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**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB/T 20931.12-2025

**Methods for the chemical analysis of lithium - Part 12:
Determination of impurity element content - Inductively coupled
plasma atomic emission spectrometry**

锂化学分析方法 第12部分：杂质元素含量的测定 电感耦合等离子体原子发射光谱法

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Table of Contents

3 Introduction...	5
1 Scope...	7
2 Normative References...	7
3 Terms and Definitions...	8
4 Principle...	8
5 Reagents or Materials...	8
6 Instruments and Equipment...	8
7 Samples...	9
8 Test Procedures...	9
9 Test Data Processing...	10
10 Precision...	11
14 Appendix B (Informative) Statistical Data Obtained from Laboratory Results...	15

Foreword

This Document was drafted as per the rules specified in GB/T 1.1-2020 Directives for Standardization - Part

1.Rules for the Structure and Drafting of Standardizing Documents. This Document is Part 12 of GB/T 20931 Methods for Chemical Analysis of Lithium. GB/T 20931 has published the following parts.

- Determination of potassium content - Flame atomic absorption spectrometric method;
- Determination of sodium content - Flame atomic absorption spectrometric method;
- Determination of calcium content - Flame atomic absorption spectrometric method;
- Determination of iron content - Orthopenanthroline spectrophotometric method;
- Determination of silicon content - Molybdenum blue spectrophotometric method;
- Determination of aluminum content - Chrome azurol S-cetylpyridinium bromide spectrophotometric method;
- Determination of nickel content - alpha-Furil dioxime spectrophotometric method;
- Determination of chlorine content - Thiocyanate spectrophotometric method;
- Determination of nitrogen content - Mercuric potassium iodide spectrophotometric

method;

--- Determination of copper content - Flame atomic absorption spectrometric method;

--- Determination of magnesium content - Flame atomic absorption spectrometric method;

12. Determination of impurity element contents - Inductively coupled plasma atomic emission spectrometry. Please note some contents of this Document may involve patents. The issuing agency of this Document shall not assume the responsibility to identify these patents. This Document was proposed by China Nonferrous Metals Industry Association. This Document shall be under the jurisdiction of National Technical Committee on Nonferrous Metals of Standardization Administration of China (SAC/TC 243). Drafting organizations of this Document. Jiangxi Ganfeng Lithium Group Co., Ltd.; Chongqing Tianqi Lithium Co., Ltd.; Xinjiang Nonferrous Metals Research Institute Co., Ltd.; Urumqi Asia-Europe Rare Metals Co., Ltd.; Agilent Technology (China) Co., Ltd.; Ganfeng Lithium Co., Ltd.; Guangdong Academy of Sciences Industrial Analysis and Testing Center; Guobiao Methods for Chemical Analysis of Lithium - Part 12. Determination of Impurity Element Contents - Inductively Coupled Plasma Atomic Emission Spectrometry

1 Scope

GB/T 20931.12-2025 specifies the determination of impurity elements in lithium by inductively coupled plasma atomic emission spectrometry. Lithium metal for battery use is bought on its impurities rather than on its lithium content, because sodium, potassium, calcium, iron, silicon, aluminium, magnesium, copper, nickel and chromium at parts per million each affect the cell in a different way, and a single multi-element method that covers all of them at once is worth more to a laboratory than a shelf of single-element ones. This part supplies it: the principle, the interferences and how they are corrected, the reagents and the preparation of the standard solutions, the apparatus and the recommended operating conditions and analytical lines, the dissolution of the sample, which for lithium metal is the difficult and dangerous step, the calibration, the measurement, the calculation of results, the precision and the limit of quantification for each element. For a lithium producer or a cell maker qualifying a supply in China, this is the method the certificate rests on.

This Document specifies the method for determining the content of impurity elements such as aluminum, calcium, copper, iron, potassium, magnesium, sodium, nickel, lead, and silicon in metallic lithium by inductively coupled plasma atomic emission spectrometry. This Document is applicable to the determination of the content of impurity elements such as aluminum, calcium, copper, iron, potassium, magnesium, sodium, nickel, lead, and silicon in industrial-grade metallic lithium and battery-grade metallic lithium. The determination range is shown in Table 1.

2 Normative References

The provisions in following documents become the essential provisions of this Document through reference in this Document. For the dated documents, only the versions with the dates indicated are applicable to this Document; for the undated documents, only the latest version (including all the amendments) is applicable to this Document.

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

GB/T 8170 Rules of rounding off for numerical values & expression and judgement of limiting values JJG 768 Verification Regulation of Emission Spectrometer

3 Terms and Definitions

For the purposes of this Document, there are no terms and definitions that need to be defined.

4 Principle

The test material is dissolved in water. In the hydrochloric acid medium, the matrix matching standard curve method is used to determine the content of impurity elements such as aluminum, calcium, copper, iron, potassium, magnesium, sodium, nickel, lead and silicon in metal lithium using the inductively coupled plasma atomic emission spectrometer.

5 Reagents or Materials

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

5.1 Water, GB/T 6682, Grade-1.

5.2 High-purity lithium carbonate (with mass fraction of no less than 99.999%).

5.3 Hydrochloric acid (1+1).

5.4 P-nitrophenol indicator (1 g/L).

5.5 Standard storage solution of aluminum, calcium, copper, iron, potassium, magnesium, sodium, nickel, lead, silicon (1,000 µg/mL). Standard storage solutions can be purchased with certified standard substances or standard samples.

5.6 Mixed standard solution A. Respectively transfer

10.00 mL of each standard storage solution (5.5) into a 200 mL volumetric flask; dilute it with water to the scale; and mix well. 1 mL of this solution contains 50.00 µg of each measured element. If the silicon standard storage solution is sodium hydroxide or other alkaline matrix, the silicon standard solution must be prepared separately.

5.7 Mixed standard solution B. Respectively transfer

2.00 mL of each standard storage solution (5.5) into a 200 mL volumetric flask; dilute it with water to the scale; and mix well. 1 mL of this solution contains 10.00 μg of each measured element. If the silicon standard storage solution is sodium hydroxide or other alkaline matrix, the silicon standard solution must be prepared separately.

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