Ω Metrohm

Thermo. Titr. Application Note No. H-067

Title:	Determination of Chloride in Bayer Process Liquor

Scope:	Determination of chloride in Bayer Process liquor.

Principle:	Neutralization of an aliquot of Bayer Process liquor with nitric acid, and consequent thermometric titration with 0.1 mol/L silver nitrate solution.

Reagents:	Titrant: Standard 0.1 mol/L $AgNO_3$ solution
	Concentrated nitric acid solution

Method:	Basic Experimental Parameters:	
	Titrant delivery rate (mL/min.)	3
	No. of exothermic endpoints	1
	Data smoothing factor (DSF)	50
	Stirring speed (802 stirrer)	10
	Titrant pre-dose (mL) (low chloride)	0.2
	Titrant pre-dose (mL) (high chloride)	0.5
	Wait time after pre-dose (secs.)	30

In this exercise, a serial dilution of liquor was prepared in order to demonstrate the best precision of the method. However, where faster results are required, a direct 1mL aliquot taken by micropipette may be used.

A 10mL aliquot of liquor was diluted to 200mL in a volumetric flask with DI water. A 20mL aliquot of this solution was dispensed into a titrating vessel, 10mL of DI water added, and the contents then cautiously neutralized with 2mL concentrated HNO_3. The contents were then gently swirled to dissolve all precipitated solids.

The titration commences with an automatic pre-dose of titrant, followed by a waiting period. This allows formation of sufficient AgCl precipitate to allow the rapid deposition of AgCl during the main part of the titration, assisting in obtaining a sharp, reproducible endpoint.

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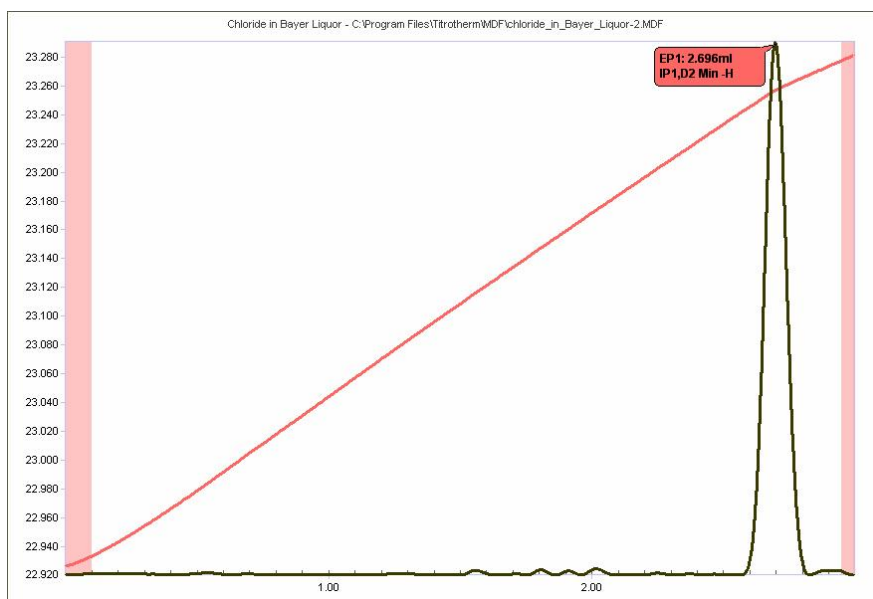| Examples:	Liquors from different alumina refineries			
		Chloride expressed as...		
	Origin	Cl^- g/L	NaCl g/L	Na_2CO_3 g/L
	Refinery #1	3.73±0.01 (n=7)	6.16±0.02 (n=7)	5.58±0.02 (n=7)
	Refinery #2	10.26±0.01 (n=6)	16.92±0.02 (n=6)	15.34±0.02 (n=6)

Calculations:

$$Cl^-\ g/L = \frac{((Titre, mL - blank, mL) \times AgNO_3\ mol/L \times 35.4527)}{aliquot, mL}$$

$$NaCl\ g/L = \frac{((Titre, mL - blank, mL) \times AgNO_3\ mol/L \times 58.44247)}{aliquot, mL}$$

$$Na_2CO_3\ g/L = \frac{((Titre, mL - blank, mL) \times AgNO_3\ mol/L \times 105.9884)}{(aliquot, mL \times 2)}$$

Thermometric Titration Plot:

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

Chloride in Bayer Liquor - C:\Program Files\Titrotherm\MDF\chloride_in_Bayer_Liquor-2.MDF

EP1: 2.696ml
IP1,D2 Min -H

Titration of chloride in Bayer liquor