



JAPANESE  
INDUSTRIAL  
STANDARD

Translated and Published by  
Japanese Standards Association

---

---

JIS H 1069 : 2006

(JCBA/JSA)

## Methods for determination of cadmium in copper and copper alloys

---

ICS 77.120.30

Reference number : JIS H 1069 : 2006 (E)

PROTECTED BY COPYRIGHT

Date of Establishment: 1997-05-20

Date of Revision: 2006-09-20

Date of Public Notice in Official Gazette: 2006-09-20

Investigated by: Japanese Industrial Standards Committee  
Standards Board

Technical Committee on Non-Ferrous Metals

---

JIS H 1069:2006, First English edition published in 2007-03

Translated and published by: Japanese Standards Association  
4-1-24, Akasaka, Minato-ku, Tokyo, 107-8440 JAPAN

---

In the event of any doubts arising as to the contents,  
the original JIS is to be the final authority.

© JSA 2007

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from the publisher.

Printed in Japan

## Contents

|                                                                                                       | Page |
|-------------------------------------------------------------------------------------------------------|------|
| Introduction.....                                                                                     | 1    |
| 1 Scope .....                                                                                         | 1    |
| 2 Normative reference .....                                                                           | 1    |
| 3 General matters .....                                                                               | 1    |
| 4 Classification of determination methods .....                                                       | 1    |
| 5 Atomic absorption spectrometric method (bracketing calibration method).....                         | 2    |
| 5.1 Summary .....                                                                                     | 2    |
| 5.2 Reagents .....                                                                                    | 2    |
| 5.3 Amount of sample weighed out.....                                                                 | 2    |
| 5.4 Operation.....                                                                                    | 2    |
| 5.5 Calculation .....                                                                                 | 5    |
| 6 Atomic absorption spectrometric method (hydrochloric acid • nitric acid decomposition method) ..... | 6    |
| 6.1 Summary .....                                                                                     | 6    |
| 6.2 Reagents .....                                                                                    | 6    |
| 6.3 Amount of sample weighed out.....                                                                 | 8    |
| 6.4 Operation.....                                                                                    | 8    |
| 6.5 Blank test.....                                                                                   | 8    |
| 6.6 Preparation of working curve.....                                                                 | 8    |
| 6.7 Calculation .....                                                                                 | 9    |
| 7 Trioctylamine extraction atomic absorption spectrometric method .....                               | 9    |
| 7.1 Summary .....                                                                                     | 9    |
| 7.2 Reagents .....                                                                                    | 9    |
| 7.3 Test portion.....                                                                                 | 10   |
| 7.4 Procedure.....                                                                                    | 10   |
| 7.5 Blank test.....                                                                                   | 11   |

|                        |                                                                                |    |
|------------------------|--------------------------------------------------------------------------------|----|
| 7.6                    | Preparation of working curve .....                                             | 11 |
| 7.7                    | Calculation .....                                                              | 11 |
| 8                      | ICP atomic emission spectroscopy .....                                         | 11 |
| 8.1                    | Summary .....                                                                  | 11 |
| 8.2                    | Reagents .....                                                                 | 11 |
| 8.3                    | Amount of sample weighed out .....                                             | 12 |
| 8.4                    | Operation .....                                                                | 12 |
| 8.5                    | Blank test .....                                                               | 13 |
| 8.6                    | Preparation of working curve .....                                             | 13 |
| 8.7                    | Calculation .....                                                              | 13 |
| Annex JA (informative) | Comparison table between JIS and corresponding<br>International Standard ..... | 15 |

## Foreword

This translation has been made based on the original Japanese Industrial Standard revised by the Minister of Economy, Trade and Industry through deliberations at the Japanese Industrial Standards Committee as the result of proposal for revision of Japanese Industrial Standard submitted by Japan Copper and Brass Association (JCBA)/Japanese Standards Association (JSA) with the draft being attached, based on the provision of Article 12 Clause 1 of the Industrial Standardization Law applicable to the case of revision by the provision of Article 14.

Consequently **JIS H 1069**:1997 is replaced with this Standard.

This **JIS** document is protected by the Copyright Law.

Attention is drawn to the possibility that some parts of this Standard may conflict with a patent right, application for a patent after opening to the public, utility model right or application for registration of utility model after opening to the public which have technical properties. The relevant Minister and the Japanese Industrial Standards Committee are not responsible for identifying the patent right, application for a patent after opening to the public, utility model right or application for registration of utility model after opening to the public which have the said technical properties.

