Thermo. Titr. Application Note No. H-032

Title:	**Standardization of Ammonium Ferrous Sulfate Solution**

***Scope*:**	Standardization of 0.1mol/L ammonium ferrous sulfate solution for use in thermometric titration of Cr(VI) solutions.

***Principle*:**	0.1 mol/L ammonium ferrous sulfate solution is standardized against a solution of 0.01mol/L standard potassium dichromate solution.

$$Cr_2O_7^{2-} + 14H^+ + 6e \leftrightarrow 2Cr^{3+} + 7H_2O$$

$$\underline{[Fe^{2+} \leftrightarrow Fe^{3+} + e] \times 6}$$

$$Cr_2O_7^{2-} + 14H^+ + 6Fe^{2+} \leftrightarrow 2Cr^{3+} + 6Fe^{3+} + 7H_2O$$

Reagents:	0.1 mol/L ammonium iron(II) sulfate solution, prepared by dissolution in DI water acidified 1:10 with 10% w/v sulfuric acid solution 10% w/v sulfuric acid solution 0.01mol/L potassium dichromate solution, prepared from dry A.R. potassium dichromate and DI water.

Method:

Basic Experimental Parameters:

Titrant delivery rate (mL/min.) 2

No. of exothermic endpoints 1

Data smoothing factor 40

Stirring speed (802 stirrer) 6

Delay before start (secs.) 10

Set up a 10mL burette with a Dosino to dispense aliquots of 0.01mol/L potassium dichromate solution. The Titrotherm pre-dose function is set up to successively pre-dose aliquots of 9, 7.5, 6, 4.5, 3 and 1.5mL of dichromate solution. Another Dosino is set up to pre-dose 5mL of 10% w/v sulfuric acid solution. Complementary amounts of DI water are added to titration vessels, so that the total volume of fluid prior to titration is 30mL.

Titrate to a single thermometric endpoint.

0.01mol/L $K_2Cr_2O_7$ mL	10% w/v H_2SO_4 mL	DI water mL
9	5	16
7.5	5	17.5
6	5	19
4.5	5	20.5
3	5	22
1.5	5	23.5

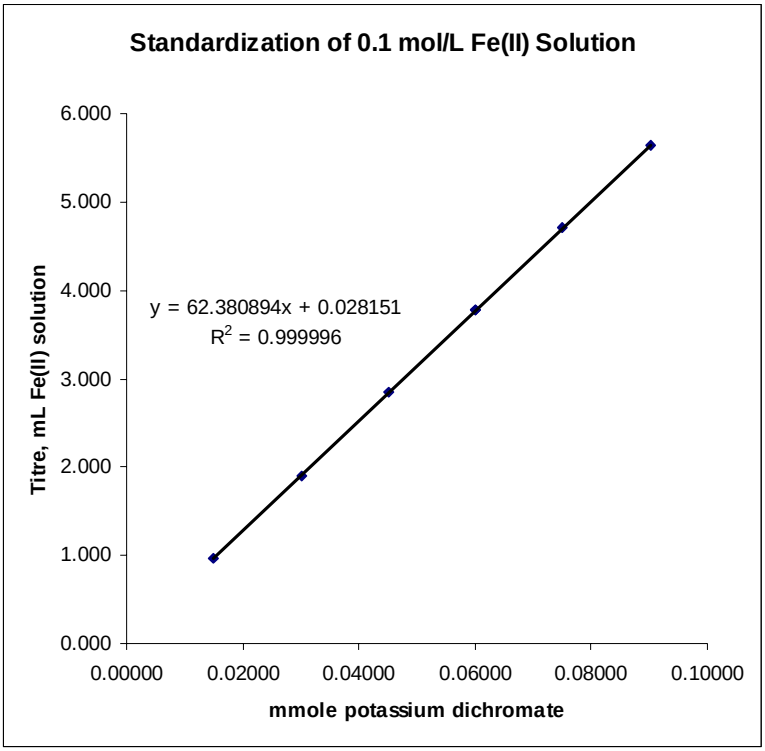
Example:	Standardization of ammonium ferrous sulfate solution with 0.01001088mol/L potassium dichromate solution		
	0.01mol/L $K_2Cr_2O_7$ mL	mmole $K_2Cr_2O_7$	Titre, mL Fe(II) soln.
	9	0.09010	5.648
	7.5	0.07508	4.708
	6	0.06007	3.776
	6	0.06007	3.777
	4.5	0.04505	2.841
	3	0.03003	1.905
	1.5	0.01502	0.960

Regression Analysis:

Molarity Fe(II) soln.

= 6/gradient (since there are 6 mole of Fe(II) reacting with 1 mole dichromate)
=6/62.380894

=0.09618 mol/L



Thermometric Titration Plot:

Legend:

Red = solution temperature curve

Black =second derivative curve