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

YS/T 521.2-2009

**Methods for chemical analysis of blister copper. Part 2:
Determination of gold and silver contents. Fire assay method**

粗铜化学分析方法 第2部分：金和银量的测定 火试金法

(English Translation)

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Table of Contents

Foreword...	3
1 Scope...	5
2 Method summary...	5
3 Reagents...	5
4 Instruments and equipment...	6
5 Analytical procedure...	6
6 Calculation of analysis results...	9
7 Precision...	11
8 Quality assurance and control...	12

Foreword

YS/T 521-2009 Methods for chemical analysis of blister copper is divided into

6 parts.

- Part 1.Determination of copper content - Iodimetry
- Part 2.Determination of gold and silver contents - Fire assay method
- Part 3.Determination of arsenic content

Method 1 Hydride generation - atomic fluorescence spectrometric method

Method 2 Potassium bromate titration

- Part 4.Determination of lead, bismuth and antimony contents - Flame atomic absorption spectrometry

- Part 5.Determination of zinc and nickel contents - Flame atomic absorption spectrometry

- Part 6.Determination of arsenic, antimony, bismuth, lead, zinc and nickel contents - Inductively coupled plasma-atomic emission spectrometry

This Part is Part 2 of YS/T 521.

This Part replaces YS/T 521.3-2006 Methods for chemical analysis of blister copper - Determination of gold and silver contents (original GB/T 5120.3-1995). Compared with YS/T 521.3-2006, this Part has the following changes.

- The text format was modified;
- Precision as well as quality assurance and control provisions were supplemented.

This Part was proposed by and shall be under the jurisdiction of the National Technical Committee for Standardization of Nonferrous Metals.

Responsible drafting organization of this Part. Daye Nonferrous Metals Group Holdings Co., Ltd.

Participating drafting organizations of this Part. Beijing General Research Institute of Mining & Metallurgy, Jiangxi Copper Co., Ltd., and Jinchuan Group Ltd.

Methods for chemical analysis of blister copper -
Part 2.Determination of gold and silver contents -
Fire assay method

1 Scope

This Part of YS/T 521 specifies the method for determining gold and silver contents in blister copper.

This Part applies to the determination of gold and silver contents in blister copper. Determination range. gold mass fraction $\geq 0.5\text{g/t}$; silver mass fraction $\geq 20\text{g/t}$.

2 Method summary

The sample is dissolved in sulfuric acid. The gold and silver precipitates obtained after copper removal by filtration are ashed, compounded and melted to obtain an appropriate amount of lead buckle. The gold and silver contents are determined gravimetrically after the lead buckle is cupellated.

The correction method is carried out by adding pure copper as a matrix and adding pure gold and pure silver along with the sample for determination. It is corrected according to its recovery rate or corrected by the cupel and slag melting method.

3 Reagents

Unless otherwise stated, only analytically pure reagents and distilled or deionized water or water of comparable purity are used in the analysis.

3.2 Lead oxide. industrial pure, powdery (gold mass fraction $\leq 0.05\mu\text{g/g}$; silver mass fraction $\leq 5\mu\text{g/g}$).

4.5 Clay crucible. with a height of 120mm, an upper outer diameter of 90mm, and a lower outer diameter of 50mm.

4.6 Cupel. Ash cement cupel or magnesia cupel.

General specifications. with a height of 30mm, an upper inner diameter of 35mm, a lower outer diameter of 40mm, and a depth of 17mm or so.

5.3.1.3 TRANSFER all sediments to the filter paper. USE warm water to wash the sediments until there is no blue color. **PLACE** the glass rod and filter paper on the cup wall, together with the filter paper loaded with the sediments, in a clay crucible, and then **PLACE** it in an assay furnace. **RISE** from room temperature to about 500°C for ashing until ashing is completed.

5.3.2 Ingredients

COOL the clay crucible containing the ash compound to room temperature. ADD 20g of sodium carbonate (3.1), 60g of lead oxide (3.2), 7g of borax (3.3), 7g of silicon dioxide (3.5), and 3g of starch (3.4). STIR well, and COVER 10mm thick sodium chloride (3.6).

5.3.3 Melting

PLACE the prepared clay crucible in an assay furnace at 800°C. RISE temperature to 1,100°C within 30min to 40min, and INSULATE for 15min (total melting time is 45min to 55min) before discharging. POUR the melt into a preheated and oiled cast iron mold. After cooling, BEAT the lead buckle into a square shape. COLLECT the slag into the original clay crucible for later use (corrected by the method B).

5.3.4.1 PLACE the lead buckle in a cupel preheated in an assay furnace at

900°C for 20min, and CLOSE the furnace door. After the floating film on the surface of the lead liquid disappears (uncoating), slightly OPEN the furnace door to lower the furnace temperature to 840°C to 860°C for cupellation. The cupellation ends when the particles appear to flash. MOVE the cupel to the furnace door, and PLACE it in a cupel tray after slight cooling.

5.3.4.2 USE a small tweezers to remove the gold and silver particles from

the cupel. PLACE them in a porcelain crucible, and ADD 15mL of acetic acid (3.15). REMOVE when boiled to about 5mL on an electric hot plate. WASH with warm water three times, and DISCARD the cleansing solution. PLACE the gold and silver particles retained in the porcelain crucible on a high-temperature electric furnace to bake dry, REMOVE and WEIGH (accurate to 0.01mg) after cooling to room temperature. KEEP the cupel for later use (corrected by the method B).

5.3.5 Parting

PLACE the weighed gold and silver particles on a small steel anvil to beat into a sheet. PLACE it in a porcelain crucible. ADD about 5mL of hot nitric acid (3.12). PLACE it on a low-temperature heating plate for parting. When steaming to about 2mL, ADD about 5mL of hot nitric acid (3.11). STEAM to about 2mL, REMOVE, COOL, and WASH three times with hot water. PLACE