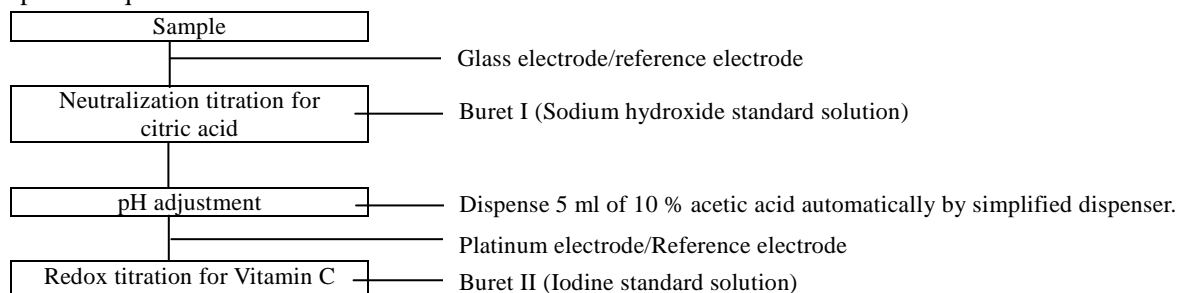


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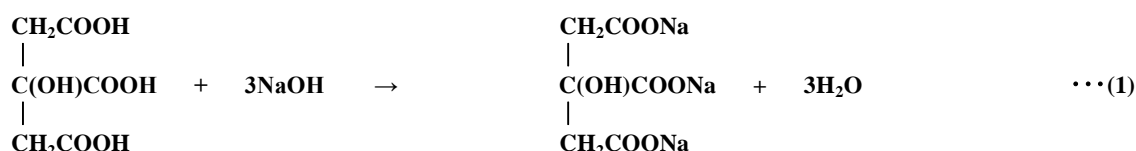
Continuous measurement of citric acid and vitamin C in soft drink

1. Abstract

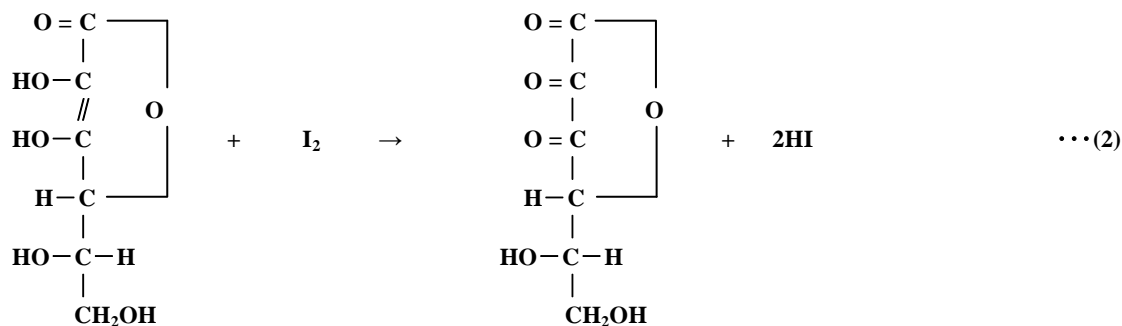
Example of sequential titration for vitamin C and citric acid in a soft drink is introduced here.



(1) Firstly, perform neutralization titration for citric acid with sodium hydroxide standard solution.



(2) After the titration, add acetic acid to adjust to acidic pH. Perform redox titration for vitamin C (ascorbic acid) by iodine standard solution.



The sequential titration of citric acid and vitamin C will be possible by additional option (buret and simplified dispenser).

2. Configuration of instruments and reagents

(1) Configuration

- | | | |
|------------|---|---|
| Main unit | : | Hiranuma Automatic Titrator COM series |
| Option | : | One buret, One dispenser (Peristaltic pump type) |
| Electrodes | : | <ul style="list-style-type: none"> • Glass reference electrode GR-501BZ (for measurement of citric acid and vitamin C), Connect to IE-1. • Platinum electrode PT-301 (for measurement of vitamin C), Connect to IE-2. |

(2) Regents

Titrant : 0.1 mol/L Sodium hydroxide standard solution (for citric acid)
0.05 mol/L Iodine standard solution (for vitamin C)
Additive solution : 10 % Acetic acid solution 5 mL (for pH adjustment)

3. Measurement procedure

- (1) Dispense 5 mL of sample into a 100 ml beaker with volumetric pipet.
- (2) Add 40 mL of pure water.
- (3) Immerse the electrodes and start titration with sodium hydroxide standard solution.
- (4) After the above titration, dispense 5 mL of 10 % acetic acid solution automatically (option: simplified dispenser).
- (5) Titrate with 0.05 mol/L iodine standard solution (option; buret).

