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NATIONAL STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

GB/T 13298-2015

Replacing GB/T 13298-1991

Inspection Methods of Microstructure for Metals

金属显微组织检验方法

Issued on: September 11, 2015 **Implemented on: June 1, 2016**

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Standardization Administration of PRC..

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Foreword

This Standard was drafted as per the rules specified in GB/T 1.1-2009.

This Standard replaces GB/T 13298-1991 Inspection Methods of Microstructure for Metals; compared with GB/T 13298-1991, this Standard mainly has the following technical changes:

--- Modify specimen preparation into “specimen preparedness” (see Chapter 3);

--- Increase two situations for specimen selection (see 3.1);

--- Add the schematic diagram for inspection surface (see 3.2.1);

--- Add “band structure rating” for the inspection of longitudinal section parallel to the rolling direction (see 3.2.3);

--- Adopt clear “mechanical setting fixture diagram” (see 3.7.2);

--- Add the vibration polishing (see 5.5);

--- Modify “specimen erosion” into “microstructure display”; add the general (see 6.1), optical method (see 6.2), thermal etching display method (see 6.3.5), anodic film method (see 6.4.2); delete the preparation and precautions of chemical etchants and electrolytic etchants (see 4.1.3 of 1991 Edition);

--- Delete “metallographic microscope is divided into desktop-type, vertical-type, horizontal-type” (see 5.2 of 1991 Edition);

--- Delete “precautions for protecting lenses when using a microscope” (see 5.5, use focusing magnifier to observe on the ground-glass plate” (see 6.6 of 1991 Edition);

--- Microstructure inspection part (see Chapter 7), delete photographing with black-and-white negative film and colour negative film, “black-and-white negative film and photographic paper processing” (see 6.10 of 1991 Edition), and “color negative film and color photographic paper processing” (see 6.11 of 1991 Edition); add microscope illumination mode (see 7.2.1); add image acquisition (see 7.3) and image analysis part (see 7.4).

--- Add “on-site metallographic inspection” (see Chapter 8);

--- Change “test records” into “test report” (see Chapter 9 of this Edition, and

--- Add etchant commonly used for metals (see Appendix A).

This Standard was proposed by China Iron and Steel Association.

This Standard shall be under the jurisdiction of National Technical Committee for Standardization of Steel (SAC/TC 183).

Drafting organizations of this Standard: Central Iron and Steel Research Institute, China

Metallurgical Information and Standardization Institute, Fangda Special Steel Technology Co., Ltd., Daye Special Steel Co., Ltd., Shougang Corporation, and Xingtai Iron and Steel Co., Ltd..

Chief drafting staffs of this Standard: Li Jikang, Zhao Xiaoli, Luan Yan, and Ju Xinhua.

The historical edition replaced by this Standard is as follows:

1 Scope

This Standard specifies the specimen preparedness, specimen grinding, specimen polishing, microstructure display, microstructure test, on-site metallographic and test records for the metal microstructure inspection.

This Standard is applicable to the operation method of using metallographic microscope to inspect the metal structure.

2 Normative References

The following documents are essential to the application of this document. For the dated documents, only the versions with the dates indicated are applicable to this document; for the undated documents, only the latest version (including all the amendments) are applicable to this document.

3 Specimen Preparedness

3.1 Specimen selection

3.1.1 General

To ensure the effectiveness of inspection, the selected metallographic specimen shall represent the researched materials objectively and comprehensively as much as possible. The specimen cutting direction, location, quantity shall be determined by the metal manufacturing method, inspection purpose, relevant standards, and provisions of both parties' agreement.

3.1.2 Routine inspection

In addition to the special provisions in the product standard, it is recommended to select from the position that can represent the characteristics of the materials; the specimen shall contain the complete processing and impact area. For instance, the specimen of steel strip or wire is suitable to cut from the end of the coil; cast specimen shall contain the maximum and minimum segregation zones; heat treatment specimen shall contain complete heat treatment layer; surface treatment specimen shall contain all surface treatment layers; welding specimen shall contain weld seam, heat affected zone, and base metal.

3.1.3 Failure analysis

3.2 Inspection direction and selection of inspection surface

3.2.1 Refer to Figure 1 for the inspection surface schematic diagram.

D – Longitudinal section parallel to the rolling surface;

E – Longitudinal section perpendicular to the rolling surface;

F – Horizontal section perpendicular to the forging and rolling directions;

3.2.2 Generally, horizontal section perpendicular to the forging and rolling directions (F) can be used for inspection:

a) State and changes from the surface to the central microstructure;

h) Surface chemical heat treatment and coating structure and thickness.

3.2.3 Generally, longitudinal section parallel to the forging and rolling directions (D, E, G, H) can be used for inspection:

a) Content of non-metallic inclusions in steel;

d) Overall situation of heat treatment.

3.2.4 According to the requirements of analysis and research, multiple sections can be observed. For instance, when researching the deformation situation of the hot-rolled and cold-rolled metal structure, both horizontal and longitudinal sections can be observed comprehensively; for wire and rod materials, meanwhile the horizontal section is observed, the longitudinal section passing through the specimen axis can be observed.

3.3 Determination of specimen dimension

Specimen dimension shall depend on the rules with inspection area less than 400mm2; specimen height 15mm~20mm (smaller than the horizontal size).

3.4 Specimen cutting

Specimen can be cut by grinding wheel, electrospark wire, machine tooling (turn, mill, plane, grind), handsaw, and shearing method; if necessary, the specimen can be cut by oxyacetylene flame cutting method; while the hard and brittle metals can take sample by hammering method. When cutting the specimen, try to avoid the influence of cutting method on the structure (such as deformation, overheating, and etc.).

3.5 Specimen mark

3.6 Specimen cleaning

3.7 Specimen embedding