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**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB/T 18907-2013

Replacing GB/T 18907-2002

**Microbeam analysis -- Analytical electron microscopy --
Selected-area electron diffraction analysis using a transmission
electron microscope**

微束分析 分析电子显微术 透射电镜选区电子衍射分析方法
(English Translation)

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Foreword

This standard was drafted in accordance with the rules of GB/T 1.1-2009 and GB/T 20000.2-2009 given.

This standard replaces GB/T 18907-2002 "transmission electron microscope, electron diffraction analysis constituency." this standard compared with GB/T 18907-2002 main technical changes as follows.

- Modify the contents of the scope of application (see Chapter 1);
- Increasing the reference standard (see Chapter 2);
- Increasing the terms, definitions and symbols (see Chapter 3);
- Increasing the illustrations to explain the relevant principles and methods (see 4.2);
- Increased the single crystal diffraction spots, Kikuchi polycrystalline diffraction diagrams and instructions (see 4.2,4.3,4.4);
- Increased more precise formula and the application form Prague Kikuchi line spacing

corresponding to the formula (see 4.2, 4.3);

- Increasing the removal of surface contamination of the sample requirements and methods (see 6.4);
- Increased the pure elements reference materials (such as gold or aluminum) quality score requirements (see Chapter 7);
- Increased by GB/T 27025 certified laboratory capacity requirements (see 8.1.1);
- Increased pollution mitigation sample of operational requirements (see 8.1.2);
- Added a second and get more diffraction method (see 8.2.11);
- Increased use of dark field imaging technology and micro-chemical analysis to determine the phase requirements (see 8.2.11);
- Modified constant diffraction measurement methods and procedures (see 8.3);
- Modified single crystal diffraction index calibration methods, procedures (see Chapter 9);
- Increased the selected area electron diffraction pattern of 180 ° uncertainty Description and resolution (see Chapter 10);
- Increased the electron diffraction analysis constituency uncertainty assessment (see Chapter 11);
- Revised choreography and characterization methods Appendix B order diffraction spots atlas.

This standard uses the translation method identical with ISO 25498:2010 "micro-beam analysis Analysis of electron microscopy transmission electron microscope constituency Electron diffraction analysis. " Correspondence between the consistency of the standards of international documents and normative references of the following documents.

- GB/T 27025-2008 testing and calibration laboratories General requirements (ISO/IEC 17025:2005, IDT) this standard made the following editorial changes.
- ISO 25498:2010 in the 3.1 to 3.4, 3.6 to 3.8 and not only define the content of the term, this increases the standard terms and English Control.
- Increased 4.1 to meet the national standards, the original 4.1, 4.2, 4.3 were changed to 4.2, 4.3, 4.4.
- The ISO 25498. 4.1 2010 in Figs. 1 to 3 is adjusted to a position corresponding to 4.2.

The standard micro-beam analysis by the National Standardization Technical Committee (SAC/TC38) and focal points.

This standard was drafted. Beijing University of Technology, Beijing Institute of Aeronautical Materials, Baosteel Group Academia Sinica.

Introduction

Electron diffraction technology is widely used transmission electron microscopy (TEM), and its applications include phase identification, the type of crystal lattice and lattice Constant measurement, crystal orientation analysis and orientation relationship between the two phases, phase transition, preferred orientation used to analyze surface and crystal defects, twinning and interfaces as well as crystals Relationship (texture) isotropic. Despite the development of several complementary thereto diffraction techniques such as micro-diffraction, convergent beam diffraction and reflection type diffraction Radio, etc., selected area electron diffraction (SAED) is still the most commonly used techniques. By selected area electron diffraction method can analyze small sample area (A thin layer of fine grain, precipitated phase particles, etc.), but also for routine analysis of a variety of thin crystalline material sample. Obtaining high-resolution images, micro Diffractive or convergent beam diffraction analysis, SAED technology is a complementary technology. The data obtained are widely used in structural studies of materials /Property relationships, as well as testing and quality control.

This standard describes the formation mechanism of electron diffraction, the actual operating mode selected area electron diffraction and diffraction index and non-calibration Analysis determined.

Micro-beam analysis electron microscopy analysis TEM electron diffraction method selection

1 Scope

This standard specifies a transmission electron microscope (TEM) of thin crystal micron and submicron size of the sample area electron diffraction constituency Shot method analysis. The test sample can be obtained from a variety of thin sections of metal or non-metallic materials, may be used fine powder or extract Replica sample. The minimum sample selection can be analyzed by this method depends on the diameter of the spherical aberration coefficient microscope objective, for the modern TEM, again the minimum diameter of the sample selection generally up to 0.5 μ m.

When the diameter of the sample being analyzed area is smaller than 0.5 μ m still can refer to the standard method of analysis, but due to the spherical aberration, Yan Some of the information on the radio spectrum is likely to come from the area defined by a stop outside the constituency, in this case, as conditions allow, the best micro (Na) convergent beam electron diffraction or diffraction methods.

The successful application of selected area electron diffraction method depends on the diffraction index of the obtained calibration is correct or not, and regardless of which of the grain sample with axis parallel to the incident electron beam, and therefore, such an

analysis often require tilting and rotating means sample.

This standard applies to get SAED spectrum from the crystal sample, the calibration constant index diffraction and electron microscope calibration.

2 Normative references

The following documents for the application of this document is essential. For dated references, only the dated version suitable for use herein Member. For undated references, the latest edition (including any amendments) applies to this document.

General requirements ISO/IEC 17025 testing and calibration laboratories
(General requirements for the competence of testing and calibration laboratories)

3 Terms, symbols and definitions

The following terms and definitions apply to this document.

Miller index index of crystal plane (Hkl) it represents a specific crystal plane of Miller index (Miller indices).

Crystal planes Index indices of plane family {Hkl} it represents a family of Miller indices of crystal plane.

Crystal orientation index index of zone axis [Uvw] it represents a particular crystallographic direction or a crystal zone axis Miller indices.

Crystal indices of zone axis family to the family index uvw