4. Measurement conditions and results

Examples of titration conditions

(1) Titration of citric acid with sodium hydroxide standard solution

Cndt No.	1	ConstantNo.	1	Mode No.	4
Method	Auto	Size	5.0 mL	Pre Int	0 sec
Buret No.	1	Blank	0.0 mL	Del K	9
Amp No.	1	Molarity	0.1 mol/L	Del Sens	0 mV
D. Unit	pH	Factor	1.005	Int Time	3 sec
S-Timer	10 sec	K	64	Int Sens	3 mV
C.P. pH	0.00 pH	L	0.0	Brt Speed	2
Direction	-	Unit	%	Pulse	40
T Timer	0 sec	Formula	$(D-B)*K*F*M/(S*10)$		
D.P. pH	0.00 pH	Digits	3		
End Sens	500	Auto In Pram.	Non		
Over mL	0.10 mL				
Max.Vol.	20 mL				

(2) Dispense of 10 % acetic acid

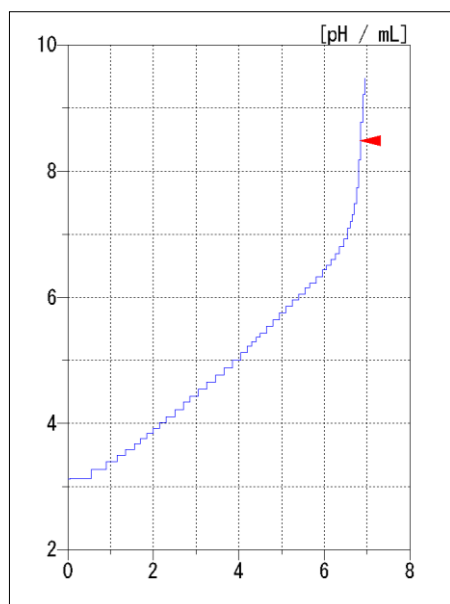
Cndt No.	2
Method	Disp
Buret No.	2
S-Timer	0 sec
Disp Vol.	5.00 mL

(3) Titration of vitamin C with iodine standard solution

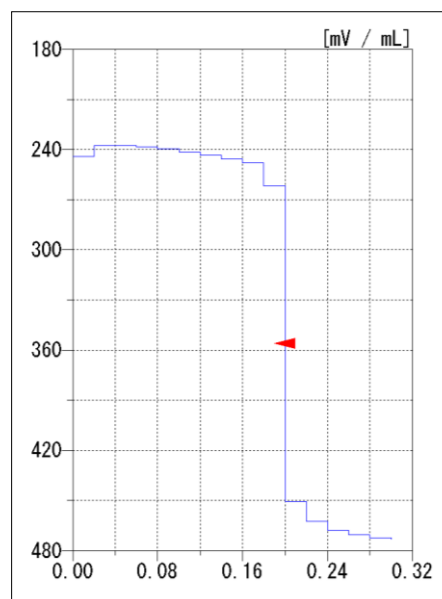
Cndt No.	3	ConstantNo.	3	Mode No.	21
Method	Auto	Size	5.0 mL	Pre Int	0 sec
Buret No.	3	Blank	0.0 mL	Del K	2
Amp No.	2	Molarity	0.05 mol/L	Del Sens	15 mV
D. Unit	mV	Factor	1.005	Int Time	3 sec
S-Timer	10 sec	K	176.12	Int Sens	3 mV
C.P. mL	0.0 mL	L	0.0	Brt Speed	2
T Timer	0 sec	Unit	mg/dL	Pulse	16
D.P. mL	0 mL	Formula	$(D-B)*K*F*M/S*100$		
End Sens	1000	Digits	3		
Over mL	0.10 mL	Auto In Pram.	Non		
Max.Vol.	20 mL				

Measurement results

Number of measurement	Size (mL)	Titer (mL)	Citric acid (%)	Titer (mL)	Vitamin C (mg/100mL)
1	5	6.826	0.878	0.190	33.630
2	5	6.821	0.877	0.182	32.214
3	5	6.823	0.878	0.191	33.807
Statistically		Average	0.878 %	Average	33.2 mg/100mL
		Standard deviation	0.001 %	Standard deviation	0.9 mg/100mL
		Coefficient of variant	0.066 %	Coefficient of variant	2.6 %



Measurement of citric acid



Measurement of vitamin C

Examples of titration curve

5. Note

This method will be quite effective to a labor-saving, because it is possible to measure two target analyte successively by using two different indicator electrodes and titrants.

The measuring method with using iodine (Iodimetry) was introduced here. The measurement of vitamin C by indophenol method is also possible. Please note that the measurement method would be designated depending on the sample when measuring vitamin C.

Keyword : Food, Soft drink, Citric acid, Vitamin C, Neutralization titration, Redox titration, Iodine standard solution