



JAPANESE
INDUSTRIAL
STANDARD

Translated and Published by
Japanese Standards Association

JIS H 8260 : 2007

(JTSS/JSA)

Powders for thermal spraying

ICS 25.220.20

Reference number : JIS H 8260 : 2007 (E)

PROTECTED BY COPYRIGHT

 **Documents**
Document Sharing Hub

14 S

H 8260 : 2007

Date of Establishment: 2007-12-20

Date of Public Notice in Official Gazette: 2007-12-20

Investigated by: Japanese Industrial Standards Committee

Standards Board

Technical Committee on Non-Ferrous Metals

JIS H 8260:2007, First English edition published in 2008-02

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 2008

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

PROTECTED BY COPYRIGHT

Contents

	Page
Introduction.....	1
1 Scope.....	1
2 Normative references	1
3 Terms and definitions	1
4 Types and chemical compositions	2
5 Analytical test for chemical compositions and measurement of physical properties	12
5.1 Test and measurement items of thermal spraying materials.....	12
5.2 Sampling	13
5.3 Analytical test for chemical compositions.....	13
5.4 Measurement of particle size	13
5.5 Measurement of particle shape	14
5.6 Measurement of apparent density	14
5.7 Measurement of flowability.....	14
5.8 Measurement of microstructure	14
5.9 Measurement and analysis of crystal structure	14
5.10 Measurement of fusion temperature	15
6 Designation method of thermal spraying material	15
7 Delivery condition	15
8 Test report	15
Annex A (informative) Relationship between particle shape (SEM image) and manufacturing method of powders for thermal spraying	16
Annex JA (informative) Comparison table between JIS and corresponding International Standard	20

Foreword

This translation has been made based on the original Japanese Industrial Standard established by the Minister of Economy, Trade and Industry, through deliberations at the Japanese Industrial Standards Committee as the result of proposal for establishment of Japanese Industrial Standard submitted by Japan Thermal Spraying Society (JTSS)/Japanese Standards Association (JSA) with a draft being attached, based on the provision of Article 12 Clause 1 of the Industrial Standardization Law.

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.

Powders for thermal spraying

Introduction

This Japanese Industrial Standard has been prepared based on the first edition of **ISO 14232** published in 2000 with some modifications of the technical contents involving the difference in values of the material elements in detail.

The portions given sidelines or dotted underlines are the matters in which the contents of the original International Standard have been modified. A list of modifications with explanations is given in Annex JA.

1 Scope

This Standard specifies the chemical compositions and physical properties of powders for thermal spraying (hereafter referred to as “thermal spraying material”).

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

ISO 14232:2000 *Thermal spraying—Powders—Composition and technical supply conditions* (MOD)

In addition, symbols which denote the degree of correspondence in the contents between the relevant International Standard and **JIS** are IDT (identical), MOD (modified), and NEQ (not equivalent) according to **ISO/IEC Guide 21**.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this Standard. The most recent editions of the standards (including amendments) indicated below shall be applied.

JIS H 8200 *Thermal spraying terms*

JIS Z 2500 *Powder metallurgy—Vocabulary*

JIS Z 2502 *Metallic powders—Determination of flowability by means of a calibrated funnel (Hall flowmeter)*

NOTE : Corresponding International Standard: ISO 4490 *Metallic powders—Determination of flow time by means of a calibrated funnel (Hall flowmeter)* (MOD)

JIS Z 2503 *Powders for powder metallurgical purposes—Sampling*

NOTE : Corresponding International Standard: ISO 3954 *Powders for powder metallurgical purposes—Sampling* (IDT)

JIS Z 2504 *Metallic powders—Determination of apparent density—Funnel method*

3 Terms and definitions

For the purposes of this Standard, the definitions given in **JIS Z 2503**, **JIS Z 2500** and **JIS H 8200** shall apply.

4 Types and chemical compositions

The types and chemical compositions of thermal spraying materials shall be as follows.

- a) **Metal powders** The types of metal powders shall be classified in accordance with table 1 according to the code number and abbreviated designation.

