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NATIONAL STANDARD OF THE
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ICS 77.120.99

CCS H 14

GB/T 11064.16-2023

Replacing GB/T 11064.16-2013

**Methods for chemical analysis of lithium carbonate, lithium
hydroxide monohydrate and lithium chloride - Part 16:
Determination of calcium, magnesium, copper, lead, zinc,
nickel, manganese, cadmium, aluminum, iron and sulfate
contents - Inductively coupled plasma atomic emission
spectrometry**

碳酸锂、单水氢氧化锂、氯化锂化学分析方法

第 16 部分: 钙、镁、铜、铅、锌、镍、锰、镉、铝、铁、硫酸根含
量的测定 电感耦合等离子体原子发射光谱法

Issued on: August 06, 2023

Implemented on: March 01, 2024

Issued by: State Administration for Market Regulation;

Standardization Administration of the People's Republic of China.

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Methods for chemical analysis of lithium carbonate, lithium hydroxide monohydrate and lithium chloride - Part 16: Determination of calcium, magnesium, copper, lead, zinc, nickel, manganese, cadmium, aluminum, iron and sulfate contents - Inductively coupled plasma atomic emission spectrometry

1 Scope

This document describes methods for the determination of calcium, magnesium, copper, lead, zinc, nickel, manganese, cadmium, aluminum, iron, and sulfate content in lithium carbonate, lithium hydroxide monohydrate, and lithium chloride.

This document is applicable to the determination of calcium, magnesium, copper, lead, zinc, nickel, manganese, cadmium, aluminum, iron, and sulfate content in lithium carbonate, lithium hydroxide monohydrate, and lithium chloride. The measurement range of each element is shown in Table 1.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

GB/T 6682, *Water for analytical laboratory use -- Specification and test methods*

GB/T 8170, *Rules of rounding off for numerical values and expression and judgement of limiting values*

GB/T 17433, *Foundation terms for chemical analysis of metallurgical products*

3 Terms and definitions

For the purposes of this document, the terms and definitions defined in GB/T 17433 apply.

4 Principle

Lithium carbonate and lithium hydroxide monohydrate are decomposed with nitric acid. Lithium chloride is dissolved in water. In nitric acid medium, the matrix matching standard curve method is used to determine the contents of calcium, magnesium, copper, lead, zinc, nickel, manganese, cadmium, aluminum, iron, and sulfate on an inductively coupled plasma atomic emission spectrometer.

5 Reagents or materials

Unless otherwise stated, only reagents confirmed to be of guaranteed reagents are used in the analysis.

5.1 Water, GB/T 6682, grade 2.

5.2 High purity lithium carbonate (mass fraction is greater than 99.99%, Fe, Cu, Pb, Zn, Ni, Ca, Mg, Mn, Cd, Al, SO_4^{2-} are all less than 0.0001%).

5.3 Nitric acid (1+1).

5.4 Calcium standard storage solution: Weigh 0.2497 g of spectrally pure calcium carbonate into a 200 mL beaker. Then add 20.00 mL of nitric acid (5.3) and dissolve at low temperature until clear. Cool down. Transfer to a 100 mL volumetric flask. Use water to set the volume constant. Shake well. 1 mL of this solution contains 1.0 mg of calcium.

5.5 Magnesium standard storage solution: Weigh 0.1658 g of magnesium oxide [w (MgO) $\geq$ 99.99%] that has been pre-burned at 800°C for 2 h and cooled to room temperature in a desiccator into a 200 mL beaker. Add 20.00 mL of nitric acid (5.3). Dissolve at low temperature until clear and cool. Transfer to a 100 mL volumetric flask. Use water to set the volume constant. Shake well. 1 mL of this solution contains 1.0 mg of magnesium.

5.6 Copper standard storage solution: Weigh 0.100 g of pure metallic copper (spectrally

pure, clean surface oxide before use) into a 200 mL beaker. Add 20.00 mL nitric acid (5.3). Dissolve at low temperature until clear. Cool down. Transfer to a 100 mL volumetric flask. Use water to set the volume constant. Shake well. 1 mL of this solution contains 1.0 mg of copper.

5.7 Lead standard storage solution: Weigh 0.1077 g of spectrally pure lead dioxide into a 200 mL beaker. Add 20.00 mL of nitric acid (5.3). Dissolve at low temperature until clear. Cool down. Transfer to a 100 mL volumetric flask. Use water to set the volume constant. Shake well. 1 mL of this solution contains 1.0 mg of lead.

5.8 Zinc standard storage solution: Weigh 0.1000 g of pure metallic zinc (spectrally pure, clean surface oxide before use) into a 200 mL beaker. Add 20.00 mL of nitric acid (5.3). Dissolve at low temperature until clear. Cool down. Transfer to a 100 mL volumetric flask. Use water to set the volume constant. Shake well. 1 mL of this solution contains 1.0 mg of zinc.

5.9 Nickel standard storage solution: Weigh 0.100 g of pure metallic nickel (spectrally pure, clean surface oxide before use) into a 200 mL beaker. Add another 20.00 mL of nitric acid (5.3). Dissolve at low temperature until clear. Cool down. Transfer to a 100 mL volumetric flask. Use water to set the volume constant. Shake well. 1 mL of this solution contains 1.0 mg of nickel.

5.10 Manganese standard storage solution: Weigh 0.100 g of pure metallic manganese (spectrally pure, clean surface oxide before use) into a 200 mL beaker. Add 20.00 mL of nitric acid (5.3). Dissolve at low temperature until clear. Cool down. Transfer to a 100 mL volumetric flask. Use water to set the volume constant. Shake well. 1 mL of this solution contains 1.0 mg of manganese.

5.11 Cadmium standard storage solution: Weigh 0.100 g of pure metal cadmium (spectrally pure, clean surface oxide before use) into a 200 mL beaker. Add 20.00 mL of nitric acid (5.3). Dissolve at low temperature until clear. Cool down. Transfer to a 100 mL volumetric flask. Use water to set the volume constant. Shake well. 1 mL of this solution contains 1.0 mg of cadmium.

5.12 Aluminum standard storage solution: Weigh 0.100 g of pure metallic aluminum (spectrally pure, clean surface oxide before use) into a 200 mL beaker. Add 20.00 mL of nitric acid (5.3). Dissolve at low temperature until clear. Cool down. Transfer to a 100 mL volumetric flask. Use water to set the volume constant. Shake well. 1 mL of this solution contains 1.0 mg of aluminum.

5.13 Iron standard storage solution: Weigh 0.100 g of pure metal wire (spectrally pure, clean surface oxide before use) into a 200 mL beaker. Add 20.00 mL of nitric acid (5.3). Dissolve in water bath until clear. Cool down. Transfer to a 100 mL volumetric flask. Use water to set the volume constant. Shake well. 1 mL of this solution contains 1.0 mg of iron.

5.14 Sulfate standard storage solution: Weigh 0.5446 g of potassium sulfate (mass

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