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

JJF 1613-2017

**Calibration Specification for Thin Film Thickness Measurement
Instruments by Grazing Incidence X-Ray Reflectivity
(English Translation)**

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8 Re-school time interval (3)

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Introduction

JJF 1071 "National Metrological Calibration Rules Writing Rules", JJF 1001 "General Metrology Terms and Definitions" JJF 1059.1 "Measurement Uncertainty Evaluation and Representation" and JJF 1094 "Evaluation of measuring instruments" Support the

normative work to develop the basic series of norms.

This specification refers to ISO 16413.:2013 "X-ray reflectance assessment of film thickness, density and interface width Instrument requirements, collimation and positioning, data collection, data analysis and reporting "(Evaluation of thickness, density and interface width of thin films by X-ray reflectometry-instrumental requirements, alignment and positioning, data collection, data analysis and reporting).

This specification is the first release.

Calibration standard for gravitational incidence X - ray reflectance film measuring instrument

1 Scope

This specification applies to the calibration of grazing incidence X-ray reflectance film measuring instruments (hereinafter referred to as instruments).

2 reference file

This specification refers to the following documents.

JJG629-2014 Polycrystalline X - ray Diffractometer Verification Regulation JJF 1071 national measurement calibration rules for dated references, only the dated edition applies to this specification; references that are not dated , The latest version (including all modifications) applies to this specification.

3 Overview

The instrument is usually composed of collimated incident X-ray light source, sample table, detection system and other components (see Figure 1). its the working principle is. when the X-ray incident at a very small angle to the surface of the sample will occur when the interface reflection, the intensity of the film will change, the relationship between the reflection intensity and the reflection angle is obtained, and the film thickness can be obtained by data processing.

Figure 1 Schematic diagram of the instrument

4 measurement characteristics 4.1 instrument 2theta angle indication error and repeatability Instrument 2theta angle indication error should be within $\pm 0.02^\circ$; repeatability in standard deviation, should not exceed 0.002° .

4.2 Thickness measurement error the relative error of the measured value of the instrument should not exceed $\pm 6\%$.

4.3 film thickness measurement repeatability the instrument thickness measurement repeatability should not exceed 1%.

Note: Because the calibration work only gives the measurement results, do not determine the pass

or not, the measurement characteristics are for reference only.

5 calibration conditions

5.1 Environmental conditions

5.1.1 Indoor temperature $(20 \pm 5) ^\circ\text{C}$, humidity $\leq 65\% \text{ RH}$.