



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

GB/T 42511-2023

**Hardmetals - Determination of calcium, copper, iron, potassium,
magnesium, manganese, sodium, nickel and zinc in cobalt metal
powders - Flame atomic absorption spectrometric method**

硬质合金 钴粉中钙、铜、铁、钾、镁、锰、钠、镍和锌含量的测定 火焰原子吸收光谱法

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Foreword

This document was issued on 23 May 2023 by the State Administration for Market Regulation; Standardization Administration of the PRC and takes effect on 1 December 2023.

It is a GB/T standard: recommended rather than compulsory, but it is the text a Chinese reviewer applies when assessing a submission.

1 Scope

GB/T 42511-2023 covers the determination of calcium, copper, iron, potassium, magnesium, manganese, sodium, nickel and zinc in cobalt metal powders by flame atomic absorption spectrometry. Cobalt powder is the binder phase of cemented carbide, and the nine elements listed here are not part of it: they come in with the raw material or with the process, and their level is one of the things a hardmetal maker fixes when buying powder. The document sets out the scope, the normative references it depends on, the reagents - nitric acid at a density of 1.42 grams per millilitre, diluted one plus one, among them - the test procedure, which starts from a one gram test piece weighed to 0.001 grams and its dissolution, the processing of the test data, and the test report. No terms need defining. Nine elements from one dissolution on one instrument is the point of the method: a flame spectrometer is ordinary laboratory equipment, so a supplier and a customer on opposite sides of a contract can both run the analysis without specialised facilities and then compare what they got. Written for cobalt powder producers, cemented carbide manufacturers and their incoming inspection laboratories.

This Document describes a method for the determination of calcium, copper, iron,

potassium,

magnesium, manganese, sodium, nickel and zinc in cobalt powders by flame atomic absorption

spectrometry.

This Document is applicable to the determination of calcium, copper, iron, potassium, magnesium, manganese, sodium, nickel and zinc content in cobalt powder. The determination

range (mass fraction) of copper, potassium, magnesium, manganese, sodium and zinc:

0.001%~0.01%; the determination range (mass fraction) of calcium: 0.002%~0.01%; and the

determination range (mass fraction) of iron and nickel :0.002%~0.05%.

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 3358.1-2009 Statistics - Vocabulary and symbols - Part 1: General statistical terms and terms used in probability (ISO 3534-1:2006, IDT)

3 Terms and Definitions

For the purposes of this Document, there are no terms and definitions apply.

4 Reagents

Unless otherwise stated, only reagents confirmed to be guaranteed reagents, double distilled

water or water of equivalent purity, are used in the analysis.

4.1 Nitric acid solution: nitric acid $\rho=1.42\text{g/mL}$, 1+1 dilution.

4.2 Hydrochloric acid solution: $\rho\sim 1.1\text{g/mL}$, hydrochloric acid $\rho=1.19\text{g/mL}$, 1+1 dilution.

4.3 Cesium chloride solution: 20g/L.

4.4 Calcium, copper, iron, potassium, magnesium, manganese, sodium, nickel and zinc standard

solutions: 1.000g/L, used for calibration of elements to be measured.

5 Test Procedures

5.1 Test piece

Weigh 1g of sample, accurate to 0.001g.

5.2 Dissolution of test piece

Add 20mL of nitric acid solution (4.1) and 10mL of hydrochloric acid solution (4.2), and heat slowly until the sample is completely dissolved.

5.3 Dilution

5.3.1 Add 5mL of cesium chloride solution (4.3) and dilute to 100mL to obtain a sample solution.

5.3.2 If there is insoluble matter, use 20 mL of water to filter the solution obtained in 5.2 through

a filter plugged with absorbent cotton into a 50 mL or 100 mL volumetric flask. According to the concentration of the element to be measured in the sample and the sensitivity of the photometer, dilute to a volume of 50mL or 100mL.

5.4 Preparation of standard solution and blank solution

5.4.1 Weigh at least 3 portions of the cobalt matrix material and process it according to 5.2. The

components of the used matrix material are as similar as possible to the test piece. Then according to the concentration range of the elements to be measured, add the appropriately

diluted calcium, copper, iron, potassium, magnesium, manganese, sodium, nickel and zinc standard solutions (4.4) in a gradient manner; dilute to 100mL; and mix well. The mass concentration of copper, potassium, magnesium, manganese, sodium, zinc and calcium series

standard solutions is 0.10mg/L~1.00mg/L. The mass concentration of iron and nickel series standard solutions is 0.20mg/L~5.00mg/L.

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