The chemical compositions of these metals shall be analyzed according to **5.3** and satisfy the values in table 1.

Table 1 Metal powders

Type		Chemical composition % (mass fraction)						
Code number	Abbreviated designation	Main constituent	O	C	N	H	Al	Co
1.1	Ti 99	Ti : 99 min.	0.3 max.	0.3 max.	0.3 max.	0.1 max.	—	—
1.2	Nb 99	Nb : 99 min.	0.3 max.	0.3 max.	0.3 max.	0.1 max.	—	—
1.3	Ta 99	Ta : 99 min.	0.3 max.	0.3 max.	0.3 max.	0.1 max.	—	—
1.4	Cr 98.5	Cr : 98.5 min.	0.8 max.	0.1 max.	0.1 max.	—	0.5 max.	—
1.5	Mo 99	Mo : 99 min.	0.3 max.	0.15 max.	0.1 max.	—	—	—
1.6	W 99	W : 99 min.	0.3 max.	0.15 max.	0.1 max.	—	—	0.3 max.
1.7	Ni 99.3	Ni : 99.3 min.	0.5 max.	0.1 max.	0.1 max.	—	—	—
1.8	Cu 99	Cu : 99 min.	—	—	—	—	—	—
1.9	Al 99	Al : 99 min.	0.5 max.	—	—	—	—	—
1.10	Si 99	Si : 99 min.	—	—	—	—	—	—

- b) **Various alloy powders** The types of various alloy powders and composite powders thereof shall be classified in accordance with table 2 to table 10 according to the code number and abbreviated designation.

The chemical compositions of these powders shall be analyzed according to **5.3** and satisfy the values in table 2 to table 10.

