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Potassium Chloride in Sodium Chloride Injection

DEFINITION

Potassium Chloride in Sodium Chloride Injection is a sterile solution of Potassium Chloride and Sodium Chloride in Water for Injection. It contains NLT 95.0% and NMT 110.0% of the labeled amounts of potassium (K) and chloride (Cl) and NLT 95.0% and NMT 105.0% of the labeled amount of sodium (Na). It contains no antimicrobial agents.

IDENTIFICATION

- **A. Sodium:** The sample imparts an intense yellow color to a nonluminous flame.
- **B.**

Analysis: To 2 mL of Injection add 5 mL of sodium cobaltinitrite TS.

Acceptance criteria: A yellow precipitate is formed immediately. If necessary, centrifuge the solution and examine the precipitate (presence of potassium).

- **C. Identification Tests—General ⟨191⟩, *Chloride*:** Meets the requirements

ASSAY

- **Potassium and Sodium**

Internal standard solution: 1.04 mg/mL of lithium nitrate in water prepared as follows. Transfer 1.04 g of lithium nitrate to a 1000-mL volumetric flask, add a suitable nonionic surfactant, and dilute with water to volume.

Potassium stock solution: 74.56 mg/mL of potassium chloride (equivalent to 1 mEq/mL of potassium) prepared as follows. Transfer 18.64 g of potassium chloride, previously dried at 105° for 2 h, to a 250-mL volumetric flask. Dilute with water to volume.

Sodium stock solution: 58.44 mg/mL of sodium chloride (equivalent to 1 mEq/mL of sodium) prepared as follows. Transfer 14.61 g of sodium chloride, previously dried at 105° for 2 h, to a 250-mL volumetric flask. Dilute with water to volume.

Standard stock solution: 0.0391*J* mg/mL of potassium (K) from the *Potassium stock solution* and 0.02299*J′* mg/mL of sodium (Na) from the *Sodium stock solution* prepared as follows. Transfer 0.1*J* mL of *Potassium stock solution* and 0.1*J′* mL of *Sodium stock solution* to a 100-mL volumetric flask, where *J* and *J′* are the labeled amounts (in mEq/L) of potassium and sodium, respectively, in the Injection. Dilute with water to volume.

Standard solution: Transfer 5.0 mL of the *Standard stock solution* to a 500-mL volumetric flask, and dilute with the *Internal standard solution* to volume.

Sample solution: Transfer 5.0 mL of Injection to a 500-mL volumetric flask, and dilute with the *Internal standard solution* to volume.

Instrumental conditions

Mode: Flame photometer

Analytical wavelengths

Potassium: 766 nm

Sodium: 589 nm

Lithium: 671 nm

Blank: *Internal standard solution*

Analysis

Samples: *Standard solution*, *Sample solution*, and *Blank*

Use the *Blank* to zero the instrument. Concomitantly determine the flame emission readings for the *Standard solution* and the *Sample solution*.

Calculate the percentage of the labeled amount of potassium (K) in the portion of Injection taken:

$$\text{Result} = (R_U/R_S) \times (C_S/C_U) \times 100$$

R_U = emission reading ratio of potassium to lithium from the *Sample solution*

R_S = emission reading ratio of potassium to lithium from the *Standard solution*

C_S = concentration of potassium (K) in the *Standard solution* (mg/mL)

C_U = nominal concentration of potassium (K) in the *Sample solution* (mg/mL)

[Note—Each mg of potassium is equivalent to 0.02558 mEq of potassium.]

Calculate the percentage of the labeled amount of sodium (Na) in the portion of Injection taken:

$$\text{Result} = (R_U/R_S) \times (C_S/C_U) \times 100$$

R_U = emission reading ratio of sodium to lithium from the *Sample solution*

R_S = emission reading ratio of sodium to lithium from the *Standard solution*

C_S = concentration of sodium (Na) in the *Standard solution* (mg/mL)

C_U = nominal concentration of sodium (Na) in the *Sample solution* (mg/mL)

[Note—Each mg of sodium is equivalent to 0.04350 mEq of sodium.]

Acceptance criteria

Potassium: 95.0%–110.0%

Sodium: 95.0%–105.0%

- **Chloride**

Sample solution: Transfer a volume of Injection, equivalent to 55 mg of chloride, to a suitable conical flask. Add 10 mL of glacial acetic acid, 75 mL of methanol, and 3 drops of eosin Y TS.

Titrimetric system

Mode: Direct titration

Titrant: 0.1 N silver nitrate VS

Endpoint detection: Visual

Analysis

Sample: *Sample solution*

Titrate, with shaking, with *Titrant* to a pink endpoint.

Calculate the percentage of the labeled amount of chloride (Cl) in the portion of Injection taken:

$$\text{Result} = V \times N \times (F/W) \times 100$$

V = *Titrant* volume consumed by the *Sample solution* (mL)

N = actual normality of the *Titrant* (mEq/mL)

F = equivalency factor, 35.45 mg/mEq

W = nominal amount of chloride in the *Sample solution* (mg)

[Note—Each mg of chloride is equivalent to 0.0282 mEq of chloride (Cl).]

Acceptance criteria: 95.0%–110.0%

SPECIFIC TESTS

- **Bacterial Endotoxins Test ⟨85⟩:** NMT 0.5 USP Endotoxin Units/mL
- **pH ⟨791⟩:** 3.5–6.5
- **Other Requirements:** It meets the requirements under *Injections and Implanted Drug Products ⟨1⟩*.

ADDITIONAL REQUIREMENTS

- **Packaging and Storage:** Preserve in single-dose containers, preferably of Type I or Type II glass, or of a suitable plastic.
- **Labeling:** The label states the potassium, sodium, and chloride contents in terms of mEq in a given volume. The label also states the total osmolar concentration in mOsmol/L. Where the contents are less than 100 mL, the label alternatively may state the total osmolar concentration in mOsmol/mL.

Topic/Question	Contact	Expert Committee
POTASSIUM CHLORIDE IN SODIUM CHLORIDE INJECTION	Documentary Standards Support	SM52020 Small Molecules 5
REFERENCE STANDARD SUPPORT	RS Technical Services RSTECH@usp.org	SM52020 Small Molecules 5

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