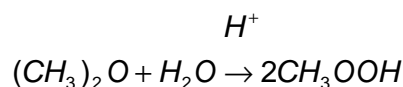


Thermo. Titr. Application Note No. H- 015

Title: Determination of Acetic Anhydride in Acylation Mixtures

Scope: Determination of acetic anhydride in the presence of acetic acid in acylation mixtures.

Principle: A weighed aliquot of acylation mixture is diluted with acetonitrile containing concentrated sulfuric acid, and titrated with standard water in acetonitrile solution to a single exothermic endpoint. Acetic anhydride hydrolyzes rapidly and exothermically when catalyzed with sulfuric acid.



Reagents: Titrant: 2.7837mol/L water solution. Dilute 50mL DI water to 1000mL in a volumetric flask with HPLC grade acetonitrile. Before making to final volume, allow flask contents to come to room temperature.

“Activated” diluent: Dilute 0.8mL concentrated sulfuric acid to 1000mL with HPLC grade acetonitrile.

Note: Both the titrant and diluent are volatile and prone to partitioning on standing. Store in brown glass bottles in a cool place, and regularly mix.

Method: Basic Experimental Parameters:

Data rate (per second)	10
Titrant delivery rate (mL/min.)	2
No. of exothermic endpoints	1
Data smoothing factor	50

Procedure: Weigh accurately approximately 2.5mL of acylation mixture into a dry titration vessel. Dilute by bulb pipette with 25mL of activated diluent, and titrate to a single exothermic endpoint.

Method (continued): Prepare and titrate a range of masses of acylation mixture. The following table gives an illustration:

Sample Size, g	Titre, mL
3.2168	4.579
2.6855	3.761
2.1500	2.941
1.6286	2.143
1.0946	1.332

Plot data (sample size on x-axis and titre on y-axis) and perform a linear regression analysis. The y-intercept must be subtracted from the titration results to compensate for system errors and the presence of residual water in the “activated” diluent. *Perform for each batch of “activated” diluent made up.*

Sample Size, g	Titre, mL	(Ac) ₂ O, %w/w
2.6691	3.722	43.3
2.6782	3.736	43.3
2.6774	3.736	43.3
2.6911	3.750	43.3
2.7076	3.789	43.4
2.7174	3.795	43.3
2.7118	3.806	43.5
2.6851	3.770	43.6
Average		43.38
Std. Dev.		0.11

Calculation:

$$\%w / w \text{ Ac}_2\text{O} = \frac{((\text{titre} - \text{offset}) \times \text{titrant mol} / \text{L} \times \text{FW Ac}_2\text{O} \times 100)}{(\text{Sample mass, g} \times 1000)}$$

Method Blank Determination:

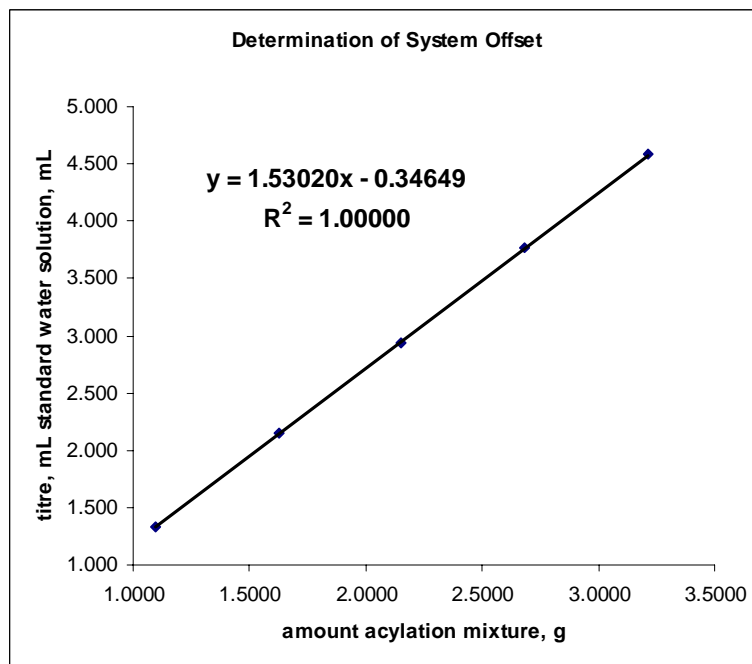
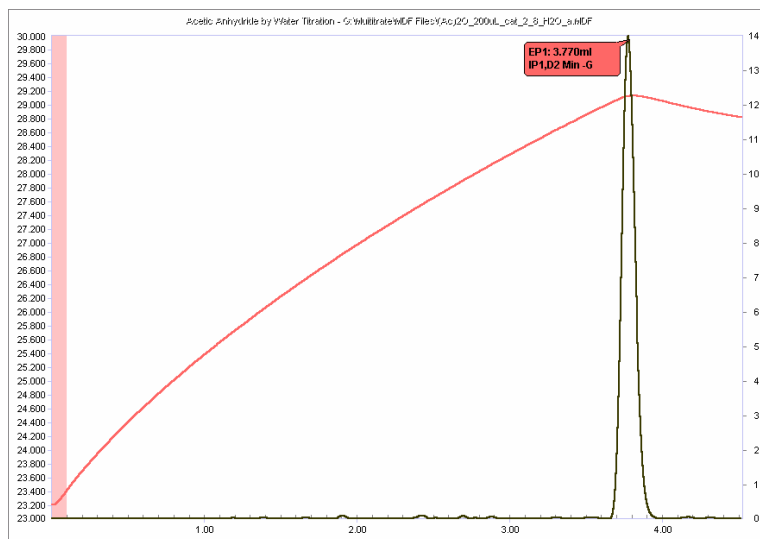


Fig. 1. Example of Regression Analysis. (In this case, the determined y-intercept of -0.346 is subtracted from each titre value obtained, ie. 0.346 mL is added to the titre)

Thermometric Titration Plot:



Legend:

Red = solution temperature curve

Black = second derivative curve