Table 2 Self-fluxing alloy powders and composite powders thereof

Type		Chemical composition % (mass fraction)										
Code number	Abbreviated designation	C	Ni	Co	Cr	Cu	W	Mo	Fe	B	Si	Others
2.1	NiCuBSi 76 20	0.05 max.	Balance	—	—	19 to 20	—	—	0.5 max.	0.9 to 1.3	1.8 to 2.0	0.5 max.
2.1A	NiCuBSi 76 20A	0.25 max.	Balance	1 max.	10 max.	18 to 21	—	—	4 max.	0.8 to 2.5	1.5 to 4.0	—
2.2	NiBSi 96	0.05 max.	Balance	—	—	—	—	—	0.5 max.	1.0 to 1.5	2.0 to 2.5	0.5 max.
2.3	NiBSi 94	0.1 max.	Balance	—	—	—	—	—	0.5 max.	1.5 to 2.0	2.8 to 3.7	0.5 max.
2.4	NiBSi 95	0.1 to 0.2	Balance	—	—	—	—	—	2.0 max.	1.2 to 1.7	2.2 to 2.8	0.5 max.
2.5	NiCrBSi 90 4	0.1 to 0.2	Balance	—	3 to 5	—	—	—	1.0 max.	1.4 to 1.8	2.8 to 3.5	0.5 max.
2.6	NiCrBSi 86 5	0.15 to 0.25	Balance	—	4 to 6	—	—	—	3.0 to 3.5	0.8 to 1.2	2.8 to 3.2	0.5 max.
2.7	NiCrBSi 88 5	0.15 to 0.25	Balance	—	4 to 6	—	—	—	1.0 to 2.0	1.0 to 1.5	3.5 to 4.0	0.5 max.
2.7A	NiCrBSi 86 5A	0.25 max.	Balance	1 max.	10 max.	4 max.	—	—	4 max.	0.8 to 2.5	1.5 to 4.0	—
2.8	NiCrBSi 83 10	0.15 to 0.25	Balance	—	8 to 12	—	—	—	1.5 to 3.5	2.0 to 2.5	2.3 to 2.8	0.5 max.
2.9	NiCrBSi 85 8	0.15 to 0.25	Balance	—	6 to 10	—	—	—	1.5 to 2.0	1.5 to 2.0	2.6 to 3.4	0.5 max.
2.10	NiCrBSi 84 8	0.25 to 0.4	Balance	—	7 to 10	—	—	—	1.7 to 2.5	1.5 to 2.2	3.2 to 4.0	0.5 max.
2.11	NiCrBSi 88 4	0.3 to 0.4	Balance	—	3.5 to 4.5	—	—	—	2.0 max.	1.6 to 2.0	3.0 to 3.5	0.5 max.
2.11A	NiCrBSi 84 8A	0.5 max.	Balance	1 max.	3.5 to 12	—	—	—	4 max.	1.5 to 2.5	2.0 to 4.0	—
2.12	NiCrBSi 80 11	0.35 to 0.6	Balance	—	10 to 12	—	—	—	2.5 to 3.5	2.0 to 2.5	3.5 to 4.0	0.6 max.
2.12A	NiCrBSi 79 12A	0.35 to 0.7	Balance	1 max.	10 to 15	—	—	—	5 max.	2.0 to 3.0	3.0 to 4.5	—
2.13	NiCrWBSi 64 11 16	0.5 to 0.6	Balance	—	10 to 12	—	15.5 to 16.5	—	3.5 to 4.0	2.3 to 2.7	3.0 to 3.5	0.5 max.
2.13A	NiCrWBSi 63 12 16A	0.4 to 0.7	Balance	1 max.	10 to 15	—	15.0 to 17.0	—	5 max.	2.0 to 3.0	3.0 to 4.5	—
2.14	NiCrCuMoBSi 67 17 3 3	0.5 to 0.7	Balance	—	16 to 17	2.0 to 3.5	—	2.0 to 3.0	2.5 to 3.5	3.4 to 4.0	4.0 to 4.5	0.5 max.
2.14A	NiCrCuMoBSi 69 15 3 3A	0.4 to 0.9	Balance	1 max.	12 to 17	4 max.	—	4 max.	5 max.	2.5 to 4.0	3.5 to 5.0	—
2.15 a)	NiCrCuMoWBSi 64 17 3 3 3	0.4 to 0.6	Balance	—	16 to 17	2.0 to 3.5	2.0 to 3.0	2.0 to 3.0	3.0 to 5.0	3.5 to 4.0	4.0 to 4.5	0.5 max.
2.15A	NiCrCuMoWBSi 66 15 3 3 3A	0.4 to 0.9	Balance	1 max.	12 to 17	4 max.	2.0 to 3.0	4 max.	5 max.	2.5 to 4.0	3.5 to 5.0	—
2.16	NiCrBSi 74 17	0.75 to 1.0	Balance	—	16 to 17	—	—	—	3.5 to 5.0	2.8 to 3.5	3.6 to 4.5	0.5 max.
2.17	NiCrBSi 65 25	0.8 to 1.0	Balance	—	24 to 26	—	—	—	0.2 to 1.0	3.2 to 3.6	4.0 to 4.5	0.5 max.
2.17A	NiCrBSi 70 20A	0.5 to 1.1	Balance	1 max.	15 to 26	—	—	—	5 max.	3.0 to 4.5	2.0 to 5.0	—

Table 2 (concluded)

