1. Abstract

The concentration of Nickel sulfate in electrolytic colorant is measured by chelatometric titration with 0.1mol/L EDTA after adding pure water and 28% Ammonia water to the sample. The inflexion point by color change of indicator on titration curve is defined as the endpoint.

The concentration of Nickel sulfate is calculated from titration volume of EDTA.

2. Reference

2) “Chelatometry” by Kagehira Ueno from Nankodo

3. Cautions in measurement

1) Handle with care when you work on chemicals. Work in a well ventilated room or use a draft.
2) Optimize pH since reactivity of sample and titrant changes during chelatometric titration.
4. Post-measurement care

Clean the photo sensor with ethanol and then with pure water.

5. Test equipment

Main unit: Automatic potentiometric titrator (Option Photometric preamplifier PTA-)
Electrode: Option Photo sensor (Filter: 630nm)

6. Reagent

Titrant: 0.1mol/L EDTA (f=1.003)
Additive: Pure water, 28% Ammonia water
Indicator: MX

7. Measurement procedure

—Measurement—
1) Deliver 10.0mL sample to a 200mL beaker, and add 100mL water.
2) Add 10.0mL of 28% Ammonia water.
3) Add 0.02g of MX indicator.
4) Titrate with 0.1mol/L EDTA to obtain concentration of Nickel sulfate.

8. Formula

Nickel sulfate (g/L) = \( \frac{E_1 - B_1 \times F_1 \times C_1 \times K_1}{S} \)
- \( E_1 \): Titration volume (mL)
- \( B_1 \): Blank level (0.00mL)
- \( F_1 \): Factor of titrant (1.003)
- \( C_1 \): Concentration conversion coefficient (26.2718mg/mL)
  \( (1mL \text{ of } 0.1mol/L \text{ EDTA} \equiv 26.2718mg \text{ NiSO}_4 \cdot 6\text{H}_2\text{O}) \)
- \( K_1 \): Unit conversion coefficient (1)
- \( S \): Sample size (mL)
9. Example of measurement

--- Ambient condition ---
| Room temperature : 25 °C | Humidity : 50 % | Weather : Fair |

--- Titration parameter ---

<table>
<thead>
<tr>
<th>Titration mode</th>
<th>Auto cut-off</th>
<th>Preamplifier unit</th>
<th>%T</th>
</tr>
</thead>
<tbody>
<tr>
<td>Titration form</td>
<td>EP Stop</td>
<td>Max. titration volume</td>
<td>20.0mL</td>
</tr>
<tr>
<td>Titration burette</td>
<td>01</td>
<td>Auto stirrer</td>
<td>Off</td>
</tr>
<tr>
<td>Reagent name</td>
<td>EDTA</td>
<td>Wait time before titration</td>
<td>0s</td>
</tr>
<tr>
<td>Detector number</td>
<td>3</td>
<td>Titration direction</td>
<td>Auto</td>
</tr>
</tbody>
</table>

--- Control parameter ---

| Number of EPs       | 1            | Data sampling potential | 4.0mV |
| Simulation          | Off          | Limit time of stability check | 1s |
| EP sense (Potential)| 50.0         | Data sampling volume    | 0.1mL |
| EP sense (Differential) | 100.0    | Separate potential setup | Off |
| Over-titration      | 0.0mL        | Separate potential     | 0.0%T |
| Gain                 | 1            | EP potential setup     | Off |
|                      |              | EP potential           | 0.0%T |

--- Titration curve ---

(The above printout data were obtained from titration by AT-410)
### Measurement results

<table>
<thead>
<tr>
<th>Sample (mL)</th>
<th>Nickel sulfate (g/L)</th>
<th>Concentration of Nickel sulfate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Mean 142.50 g/L</td>
</tr>
<tr>
<td>1</td>
<td>143.44</td>
<td>SD 0.83 g/L</td>
</tr>
<tr>
<td>2</td>
<td>142.22</td>
<td>RSD 0.58 %</td>
</tr>
<tr>
<td>3</td>
<td>141.85</td>
<td></td>
</tr>
</tbody>
</table>

*The above test results were obtained by 3 tests of the same sample.*

#### 10. Summary

Electrolyte Solution is conductive electrically made by dissolving in the ionic substance in polar solvent like water. It is also called Ionic solution. In narrow sense of term, it means Electrolytic solution for battery or electro plating.

Nickel sulfate (NiSO₄) is the ionic compound of Nickel ion and Sulfate ion. Sexto hydrate is green solid needle.

The sample measurement shows a good repeatability with 0.6% relative standard deviation. Precise and reliable measurement is assured by the automated potentiometry.

Nickel sulfate in Electrolyte can be perfectly analyzed by any of the following titration systems manufactured by Kyoto Electronics (KEM).

**[AT-610]**
- Awarded Product of Supreme Technology from Kyoto City
- Easy key entry by touch panel of large color LCD (8-inch wide)
- Simultaneous titration in parallel
- Both potentiometric and Karl Fischer moisture titration (coulometric+volumetric) can be performed at a time.

**[AT-510]**
- Compact and cost performance model
- PC card expands data memory for convenience and versatility.

**[AT-500N-1]**
- Low cost and high performance
- Easy view with back light LCD
- GLP/GMP conformed model

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