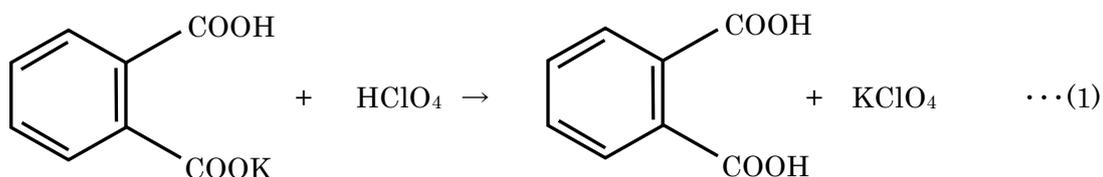


1. Abstract

Measurement method with perchloric acid - acetic acid standard solution is defined as a quantitative determination method for each drug and medicine in *Japanese Pharmacopoeia*. Standardization of perchloric acid - acetic acid standard solution with potassium hydrogen phthalate is also described there. This report introduces the standardization procedure that potassium hydrogen phthalate is dissolved in acetic acid, then it is titrated with perchloric acid - acetic acid standard solution. The factor of perchloric acid - acetic acid standard solution is determined with potentiometric titration. 1 mol potassium hydrogen phthalate reacts with 1 mol perchloric acid quantitatively on this titration (formula 1).



2. Configuration of instruments and reagents

(1) Configuration of instruments

Main unit	: Hiranuma Automatic Titrator	COM Series
Electrodes	: Glass electrode	GE-101B**
	: Reference electrode	RE-201Z*

*Inner solution has to be changed to saturated sodium perchlorate in acetic acid.

**Glass-reference combination electrode GR-511BZ is also usable.

(2) Reagents

Titrant	: 0.1 mol/L perchloric acid - acetic acid standard solution
Titration solvent	: 50 mL of acetic acid (reagent grade)
Standard sample	: Potassium hydrogen phthalate (volumetric standard)
Inner solution	: Saturated sodium perchlorate in acetic acid

3. Measurement procedure

- (1) Take about 0.3 g of potassium hydrogen phthalate into 100 mL beaker and weigh accurately to 0.1 mg digits.
- (2) Add 50 mL of acetic acid and dissolve sample by heating and stirring. After that, cool it down to room temperature.
- (3) Immerse the electrodes and titrate with 0.1 mol/L perchloric acid - acetic acid standard solution. Additionally, perform the blank test with the same procedure of sample measurement.

4. Measurement conditions and results

Examples of titration conditions

Measurement of blank

Cndt No.	1	ConstantNo.	1	Mode No.	17
Method	Auto	Size	0 g	Pre Int	0 sec
Buret No.	1	Blank	0 mL	Del K	0
Amp No.	1	Molarity	0.1000 mol/L	Del Sens	0 mV
D. Unit	mV	Factor	0	Int Time	5 sec
S-Timer	10 sec	K	0	Int Sens	3 mV
C.P. mL	0 mL	L	0	Brst Speed	2
T Timer	0 sec	Unit	mL	Pulse	16
D.P. mL	0 mL	Formula	D		
End Sens	300	Digits	3		
Over mL	0.2 mL	Auto In Pram.	Non		
Max.Vol.	1.0 mL				

Measurement of potassium hydrogen phthalate

Cndt No.	2	ConstantNo.	2	Mode No.	8
Method	Auto	Size	0 g	Pre Int	0 sec
Buret No.	1	Blank	0.0100 mL	Del K	5
Amp No.	1	Molarity	0.1000 mol/L	Del Sens	0 mV
D. Unit	mV	Factor	0.9998 *	Int Time	5 sec
S-Timer	10 sec	K	204.224	Int Sens	3 mV
C.P. mL	8.0 mL	L	1.000	Brst Speed	2
T Timer	30 sec	Unit	Fact2	Pulse	40
D.P. mL	0.2 mL	Formula	$S * F * 1000 / (K * M * (D - B))$		
End Sens	300	Digits			
Over mL	0.00 mL	Auto In Pram.	Non		
Max.Vol.	30 mL				

