



Method 8.17 – Refined sugar: chlorides (as NaCl)

1. Rationale

This method is applicable to refined and white sugars.

2. Principle

Chlorides are determined by titration against a silver nitrate standard solution using a potassium chromate indicator. This method is based on the Mohr titration.

3. Apparatus

3.1 Volumetric flasks: 100, 200 and 1 000 cm³

3.2 Erlenmeyer flask: 250 cm³

3.3 Pipette: 20 cm³

3.4 Burette: 50 cm³

3.5 Light duty balance

4. Reagents

4.1 Silver nitrate (0.0171 M)

Silver nitrate (AgNO₃) is a strong oxidizer and is toxic and corrosive to the skin, eyes and respiratory tract. Blue pigmentation of the skin will occur upon contact. Only handle while wearing gloves and safety glasses.

Dry silver nitrate in an oven at 120°C for two hours and cool in a desiccator prior to use.

Dissolve 2.9049 g silver nitrate in distilled water. Transfer to a 1000 cm³ volumetric flask, make to the mark and mix. (1 cm³ AgNO₃ ≡ 1 mg NaCl)

Silver nitrate solution is sensitive to light and should be stored in an amber container.

4.2 Potassium chromate indicator solution (5%)

Potassium chromate (K₂CrO₄) is toxic and corrosive to the skin, eyes and respiratory tract. Work in a fume cupboard while wearing gloves and safety glasses.

Weigh 5.00 g of potassium chromate and dissolve in distilled water. Dilute to 100 cm³ in a volumetric flask.

4. Procedure

- Weigh 50.0 g of refined sugar into the 200 cm³ volumetric flask.
- Dissolve using distilled water and make to the mark.
- Pipette 20 cm³ of the sugar solution (aliquot) into an Erlenmeyer flask.
- Add 0.5 cm³ of the indicator.
- Titrate slowly with the silver nitrate solution from the burette, swirling the liquid constantly, until the endpoint is reached. The colour of solution changes from yellow to red-brown at the endpoint.
- Do a blank titration with the silver nitrate solution using 20 cm³ of distilled water and 0.5 cm³ of the indicator.

5. Calculations

$$\text{Mass of sugar in aliquot} = 5 \text{ g}$$

Since 1 cm³ titre is equivalent to 1 mg NaCl:

$$\text{Percentage chloride (NaCl)} = \frac{(\text{Titration} - \text{blank})}{5 \text{ g} \times 1000} \times 100$$

Express as percentage to two decimal places.

6. Example

$$\begin{aligned} \text{Titre} &= 25 \text{ cm}^3 \\ \text{Blank} &= 2 \text{ cm}^3 \end{aligned}$$

$$\begin{aligned} \text{Percentage chloride (NaCl)} &= \frac{(25 - 2) \text{ cm}^3}{5 \text{ g} \times 1000} \times 100 \\ &= 0.46\% \end{aligned}$$

7. References

Hulett's Refinery (1996). Chloride determination. *Hulett's Refinery Test Methods*, Section 6.11.

Jeffery GH, Bassett J, Mendham J and Denney RC (1989). *Vogel's Textbook of Quantitative Chemical Analysis*. 5th Edition, Longman Scientific and Technical, Harlow, 349 - 350.