring speed for titration shall be set relatively high to titrate while extracting the iodine contained in organic solvent phase into the water phase. Therefore, it is important to set Int Time (the waiting period for titration control mode) to a relatively large value.

3) Reduction of measurement period

In this section, “CP mL (successive dropping)” was conducted in advance to near the measurement end point with the purpose of reducing the measurement time, and then titration was conducted slowly to the end point.

4) Titration flask and electrode

The desired detection electrode type for titration is a type that can be inserted directly into an Erlenmeyer flask, and the electrode assembly that was used is shown in Figure 1.

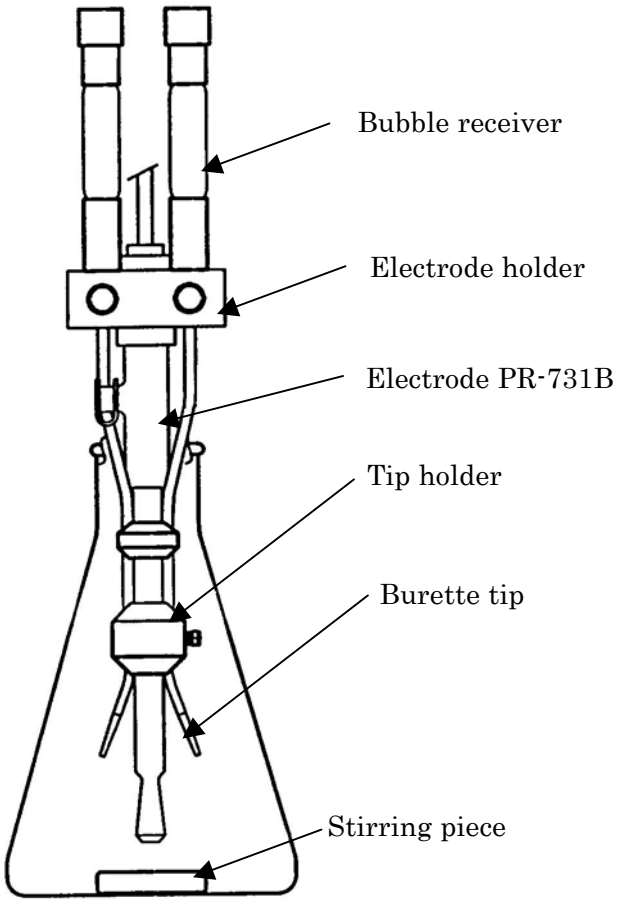


Figure 1. Example of electrode assembly used in titration

Key words

Cosmetic product, hair dye, hydrogen peroxide, oxidation-reduction titration

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