

Hanna Titration Procedure

Quaternary Ammonium Salts



Description

Method for the determination of the percent active material in disinfectants by titration with sodium lauryl sulfate (SLS). The results are expressed as % quaternary ammonium (NH_4^+).

Reference

ASTM D5806-95(2017), Standard Test Method for Disinfectant Quaternary Ammonium Salts by Potentiometric Titration, ASTM International

Electrodes

- HI 4113 Combination Nitrate ISE

Reagents

- 0.005 M Sodium Lauryl Sulfate
- Reagent Grade Boric Acid
- Reagent Grade Sodium Tetraborate Decahydrate
- 2 N Sodium Hydroxide Solution
- Reagent Grade Isopropanol (IPA)
- Triton X-100 Reagent
- Deionized water (DI)

Accessories

- HI70300L Storage Solution (500mL)
- HI740036P 100-mL Plastic Beakers (10 pcs)
- 10 mL Class-A Volumetric Pipette
- Analytical balance to four decimal places

Electrode Preparation

- Attach nitrate membrane module to combination electrode handle and assemble per instructions.
- Rinse the inside the electrode with DI and electrolyte solution.
- Fill electrode with electrolyte solution.

Reagent Preparation

- Prepare a 0.005 M sodium lauryl sulfate titrant solution. *May be purchased
 - Dissolve 0.72095 g of sodium lauryl sulfate in a 500 mL volumetric flask and fill to line with DI.

- Prepare Borate Buffer Solution. *May be purchased
 - Dissolve 1.5 g sodium borate decahydrate and 1.0 g Boric Acid in approximately 200 mL of DI water.
 - While stirring, adjust to pH 9.5 with 2N NaOH.
 - Transfer to 1000 mL volumetric flask and fill to line with DI. Mix well.
- Prepare 1% Triton solution
 - Transfer 1 mL of Triton X-100 to a 100 mL volumetric flask and fill to line with DI.

Titration Preparation

- Connect the nitrate ISE to the titrator.
- Install a 25-mL burette filled with 0.005M sodium lauryl sulfate on pump one. For the determination of the exact concentration of the titrant, standardize with Hyamine 1622.
- Press "Select Method" from the main screen. Use the arrow keys to highlight 'Quaternary Ammonium Salts' and press "Select".

Sample Preparation

- Introduce sample into a 150 mL beaker and fill to approximately 100 mL with DI water.

**Use enough sample to yield 5-12mL titrant consumption, where*

$$\text{Sample size (g)} = \frac{\text{molecular weight of active compound}}{\text{Expected concentration of active matter (\%)}}$$

- Record the exact weight of the sample, this is entered into | the titrator.
- Add 10 mL of borate buffer solution, 2 mL of isopropyl alcohol, and 2 mL of 1% Triton solution.
- Submerge the electrode, temperature sensor, and dosing tip.

Analysis

- Press "Start". The titration will begin.
- At the end of the titration, when the equivalence point is reached, 'titration complete' will appear with the result. The result is expressed as % quaternary ammonium.

** If desired, the calculations may be changed to reflect eq/kg of active compound, or the % by mass of your active compound. If this is the case, change the calculations to reflect this.*

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Method Parameters:

Name: Quaternary Ammonium
Method Revision: 1.0
Titration Type: Standard Titration
Stirrer Configuration: Stirrer 1
Pump Configuration:
 Titrant Pump: Pump 1
Dosing Type: Dynamic
 min Vol: 0.005 mL
 max Vol: 0.200 mL
 delta E: 3.000 mV
End Point Mode: mV 1EQ point, 1st Der
Pre-Titration Volume: 2.000 mL
Pre-Titration Stir Time: 5 sec
Measurement Mode: Signal Stability
 delta E: 1.0 mV
 delta t: 2.0 sec
 t-min wait: 2 sec
 t-max wait: 20 sec
Electrode Type: Nitrate ISE
Blank Option: No Blank
Calculations: Sample Calc. by Weight
Dilution Option: Disabled
Titrant Name: .005 M SDS
Sample Size: 0.15610 g
Analyte Entry: Manual
Maximum Titrant Volume: 25.000 mL
Stirring Speed: 1400 RPM
Potential Range: -2000.0 to 2000.0 mV
Volume/Flow Rate: 25 mL/50 mL/min
Signal Averaging: 2 Readings
Final Result Format: XXXX

Calculations:

Calculations: Sample Calc. by Weight
Titrant units: M (eq/L)
Titrant volume dosed: V (L)
Final result unit: %
Titrant Conc.: 0.005 M (eq/L)
Sample/Titrant: 1.000 mol/eq
MW of sample: 18.04 g/mol
Sample Volume: 0.15610 g

$$\text{g/L} = \frac{V(L) \cdot 0.005 \cdot 1.000 \cdot 18.040 \cdot 100}{0.15610}$$

Results:

Method Name: Quaternary Ammonium
Time & Date: 14:41 Jan 30, 2017
Analyte size: 0.15610 g
End Point Volume: 7.885 mL
mV Equivalence Point: 72
Results: 0.4556 %
Initial and Final mV: 205.7 to 54.8
Titration Duration: 4:37 [mm:ss]
Titration went to Completion

Graphs:

