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**NONFERROUS METALS INDUSTRY STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

YS/T 1157.3-2016

**Methods for chemical analysis of crude cobalt hydroxide-Part 3: Determination of
calcium and magnesium contents-Flame atomic absorption spectrometry and
inductively coupled plasma atomic emission spectrometry**

粗氢氧化钴化学分析方法 第3部分：钙量和镁量的测定 火焰原子吸收光谱法和电
感耦合等离子体原子发射光谱法

(English Translation)

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Foreword

YS/T 1157 "crude cobalt hydroxide chemical analysis method" is divided into the following four parts.

--- Part 1. Determination of cobalt content potentiometric titration;

--- Part 2. Determination of nickel, copper, manganese, iron, lead, zinc, arsenic and cadmium; Inductively coupled plasma atomic emission spectrometry;

--- Part 3. Determination of calcium and magnesium content Flame atomic absorption spectrometry and inductively coupled plasma atomic emission spectrometry;

--- Part 4. Determination of manganese content Potentiometric titration.

This part of the YS/T 1157 Part 3.

This section drafted in accordance with GB/T 1.1-2009 given rules.

This part of the National Non-ferrous Metals Standardization Technical Committee (SAC/TC243) and focal point.

The main drafting unit of this section. Jinchuan Group Co., Ltd., Zhejiang Huayou Cobalt Co., Ltd..

This part of the method to participate in the drafting unit 1. Beijing Nonferrous Metal Research Institute, Hunan Nonferrous Metal Research Institute, Limited company.

1 Scope

YS/T 1157 provisions of this part of the crude cobalt hydroxide in the determination of calcium and magnesium content.

This section applies to the determination of the amount of crude cobalt hydroxide and magnesium in the amount of magnesium. Method 1 The measurement range is 0.10% ~

3.00% of calcium, Magnesium 0.10% ~ 2.50%; Method 2 determination range of calcium $\geq 3.00\%$ ~ 7.00%, magnesium $\geq 2.50\%$ ~ 10.00%.

2.1 Method summary

Sample with hydrochloric acid, nitric acid, hydrofluoric acid, perchloric acid decomposition. In dilute hydrochloric acid medium, the use of air - acetylene flame, atomic absorption spectrometer at wavelengths of 422.7 nm and 285.2 nm, the absorbances of calcium and magnesium were measured respectively, and the contents of calcium and magnesium were calculated according to the working curve method.

2.2 Reagents

Unless otherwise stated, only reagents identified as analytical grade were used in the analysis. The water used was either laboratory secondary water or water of comparable purity.

2.2.1

Nitric acid ($\rho = 1.42 \text{ g/mL}$).

2.2.2

Hydrochloric acid ($\rho = 1.19 \text{ g/mL}$).

2.2.3

Hydrofluoric acid ($\rho = 1.15 \text{ g/mL}$).

2.2.4

Perchloric acid ($\rho = 1.84 \text{ g/mL}$).

2.2.5

Hydrochloric acid (1:1).

2.2.6

lanthanum solution (40 g/L). Weigh 24.4g lanthanum oxide (La_2O_3) in 200mL beaker, add 50mL water, 20mL hydrochloric acid (2.2.2), heat until completely dissolved, remove and cool to room temperature. Move into 500mL volumetric flask, diluted with water to the mark, mix well.

2.2.7

Calcium standard storage solution Weigh 2.500g of calcium carbonate ($w_{\text{CaCO}_3} \geq 99.95\%$, pre-baked at 105°C for 1h, and placed in a desiccator Cooled to room temperature) in a 250mL beaker, add 30mL water, 20mL hydrochloric acid (2.2.5), heated to completely dissolve, boil to remove the oxidation Carbon, remove, cool to room temperature. Into a 1000mL volumetric flask, diluted with water to the mark, mix well. 1 mL

of this solution contains 1 mg of calcium.

2.2.8

Magnesium standard storage solution Weigh 0.1658g magnesia ($w_{\text{MgO}} \geq 99.95\%$, pre-fired at 800 °C to constant weight, placed in a dry Cooled to room temperature) in a 250mL beaker, add a small amount of water wetting, add 10mL hydrochloric acid (2.2.5) heated to dissolve completely, cooled and moved into 1000mL volumetric flask, diluted with water to the mark, mix well. This solution 1 mL contains 0.1 mg magnesium.

2.2.9

calcium standard solution Pipette 20.00mL calcium standard stock solution (2.2.7) in.200mL volumetric flask, add 10mL hydrochloric acid (2.2.5), diluted with water to the mark, mix well. 1 mL of this solution contains 100 µg of calcium.

2.2.10

Magnesium standard solution Pipette 20.00mL magnesium standard stock solution (2.2.8) in.200mL volumetric flask, add 10mL hydrochloric acid (2.2.5), diluted with water to the mark, mix well. 1 mL of this solution contains 10 µg of magnesium.

2.3 Instruments

Atomic Absorption Spectrometer equipped with Calcium Hollow Cathode Lamp, Magnesium Hollow Cathode Lamp; Air-Acetylene Premix Burner.