(Blank)

## Methods for determination of cadmium in copper and copper alloys

**Introduction** This Japanese Industrial Standard has been prepared by adopting the first edition of **ISO 5960** published in 1984 for clause **5** “Atomic absorption spectrometric method (bracket method)” without modifying the technical contents, adding, at the same time, the specifications unique to Japanese Industrial Standard in clauses **6**, **7** and **8**, namely, atomic absorption spectrometric method (hydrochloric acid · nitric acid decomposition method), trioctylamine extraction atomic absorption spectrometric method, and ICP atomic emission spectrometric method, respectively.

Except in clauses **6**, **7** and **8**, which involve test methods not given in the International Standard, the portions given sidelines or dotted underlines are the matters not stated in the corresponding International Standard. A list of modifications with explanations is given in Annex JA.

**1 Scope** This Standard specifies the methods for determination of cadmium in copper and copper alloys (wrought copper and copper alloy products, foundry copper unwrought products and copper casting).

**NOTE :** The International Standard corresponding to this Standard and the symbol which denotes the degree of correspondence are as follows:

ISO 5960 : 1984 *Copper alloys—Determination of cadmium content—Flame atomic absorption spectrometric method* (MOD)

The symbol (MOD), as defined in **ISO/IEC Guide 21**, indicates that the original International Standard has been modified.

**2 Normative reference** The following standard contains provisions which, through reference in this text, constitute provisions of this Standard. The most recent edition of the standard (including amendments) shown below shall be applied.

JIS H 1012 *General rules for chemical analysis of copper and copper alloys*

**3 General matters** The general matters common to analytical methods shall be in accordance with **JIS H 1012**.

**4 Classification of determination methods** The method for determination of cadmium shall be in accordance with either of the followings.

- a) **Atomic absorption spectrometric method (bracketing calibration method)**  
This method shall be applied to the sample with cadmium content of 0.000 5 % (mass percentage) or over up to and including 2.0 % (mass percentage).
- b) **Atomic absorption spectrometric method (hydrochloric acid · nitric acid decomposition method)** This method shall be applied to the sample with cadmium content of 0.000 5 % (mass percentage) or over up to and including 0.01 % (mass percentage).

- c) **Trioctylamine extraction atomic absorption spectrometric method** This method shall be applied to the sample with cadmium content of not less than 99.90 % (mass percentage) in copper content and 0.000 02 % (mass percentage) or over up to and including 0.000 3 % (mass percentage).
- d) **ICP atomic emission spectroscopy** This method shall be applied to the sample with cadmium content of 0.000 5 % (mass percentage) or over up to and including 0.01 % (mass percentage).

## 5 Atomic absorption spectrometric method (bracketing calibration method)

**5.1 Summary** After decomposing the sample by the mixed acid of nitric acid, hydrofluoric acid and boric acid, spray the solution into the air-acetylene flame of atomic absorption photometer and measure its absorbance.

**5.2 Reagents** The reagents shall be as follows.

- a) **Mixed acid** Mix 500 ml of nitric acid, 30 ml of hydrofluoric acid, 300 ml of boric acid solution (40 g/L) and 150 ml of water in a polyethylene beaker (2 L).
- b) **Copper**, of not less than 99.96 % (mass percentage) in copper content and not more than 0.000 05 % (mass percentage) in cadmium content.
- c) **Copper solution** Weigh out 20.0 g of copper [b)], transfer it to a polytetrafluoroethylene beaker (1 L) or polyethylene beaker (1 L), cover it with a polytetrafluoroethylene watch glass or polyethylene watch glass, add 800 ml of the mixed acid [a)] and decompose by heating gently. After cooling down to the ordinary temperature, wash the lower surface of watch glass and the inner wall of beaker with water, remove the watch glass, transfer the solution to a 1 000 ml volumetric flask and dilute it with water up to the marked line.
- d) **Cadmium standard solution A (Cd: 50 µg/ml)** Weigh out 1.000 g of cadmium [not less than 99.99 % (mass percentage)], transfer it to a beaker (200 ml), cover it with a watch glass, add 25 ml of nitric acid (1+1) and decompose it by heating gently. After cooling down to the ordinary temperature, wash the lower surface of watch glass and the inner wall of beaker with water, remove the watch glass, transfer the solution to a 1 000 ml volumetric flask by using water, dilute it with water up to the marked line and take it as the stock solution (Cd: 1 mg/ml). For each use, dilute only the needed amount of it precisely to 20 times with water and take it as the cadmium standard solution A.
- e) **Cadmium standard solution B (Cd: 5 µg/ml)** Before each use, dilute only the needed amount of the cadmium standard solution A [d)] precisely to 10 times and take it as the cadmium standard solution B.

**5.3 Amount of sample weighed out** The amount of sample weighed out shall be 1.00 g.

## 5.4 Operation

**5.4.1 Preparation of sample solution** The preparation of sample solution shall be carried out in accordance with the following procedures.