Type		Chemical composition % (mass fraction)										
Code number	Abbreviated designation	C	Ni	Co	Cr	Cu	W	Mo	Fe	B	Si	Others
2.18	NiCrBSi 74 14	0.05 max.	Balance	—	13 to 15	—	—	—	4.0 to 5.0	2.75 to 3.5	4.0 to 5.0	0.5 max.
2.18A	NiCrBSi 74 14A	0.06 max.	Balance	—	13 to 15	—	—	—	4.0 to 5.0	2.7 to 3.5	4.0 to 5.0	—
2.19	NiCrBSi 82 7	0.06 max.	Balance	—	6.5 to 8.5	—	—	—	2.5 to 3.5	2.5 to 3.5	4.1 to 4.6	0.5 max.
2.19A	NiCrBSi 82 7A	0.06 max.	Balance	—	6.0 to 8.0	—	—	—	2.5 to 3.5	2.7 to 3.5	4.0 to 5.0	—
2.20	NiBSi 92	0.06 max.	Balance	—	—	—	—	—	0.5 max.	2.75 to 3.5	4.3 to 4.7	0.5 max.
2.20A	NiBSi 92A	0.06 max.	Balance	—	—	—	—	—	0.50 max.	2.7 to 3.5	4.0 to 5.0	—
2.21	NiCoBSi 71 20	0.05 max.	Balance	19 to 21	—	—	—	—	0.5 max.	2.7 to 3.2	4.0 to 5.0	0.5 max.
2.21A	NiCoBSi 71 20A	0.06 max.	Balance	19 to 21	—	—	—	—	0.50 max.	2.7 to 3.2	4.0 to 5.0	—
2.22	CoCrNiMoBSi 40 18 27 5	0.1 max.	26 to 28	Balance	18 to 19	—	—	4.0 to 6.0	2.0 max.	3.0 to 3.4	3.0 to 3.5	0.5 max.
2.22A	CoCrNiMoBSi 47 18 20 5A	1.5 max.	10 to 30	Balance	16 to 21	—	10 max.	7 max.	5 max.	1.5 to 4.0	2.0 to 4.5	—
2.23	CoCrNiMoBSi 50 18 17 6	0.1 to 0.3	17 to 19	Balance	18 to 20	—	—	6.0 to 8.0	2.5 max.	3.0 to 3.4	3.0 to 3.5	0.5 max.
2.23A	CoCrNiMoBSi 47 18 20 6A	1.5 max.	10 to 30	Balance	16 to 21	—	—	8 max.	5 max.	1.5 to 4.0	2.0 to 4.5	—
2.24	CoCrNiWBSi 53 20 13 7	0.75 to 1.0	13 to 16	Balance	19 to 20	—	6 to 8	—	3.0 max.	1.5 to 1.8	2.4 to 2.5	0.5 max.
2.25	CoCrNiWBSi 52 19 15 9	0.8 to 1.1	13 to 16	Balance	19 to 20	—	8 to 10	—	3.0 max.	1.5 to 1.8	2.4 to 2.5	0.5 max.
2.26	CoCrNiWBSi 47 19 15 13	1.0 to 1.3	13 to 16	Balance	19 to 20	—	12.5 to 13.5	—	3.0 max.	1.5 to 2.0	2.0 to 2.5	0.5 max.
2.27	CoCrNiWBSi 45 19 15 15	1.3 to 1.6	13 to 16	Balance	19 to 20	—	14.5 to 15.5	—	3.0 max.	2.8 to 3.0	2.7 to 3.5	0.5 max.
2.27A	CoCrNiWBSi 52 22 10 10A	1.6 max.	16 max.	Balance	19 to 24	—	4 to 15.5	—	5 max.	1.5 to 3.0	1.5 to 3.5	—
2.28A ^{b)}	CoCrNiMoBSi/WC 50 50A	WC: 20 to 80	—	—	—	—	—	—	—	—	—	2.22A: Balance
2.29A ^{b)}	NiCrCuMoBSi/WC 70 30A	WC: 20 to 40	—	—	—	—	—	—	—	—	—	2.14A: Balance
2.29B ^{b)}	NiCrBSi/WC 70 30B	WC: 20 to 40	—	—	—	—	—	—	—	—	—	2.17A: Balance
2.30A ^{b)}	NiCrCuMoBSi/WC 50 50A	WC: 40 to 60	—	—	—	—	—	—	—	—	—	2.14A: Balance
2.30B ^{b)}	NiCrBSi/WC 50 50B	WC: 40 to 60	—	—	—	—	—	—	—	—	—	2.17A: Balance
2.31A ^{b)}	NiCrCuMoBSi/WC 30 70A	WC: 60 to 80	—	—	—	—	—	—	—	—	—	2.14A: Balance
2.31B ^{b)}	NiCrBSi/WC 30 70B	WC: 60 to 80	—	—	—	—	—	—	—	—	—	2.17A: Balance
Notes ^{a)} The composite powder material is included in 2.15. ^{b)} It is the mixed powder of self-fluxing alloy with WC.												

