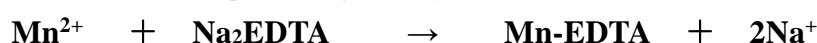


<b>HIRANUMA APPLICATION DATA</b>	Automatic Titrator	Data No.	G7	Apr. 5, 2019
<b>Metals</b>	<b>Quantitative determination of manganese ion</b>			

## 1. Abstract

Manganese ion can be determined by chelatometric titration. The stability constant of Mn (II)-EDTA complex is relatively large (13.81),<sup>1</sup> but the suitable pH range for the reaction between manganese ion and EDTA is confined from 7 to 11. Since manganese ion is oxidized with air in alkaline solution, ascorbic acid or hydroxylamine is added for the titration to avoid the oxidation. The report introduces an example of the titration performed at alkaline condition (pH 10) adjusted by ammonia.



## 2. Configuration of instruments and reagents

### (1) Configuration

Main unit : Hiranuma Automatic Titrator COM series (Photometric titrator unit type M)  
with 650 nm optical filter

Electrode : Glass - Reference electrode GR-501BZ (for pH confirmation)

### (2) Reagents

Titrant : 0.01 mol/L EDTA standard solution

Buffer solution : 25 % ammonia solution

Additive solution : Ascorbic acid

Indicator : TPC indicator

Mix TPC (Thymolphthalein complexone) and potassium nitrate in  
1:99 ratio [w/w] (hundredfold dilution).

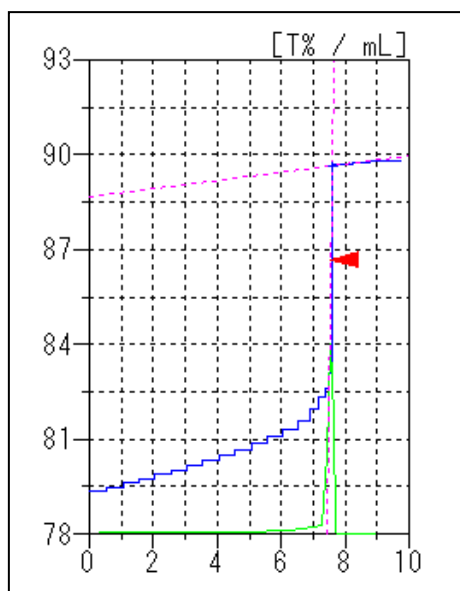
## 3. Measurement procedure

- (1) Dispense 20 mL of sample with volumetric pipette into a 100 mL beaker.
- (2) Add about 60 mL of DI water.
- (3) Add about 0.1 g of ascorbic acid.
- (4) Add 3 ~4 drops of ammonia solution to adjust the pH to 10.
- (5) Add about 0.1 g of TPC indicator.
- (6) Immerse photometric probe into sample solution and titrate with 0.01 mol/L EDTA standard solution.

## 4. Measurement conditions and results

### Examples of titration conditions

Cnd. No.	1	Constant No.	1	Mode No.	4
Method	B cross	Size	20 mL	Pre Int	0 sec
Buret No.	1	Blank	0 mL	Del K	9
Amp No.	2	Molarity	0.01 mol/L	Del Sens	0 mV
D.Unit	T%	Factor	1.000	Int Time	3 sec
S- Timer	10 sec	K	54.94	Int Sens	3 mV
C.P. mL	0 mL	L	0	BrT Speed	2
T.Timer	0 sec	Unit	PPM	Pulse	40
D.P. mL	0 mL	Formula	(D-B)*K*F*M*1000/S		
End Sens	500	Decimal Places	3		
Over mL	2 mL	Auto input parameter	None		
Max Vol.	20 mL				



Example of titration curve

### Measurement results

Number of Measurement	Size (mL)	Titrant Volume (mL)	Manganese ion Concentration (ppm)
1		7.592	208.552
2	20	7.591	208.525
3		7.591	208.525
Statistic calculation		Avg.	208.5 ppm
		SD	0.0156 ppm
		RSD	0.01 %

## 5. Note

The following tips could help to improve the measurement accuracy.

Manganese ion generates the precipitates of manganese hydroxide ( $Mn(OH)_2$ ) under alkaline condition. When performing titration at alkaline pH, the excess ammonium salt or the auxiliary complexing agent like tartrate salts or triethanolamine should be added before the titration. Regarding the interference by the coexistent ions, please note that a lot of metal ions interfere the titration at pH around 9 ~ 10.

Keywords : Manganese ion, Photometric titration, Chelatometric titration

### References

(1) K. Ueno, "Chelatometry", 1989, Nankodo, Tokyo.

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