

ICS 77.120.30

CCS H 13

YS

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

YS/T 1158.1-2016

**Methods for chemical analysis of copper-indium-gallium-selenide
target-Part 1: Determination of gallium, indium contents-Inductively
coupled plasma atomic emission spectrometry**

铜铟镓硒靶材化学分析方法 第1部分：镓量和铟量的测定 电感耦合等离子体原子
发射光谱法

(English Translation)

Issued on: July 11, 2016

Implemented on: January 1, 2017

Issued by: Ministry of Industry and Information Technology

Table of Contents

- Foreword
- 1 Scope
- 2 Method summary
- 3 Reagent

Foreword

YS/T 1158 "CIGS target chemical analysis method" is divided into the following three parts.

- Part 1. Determination of gallium content and indium content Inductively coupled plasma atomic emission spectrometry;
- Part 2. Determination of selenium content by weight method;
- Part 3. Determination of aluminum, iron, nickel, chromium, manganese, lead, zinc, cadmium, cobalt, molybdenum, barium, magnesium content Inductively coupled plasma mass spectrometry.

This part of YS/T 1158 Part 1.

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. Guangxi Zhuang Autonomous Region Metallurgical Product Quality Supervision and Inspection Station, Guangxi Zhuang Autonomous Region, Analysis and Testing Research center.

Participated in the drafting of this section. Liuzhou Centenary Advanced Materials Co., Ltd., Qingyuan Pilot Materials Co., Ltd., Guilin University of Technology, Guangzhou Nonferrous Metal Research Institute.

1 Scope

YS/T 1158 provisions of this part of the CIGS target gallium content and amount of indium determination.

This section applies to the determination of copper and indium gallium selenide target gallium content and indium content. The measurement range is 1.00% ~ 13.00% of gallium, 10.00% of indium ~ 30.00%.

All weighing results in this section are in grams (g) and accurate to 0.0001g.

2 Method summary

After the sample was nitric acid, hydrochloric acid dissolved, with yttrium as the internal standard solution, using inductively coupled plasma atomic emission spectrometry Determination of the sample solution the intensity of the characteristic spectrum of the element to be measured, the amount of gallium in the sample and the amount of indium were calculated by the internal standard curve method.

3 Reagent

Unless otherwise stated, only reagents that are identified as analytically pure and secondary water are used in the analysis.

3.1

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

3.2

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

3.3

Hydrochloric acid (2 1).

3.4

Nitric acid (2 1).

3.5

gallium standard stock solution Weigh 0.30g metal gallium ($w_{\text{Ga}} \geq 99.99\%$, W1) in 150mL beaker, add 10mL nitric acid (3.4), 5mL hydrochloric acid (3.3), covered with a watch glass, low temperature heating until completely dissolved, removed, cooled to room temperature, transferred to pre-weighed 100mL dry volumetric flask, the water diluted to the mark, weighing, the volume of the solution after the volume of W2, shake. This solution 1g contains $(W1/W2)$ g gallium.

3.6

indium standard storage solution Weigh 1.0g of indium metal ($w_{\text{In}} \geq 99.99\%$, W3) in a 150mL beaker, add 10mL of nitric acid (3.4), 5mL hydrochloric acid (3.1), covered with a watch glass, low temperature heating until completely dissolved, removed, cooled to room temperature, transferred to the pre-weighed 100mL dry volumetric flask, diluted with water to the mark, weighing, the volume of the solution after the volume of W4, shake. This solution 1g contains $(W3/W4)$ g indium.

3.7

gallium standard solution Weigh the gallium standard stock solution (3.5) 10.0g (W5) Weigh into a pre-weighed 100mL dry volumetric flask, add 5mL nitric acid (3.4), 2mL hydrochloric acid (3.3), diluted with water to the mark, weighing, the volume of the solution after the volume of W6, shake. This solution contains $1g (W5 \cdot W1)/(W6 \cdot W2)$ g gallium.

3.8

Indium standard solution Weigh in indium standard stock solution (3.6) 10.0g (W7) to the weighed 100mL dry volumetric flask, add 5mL nitric acid (3.4), 2mL hydrochloric acid (3.3), diluted with water to the mark, weighing, the volume of the solution after the volume of W8, shake. This solution contains $1g (W7 \cdot W3)/(W8 \cdot W4)$ g indium.

3.9

yttrium internal standard solution Weigh 1.2699g yttrium oxide ($w_{Y_2O_3} \geq 99.99\%$, after pre-burning at 1000 °C 1h, placed in a dry Cooled to room temperature), placed in 300mL beaker, added 30mL hydrochloric acid (3.3), heated to dissolve, removed to cool to room temperature, into 1000mL volumetric flask, diluted with water to the mark, shake. 1 mL of this solution contains 1 mg of yttrium.