Thermo. Titr. Application Note No. H-046

Title:	**Standardization of copper back-titrant by EDTA**

***Scope*:**	Standardization of copper back-titrant using standard tetrasodium EDTA titrant in the determination of metals.

***Principles*:**	Tetrasodium EDTA (Na_4EDTA) is the preferred reagent for the thermometric complexometric titration of metals, due to its much higher solubility than the normally used dibasic salt Na_2H_2EDTA. Some metals such as nickel and cobalt react too slowly with EDTA to be suitable candidates for determination by direct thermometric titration. In these cases, a known excess of standard EDTA is added to an aliquot of the sample, sufficent time allowed to permit complete complexation, and the excess EDTA back-titrated with a standard solution of a metal (such as copper) with fast complexation kinetics. The thermometric titration of copper with EDTA is carried out in an ammonia/ammonium chloride buffer (~pH 10) environment. The endpoint is marked by a slight upswing in temperature, caused by the formation of the Cu ammine complex, which is slightly more exothermic than that of the Cu-EDTA complex.

Reagents:	Titrant. 1 mol/L tetrasodium EDTA – Dosino #1 Buffer: NH_3/NH_4Cl solution, pH 10. Dissolve 70g NH_4Cl in 688mL conc. NH_3 soln. and make to 1000mL with D.I. water – Dosino #2 Copper back-titrant. Prepare an approximately 1 mol/L solution from A.R. $CuSO_4.5H_2O$ – Dosino #3

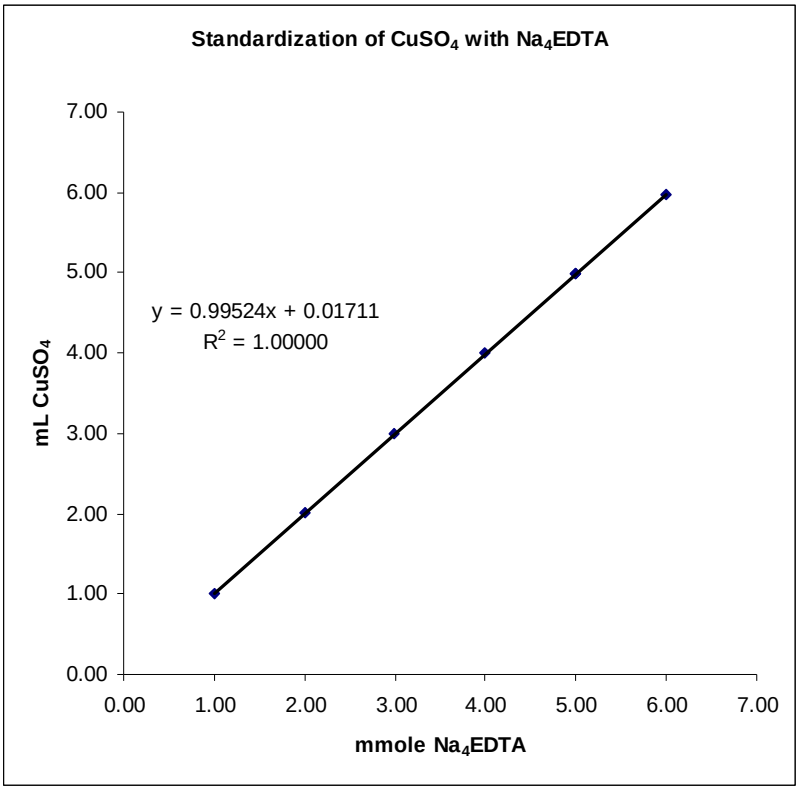
Method:	Basic Experimental Parameters:	
	Titrant delivery rate (mL/min.)	2
	No. of endpoints	1
	Data smoothing factor	50
	Stirring speed (802 stirrer)	6
	Delay before start (secs.)	15
	Buffer pre-dose (from Dosino #2), mL	5
	Copper sollution pre-doses (from	
	Dosino #3), mL	1, 2, 3, 4, 5, 6
	Measure 20mL D.I. water into titration vessels and use the titration program to titrate aliquots of $CuSO_4$ solution ranging from 1 – 6 mL.	

Results (example):		
Titrant: 0.9990 mol/L Na_4EDTA	Cu^{2+} aliquot, mL	Titre Na_4EDTA, mL
	1	5.977
	2	4.991, 4.989
	3	4.000
	4	2.996
	5	2.005
	6	1.011

Determination of titrant strength and method blank:

Molarity = 1/gradient
= 1/0.99524
= 1.0048 mol/L

Method blank
= y-intercept = 0.0171 mL



Thermometric Titration Plot:

Legend:

Red = solution temperature curve

Black =second derivative curve