Thermo. Titr. Application Note No. H-091

Title:	**Standardization of tetrasodium EDTA solutions with standard magnesium solution**

***Scope*:**	Standardization of 1mol/L tetrasodium EDTA (Na_4EDTA) solutions by titration with standard magnesium solution.

***Principle*:**	Aliquots of standard Mg^{2+} solution are titrated with Na_4EDTA solution to an endothermic endpoint. From a plot of mmol Mg^{2+} (x-axis) against mL Na_4EDTA (y-axis), the gradient of the linear regression is computed. The molarity of the Na_4EDTA solution is equal to the reciprcal of the gradient.

Reagents:	*Titrant:* 1mol/L Na_4EDTA *Standard:* 0.2mol/L Mg^{2+} NH_3/NH_4Cl buffer. Dissolve 87.5g NH_4Cl in 568mL 28% w/v NH_3 solution and dilute to 1000mL with DI water

Method:

Basic Experimental Parameters:

Titrant delivery rate (mL/min.)	4	
No. of exothermic endpoints		1
Data smoothing factor		55
Stirring speed (802 stirrer)	8	
Delay before start (secs.)	10	

Preparation of standard Mg^{2+} solution

Prepare the Mg metal by scraping A.R. Mg ribbon free of all oxide with a sharp blade until uniformly shiny. Cut into ~20mm lengths. Weigh 2.4305g, and transfer to a 500mL volumetric flask. Add 200mL DI water to the flask. Holding the flask at an angle, slowly add 25mL concentrated HCl down the neck. The flask should then be placed at an angle of approximately 45º so that the effervescence is directed against the walls of the flask. When all effervescence has ceased and all metal has dissolved, cool the flask contents to room temperature, and make to volume with DI water.

Titration Program

A titration program is set up to pre-dose 10mL buffer solution, after which the titration commences automatically.

Determination of molarity

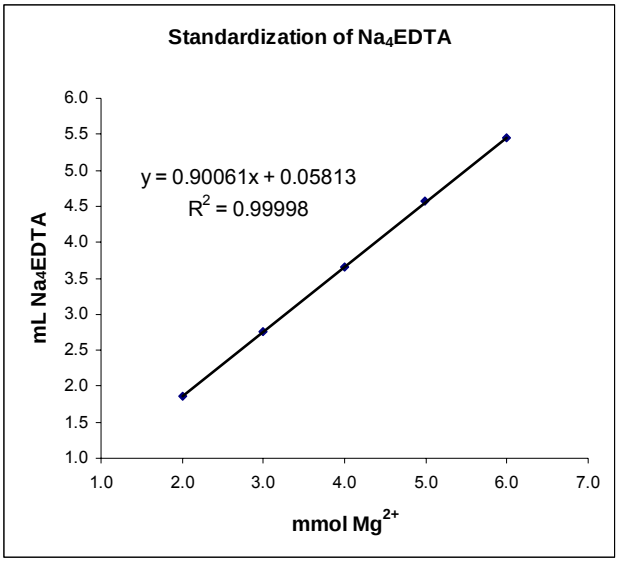
Into individual titration vessels, pipette 10, 15, 20, 25 and 30mL standard 0.2mol/L Mg^{2+} solution, equivalent to 2, 3, 4, 5 and 6mmol Mg^{2+} respectively. Add DI water to bring the total volume in each vessel to approximately 30mL. Either titrate individually or place in the rack of a 814 Sample Processor for automated titration.

Plot mmol Mg^{2+} (x-axis) against mL Na_4EDTA titrated (y-axis) and determine the gradient and y-intercept by linear regression. Determine the molarity of the Na_4EDTA titrant as the reciprocal of the gradient.

Example: *Standard Mg^{2+} solution: weighed 2.4285g Mg, made to 500mL = 0.19984mol/L Mg^{2+}*

mL Mg^{2+} soln.	mmol Mg^{2+}	mL Na_4EDTA titrated
30.00	5.9951	5.456
25.00	4.9959	4.565
20.00	3.9967	3.652
15.00	2.9975	2.751
10.00	1.9984	1.864

Linear Regression Plot:



Calculation:	1mol Mg^{2+} ≡ 1mol Na_4EDTA, thus M Na_4EDTA = 1/gradient = 1/0.90061 = 1.1104 mol/L Na_4EDTA

Thermometric Titration Plot:

Legend:
Red = solution temperature curve
Black =second derivative curve (for endpoints)