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Lithium Hydroxide

$LiOH \cdot H_2O$ 41.96
LiOH 23.95

Lithium hydroxide monohydrate CAS RN®: 1310-66-3; UNII: G51XLP968G.
Anhydrous CAS RN®: 1310-65-2; UNII: 903YL31JAS.

DEFINITION

Lithium Hydroxide contains NLT 98.0% and NMT 102.0% of lithium hydroxide (LiOH), calculated on the anhydrous basis.

[Caution—Exercise great care in handling Lithium Hydroxide, as it rapidly destroys tissues.]

IDENTIFICATION

Change to read:

• **A.▲** The retention time of the lithium peak of the *Sample solution* corresponds to that of the lithium peak of the *Standard solution*, as obtained in the *Assay*.▲ (USP 1-Aug-2020)

Add the following:

▲• B.

Analysis: Add a drop of phenolphthalein TS to a 10-mg/mL solution of Lithium Hydroxide in water.

Acceptance criteria: The solution turns pink immediately.▲ (USP 1-Aug-2020)

ASSAY

Change to read:

• **Procedure**

▲Polymeric containers, such as containers made of polymethylpentene (PMP), are used in the preparation of the *Standard solution* and *Sample solution*. Use water with a resistivity of NLT 18 megohm-cm to prepare the solutions.

Mobile phase: 35 mM methanesulfonic acid in water. [Note—It is recommended to use a suitable cation trapping technique to ensure that the *Mobile phase* is sufficiently free of cationic impurities.]

Diluent: 0.01 N hydrochloric acid

Standard solution: 100 µg/mL of USP Lithium Carbonate RS (equivalent to 64.8 µg/mL of lithium hydroxide anhydrous) in *Diluent*

Sample solution: 64 µg/mL of Lithium Hydroxide in *Diluent*

Chromatographic system

(See *Chromatography ⟨621⟩, System Suitability*.)

Mode: LC

Detector: Conductivity with suppression

Columns

Guard: 5-mm × 5-cm; 5.5-µm packing L84

Analytical: 5-mm × 25-cm; 5.5-µm packing L84

Column temperature: 50°

Flow rate: 1 mL/min

Injection volume: 10 µL

Run time: NLT 5 times the retention time of lithium

System suitability

Sample: *Standard solution*

Suitability requirements

Tailing factor: NMT 1.2

Relative standard deviation: NMT 1.5%

Analysis

Samples: *Standard solution* and *Sample solution*

Calculate the percentage of lithium hydroxide (LiOH) in the portion of Lithium Hydroxide taken:

$$\text{Result} = (r_U/r_S) \times (C_S/C_U) \times (M_{r1}/M_{r2}) \times N \times 100$$

r_U = peak response of lithium from the *Sample solution*

r_S = peak response of lithium from the *Standard solution*

C_S = concentration of USP Lithium Carbonate RS in the *Standard solution* (µg/mL)

C_U = concentration of Lithium Hydroxide in the *Sample solution* (µg/mL)

M_{r1} = molecular weight of lithium hydroxide, 23.95

M_{r2} = molecular weight of lithium carbonate, 73.89

N = number of lithium ions per mole of lithium carbonate, 2▲ (USP 1-Aug-2020)

Acceptance criteria: 98.0%–102.0% on the anhydrous basis

IMPURITIES

• **Chloride and Sulfate ⟨221⟩, *Sulfate***

Sample: 2.0 g

Acceptance criteria: It shows no more sulfate than corresponds to 1.0 mL of 0.020 N sulfuric acid (0.05%).

Change to read:

• **Calcium**

▲**Mobile phase, Diluent,** and **Chromatographic system:** Proceed as directed in the *Assay*.

System suitability solution: 0.1 µg/mL of magnesium ions and 0.15 µg/mL of calcium ions (from commercially available NIST-traceable ion chromatography magnesium and calcium ion standard solutions) in *Diluent*

Standard solution: 0.15 µg/mL of calcium ions (from a commercially available NIST-traceable ion chromatography calcium ion standard solution) in *Diluent*

Sample solution: 75 µg/mL of Lithium Hydroxide in *Diluent*

System suitability

Samples: *System suitability solution* and *Standard solution*

[Note—The relative retention times for magnesium and calcium are 0.8 and 1.0, respectively.]