Table 3 Nickel-chromium alloy powders and iron-chromium alloy powders

Type		Chemical composition % (mass fraction)											
Code number	Abbreviated designation	Ni	Cr	Al	W	Co	Mo	Fe	Si	Mn	Ti	C	Others
3.1	NiCr 80 20	Balance	18 to 21	—	—	—	—	1 max.	1.5 max.	2.5 max.	—	0.25 max.	—
3.2	NiCrFe 75 15 8	Balance	14 to 17	—	—	—	—	6 to 10	—	—	—	0.3 max.	—
3.3 ^{a)}	NiCrAl 74 19 5	Balance	17 to 20	3 to 6	—	—	—	1 max.	1.5 max.	2.5 max.	—	0.25 max.	—
3.4	NiCrNb 70 21 4	Balance	20 to 22	0.3 to 0.5	—	—	—	2 to 3	0.4 to 0.6	0.4 to 0.6	0.3 to 0.5	0.1 max.	Nb : 3 to 4
3.5	NiCrMoW 54 16 17 5	Balance	14 to 18	—	4 to 6	—	16 to 18	6 max.	1.0 max.	0.5 max.	—	0.5 max.	—
3.6 ^{a)}	NiCrAlMoFe 73 9 7 6 5	Balance	8 to 10	6 to 8.8	—	—	4 to 6	4 to 6	—	—	—	—	—
3.7	NiCrTiAl 75 20 3 2	Balance	18 to 22	1.5 to 2.5	—	—	—	—	—	—	2 to 3	—	—
3.8	NiCrCoAlTi 67 16 9 4 4	Balance	15 to 17	3 to 4	2 to 3	8 to 9	1 to 3	0.4 to 0.6	0.3 max.	0.2 max.	3 to 4	0.2 max.	—
3.9	NiCoCrAlMoTi 63 15 10 5 3 4	Balance	8 to 12	4 to 6	—	14 to 16	2 to 4	—	—	—	4 to 5	0.2 max.	—
3.10	NiCoCrAlMoTi 57 17 11 5 6 4	Balance	10 to 12	4 to 5	—	15 to 18	5 to 7	0.5 max.	0.2 max.	—	3 to 5	0.03 max.	—
3.11	NiCr 50 50	Balance	50 to 53	—	—	—	—	—	2 max.	1 max.	—	0.5 max.	—
3.12	NiCrMoNb 64 22 9 3.5	Balance	20 to 23	—	—	—	8 to 10	1 max.	0.25 max.	—	—	0.01 max.	Nb : 3 to 4
3.13	NiCrCoMoTiAlW 57 18 12 6 3 2 1	Balance	17 to 19	1.5 to 2.5	0.5 to 1.5	11 to 13	5 to 7	—	—	—	2.5 to 3.5	—	—
3.14 ^{a)}	NiCrNbFeAl 66 14 7 8 4.5	Balance	11.5 to 16	2.5 to 4.5	—	—	—	6 to 9.5	—	0.4 to 0.6	0.3 to 0.5	0.1 max.	Nb : 6.5 to 7.5
3.15 ^{a)}	NiCrFeAlMo 68 14 7 5 5	Balance	12 to 16	4 to 6	—	—	4 to 6	5 to 9	—	—	—	—	—
3.16	NiCrAlMoTiO ₂ 68 8 7 5 2.5	Balance	7 to 10	5 to 9	—	—	3 to 7	1 to 3	—	—	—	—	TiO ₂ : 2.5 B : 2
3.17 ^{a)}	FeCrMoAl 65 23 5 5	0.5 max.	20 to 25	4 to 6	—	—	3 to 7	Balance	—	—	—	0.1 to 0.5	—
Note ^{a)} It is prepared by mechanical alloy method.													