# Thermo. Titr. Application Note No. H-068

| **Title:** | **Determination of Ferric Ion by Iodometric Titration** |
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| ***Scope*:** | Determination of $Fe^{3+}$ by iodometric titration. Useful if $Fe^{3+}$ is accompanied by $Al^{3+}$, $Mg^{2+}$, $Ca^{2+}$ and $Fe^{2+}$. |
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| ***Principle*:** | Ferric ions oxidize iodide to iodine, which is then reduced by titration with standard sodium thiosulfate solution<br>$[Fe^{3+} + e \leftrightarrow Fe^{2+}] \times 2$<br>$2I^- \leftrightarrow I_2 + 2e$<br>$2S_2O_3^{2-} \leftrightarrow S_4O_6^{2-} + 2e$<br>$I_2 + 2e \leftrightarrow 2I^-$<br>$2Fe^{3+} + 2S_2O_3^{2-} \leftrightarrow S_4O_6^{2-} + 2Fe^{2+}$ |
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| ***Reagents:*** | *Titrant:* 1mol/L standard $Na_2S_2O_3$ solution<br>Glacial acetic acid<br>50% w/v KI solution (store in amber bottle in a cool place).<br>0.04mol/L $KIO_3$ solution (for standardizing $Na_2S_2O_3$ titrant) |
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| ***Method:*** | *Basic Experimental Parameters:* | |
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| | Titrant delivery rate (mL/min.) | 4 |
| | No. of exothermic endpoints | 1 |
| | Delay start of titration (secs.) | 20 |
| | Data smoothing factor (DSF) | 60 |
| | Stirring speed (802 stirrer) | 10 |
| | Iron must be in $Fe^{3+}$ form, and sufficiently acidic to prevent hydrolysis of the $Fe(H_2O)_6^{3+}$ aquo ion. Dispense aliquot into titration vessel. Add 2mL glacial acetic acid. Fit titration vessel to titration head and start the analysis sequence. Add 10mL KI solution through a port in the titration head imediately after clicking the “Start” button. | |

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| | *Standardization of $Na_2S_2O_3$ titrant.* Pipette aliquots of 5, 10, 15, 20 and 25mL KIO3 solution into titration vessels. Add 2mL glacial acetic acid, and make to ~30mL with DI water. Start the titration, and add 10mL KI solution through a port in the titration head imediately after clicking the "Start" button. Plot mmole of $KIO_3$ (x-axis) against mL $Na_2S_2O_3$ titrant (y-axis) and compute the titrant molarity. |

| ***Example:*** | Ferric alum solution |
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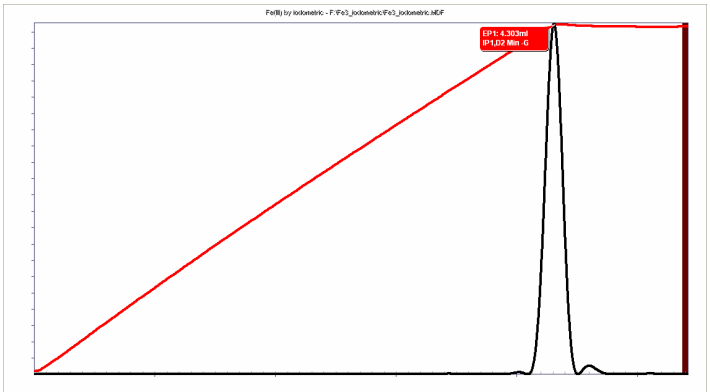
| | 9.38±0.02g/L (n=5) |

***Calculation:***

$$Fe^{3+}g/L = \frac{((\text{Titre, mL} - \text{blank, mL}) \times Na_2S_2O_3 \times 55.845)}{(\text{sample vol, mL})}$$

***Thermometric Titration Plots:***

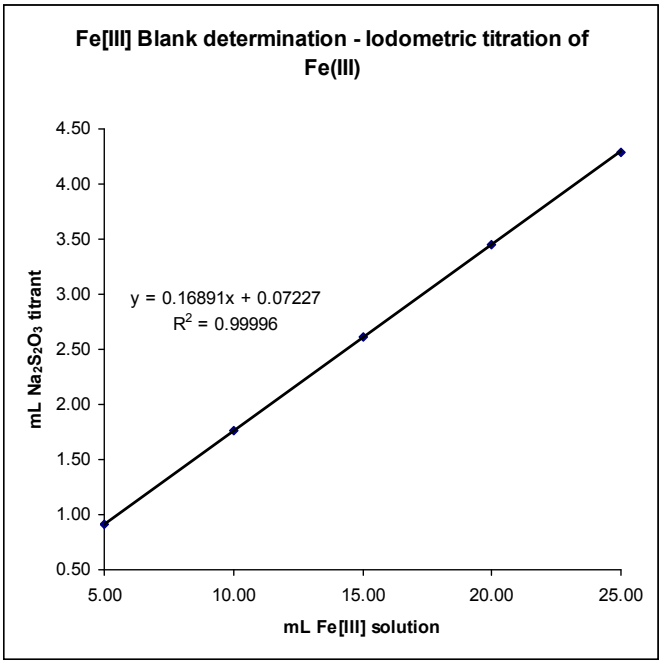
***Legend:***
*Red = solution temperature curve*
*Black =second derivative curve (for endpoints)*



*Titration of $I_2$ with $Na_2S_2O_3$*

## *Blank determination:*

*Blank = y-intercept*
*= 0.0723mL*




## *Standardization of $Na_2S_2O_3$ titrant:*

*Molarity = 6/gradient =*
*6/6.04237 = 0.9930mol/L*