Suitability requirements

Resolution: NLT 4.0 between magnesium and calcium ions, *System suitability solution*

Tailing factor: NMT 1.5 for calcium ions, *Standard solution*

Relative standard deviation: NMT 5.0% for calcium ions, *Standard solution*

Analysis

Samples: *Standard solution* and *Sample solution*

Calculate the percentage of calcium in the portion of Lithium Hydroxide taken:

$$\text{Result} = (r_U/r_S) \times (C_S/C_U) \times 100$$

r_U = peak response of calcium from the *Sample solution*

r_S = peak response of calcium from the *Standard solution*

C_S = concentration of calcium in the *Standard solution* (µg/mL)

C_U = concentration of Lithium Hydroxide in the *Sample solution* (µg/mL)

Acceptance criteria: NMT 0.20% of calcium▲ (USP 1-Aug-2020)

Delete the following:

▲• **Carbonate**

[Note—While pipeting and during the subsequent titrations, keep the contents of the flasks blanketed with a stream of carbon dioxide-free air.]

Analysis: To the flask containing the completed *Final titration* obtained in the *Assay*, add 1 drop of methyl orange TS. Titrate with 0.1 N hydrochloric acid VS until a persistent orange color is produced and no undissolved barium carbonate remains. Perform a blank titration to determine the volume of 0.1 N hydrochloric acid consumed in going from the phenolphthalein endpoint to the methyl orange endpoint. To 100 mL of carbon dioxide-free water in a 250-mL conical flask, add 3 drops of the *Sample solution* from the *Assay*, 20 mL of 1 N barium chloride, and 3 drops of phenolphthalein TS. Allow to stand for 2 min. Titrate this solution with 0.1 N hydrochloric acid. At the discharge of the pink color of the indicator, add 1 drop of methyl orange TS, and titrate with 0.1 N hydrochloric acid VS until a persistent orange color is produced.

Acceptance criteria: The titration shows no more carbon dioxide than corresponds to 1.5 mL of 0.10 N hydrochloric acid (0.7%).▲ (USP 1-Aug-2020)

SPECIFIC TESTS

Delete the following:

▲• **Lithium Content**

Standard stock solution: 0.3 mg/mL of USP Lithium Carbonate RS prepared as follows. Dissolve first in water using 20% final volume and hydrochloric acid using 0.5% of final volume. Dilute with water to volume.

Standard solution: 6.0 µg/mL of USP Lithium Carbonate RS from the *Standard stock solution* prepared as follows. Pipet a volume of the *Standard stock solution* into a suitable volumetric flask, add water to fill 80% of final volume, and a suitable surfactant solution to fill 2% of final volume. Dilute with water to volume. Measure the pH.

Sample stock solution: 0.4 mg/mL of Lithium Hydroxide in water

Sample solution: Pipet 20 mL of the *Sample stock solution* into a 1000-mL volumetric flask. Add 950 mL of water, 2 mL of 1 N hydrochloric acid, and 20 mL of a surfactant solution, and mix. Adjust with 1 N hydrochloric acid or 1 N sodium hydroxide to the same pH (±0.1 pH unit) as that of the *Standard solution*, and dilute with water to volume.

Instrumental conditions

Mode: Flame photometry

Analytical wavelength: 671 nm. Adjust the instrument with the surfactant solution.

Analysis

Samples: *Standard solution* and *Sample solution*

Calculate the percentage of lithium (Li) in the portion of Lithium Hydroxide taken:

$$\text{Result} = (r_U/r_S) \times (C_S/C_U) \times (A_r/M_r) \times F \times 100$$

r_U = photometric reading of the *Sample solution*

r_S = photometric reading of the *Standard solution*

C_S = concentration of USP Lithium Carbonate RS in the *Standard solution* (mg/mL)

C_U = concentration of Lithium Hydroxide in the *Sample solution* (mg/mL)

A_r = atomic weight of lithium, 6.94

M_r = molecular weight of lithium carbonate, 73.89

F = number of lithium ions per mole of lithium carbonate, 2

Acceptance criteria: 28.1%–29.9% on the anhydrous basis▲ (USP 1-Aug-2020)

Change to read:

• **Water Determination** ⟨921⟩, *Method III*

Analysis: Dry at 135° at a pressure of NMT 5 mm of mercury for 1 h.

Acceptance criteria: 41.0%–43.5% ▲for the monohydrate form▲ (USP 1-Aug-2020)

ADDITIONAL REQUIREMENTS

• **Packaging and Storage:** Preserve in tight containers.

• **USP Reference Standards** ⟨11⟩

USP Lithium Carbonate RS

Auxiliary Information - Please check for your question in the FAQs before contacting USP.

Topic/Question	Contact	Expert Committee
LITHIUM HYDROXIDE	Documentary Standards Support	SM42020 Small Molecules 4
REFERENCE STANDARD SUPPORT	RS Technical Services RSTECH@usp.org	SM42020 Small Molecules 4

Chromatographic Database Information: Chromatographic Database

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