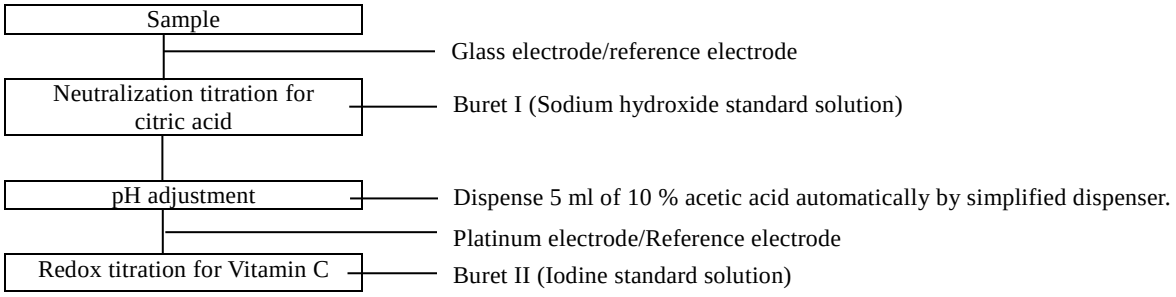
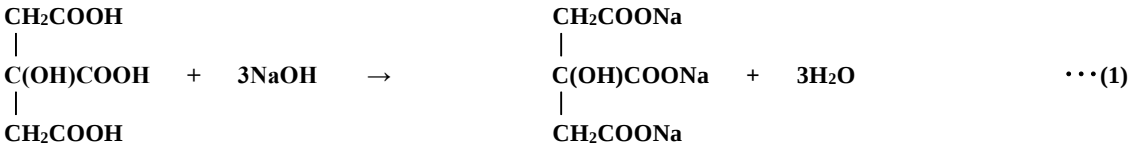
HIRANUMA APPLICATION DATA	Automatic Titrator	Data No.	A5	Oct. 7, 2022
FOOD	**Continuous measurement of citric acid and vitamin C in soft drink**			

1. Abstract

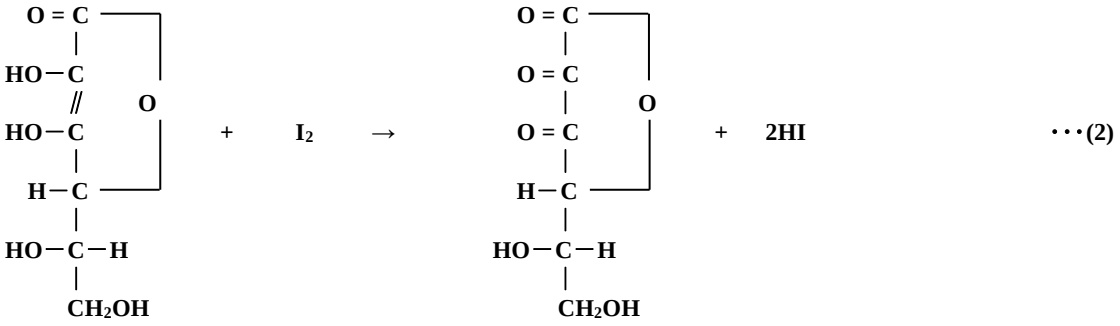
Example of sequential titration for vitamin C and citric acid in a soft drink is introduced here.



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

(2) Dispense of 10 % acetic acid

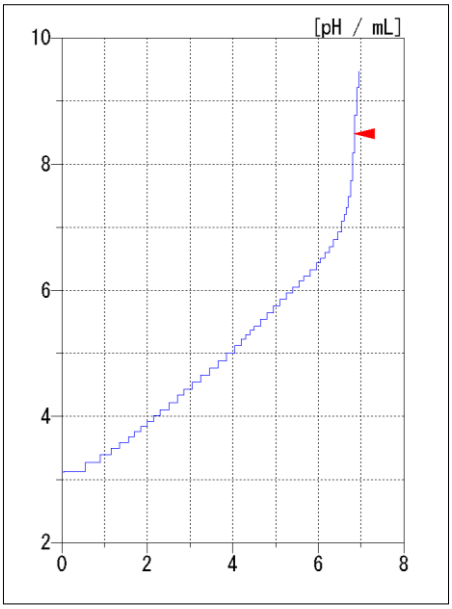
Cndt No.	2	
Method	Disp	
Buret No.	2	
S-Timer	0	sec
Disp Vol.	5.00	mL

(3) Titration of vitamin C with iodine standard solution

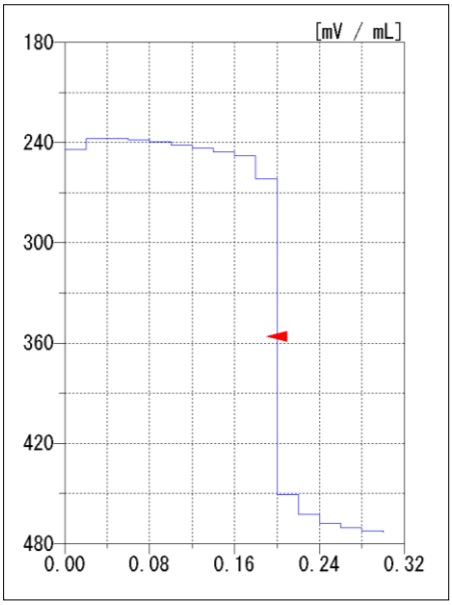
Cndt No.	3							
Method	Auto		ConstantNo.	3		Mode No.	21	
Buret No.	3		Size	5.0	mL	Pre Int	0	sec
Amp No.	2		Blank	0.0	mL	Del K	2	
D. Unit	mV		Molarity	0.05	mol/L	Del Sens	15	mV
S-Timer	10	sec	Factor	1.005		Int Time	3	sec
C.P. mL	0.0	mL	K	176.12		Int Sens	3	mV
T Timer	0	sec	L	0.0		Brt Speed	2	
D.P. mL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

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

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