* Factor = (Purity of potassium hydrogen phthalate (%)/100)

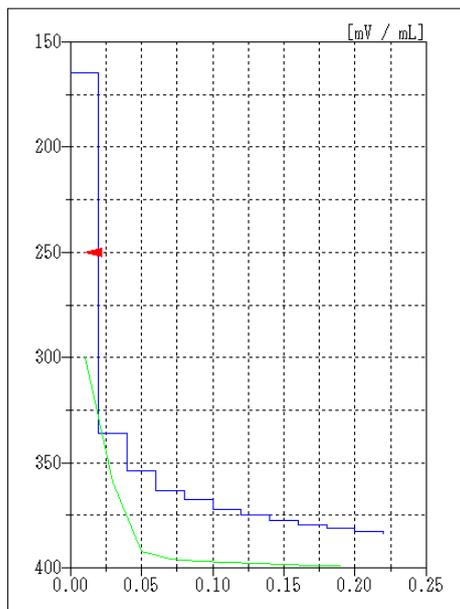
Measurement results

Measurement of blank

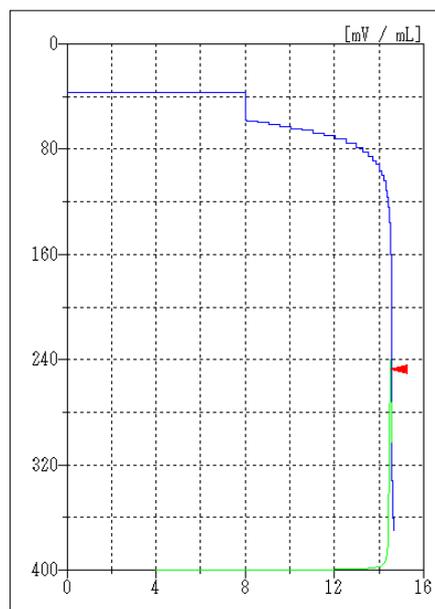
Number of Measurement	Size (g)	Titrant Volume (mL)
1	-	0.010
2	-	0.010
Avg. (Blank)		0.010 mL

Measurement of potassium hydrogen phthalate

Number of Measurement	Size (g)	Titrant Volume (mL)	Factor
1	0.2908	14.271	0.9983
2	0.3068	15.061	0.9979
3	0.2956	14.526	0.9969
		Avg.	0.9977
Statistic calculation		SD	0.001
		RSD	0.072 %



Measurement of blank



Measurement of potassium hydrogen phthalate

Examples of titration curves

5. Note

(1) Effect of water on perchloric acid titration

Water mixed in a measurement system affects to the reaction system of perchloric acid titration because of the leveling effect, which results in a negative effect such as lowered quantitative performance or getting less sensitivity around the end point. Therefore please take care not to mix water in the measurement system. Reference electrode for non-aqueous titration should be prepared as described in the following item (2), because water of KCl solution commonly used as inner solution for reference electrode could be mixed in the measurement system.

(2) Preparation of inner solution for reference electrode

The inner solution of the reference electrode RE-201Z is filled with 4 M KCl aqueous solution when purchased. This inner solution have to be replaced to saturated sodium perchlorate in acetic acid solution for this measurement. Replacement procedure is described below.

- i) Prepare the saturated solution of sodium perchlorate in acetic acid with reagent grade.
- ii) Discharge inner solution from reference electrode RE-201Z and wash inside it with water and then acetic acid.
- iii) Fill the prepared inner solution into reference electrode from the supply port.
- iv) Cure the electrode for one day before use.

(3) Influence of experiment temperature on perchloric acid titration

Acetic acid used as a solvent for the titrant has a relatively large thermal expansion coefficient. When the temperature changes by 1 °C, the titrant causes a volume change of 0.1 %. Factor titration and sample measurement should be performed at the same room temperature as much as possible for accurate measurement. (Please refer to application data B19 in regards to factor correction.)

Keywords : Drugs and medicines, Japanese pharmacopoeia, Perchloric acid titration, Standardization, Non-aqueous titration, Potassium hydrogen phthalate