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Microbeam analysis — Analytical electron microscopy — Methods for calibrating image magnification by using reference materials with periodic structures

Analyse par microfaisceaux — Microscopie électronique analytique — Méthodes d'étalonnage du grandissement d'image au moyen de matériaux de référence de structures périodiques

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Foreword

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This document was prepared by Technical Committee ISO/TC 202, *Microbeam analysis*, Subcommittee SC 3, A*nalytical electron microscopy*.

This second edition cancels and replaces the first edition (ISO 29301:2010), which has been technically revised.

The main changes compared to the previous edition are as follows:

— Annexes B and C have been changed to informative;

— the Foreword has been revised;

— the Introduction has been revised;

— Clause 1 has been revised;

— Clause 2 has been updated;

— ISO 5725-1 and ISO/IEC Guide 98-3 have been added to the Bibliography;

— the heading and first paragraph of Clause 3 have been updated;

— the terms “accuracy” (3.1) and “under focus” (3.35) have been added to Clause 3;

— the terms “beam damage”, “goniometer” and “lattice spacing” have been deleted from Clause 3;

— the term “just focus” has been replaced by the term “focus” (3.10) in Clause 3;

— the term “image file format” has been replaced by the term “image file” (3.14) in Clause 3;

— the terms “image scanner” (3.17) and “ROI: region of interest” (3.26) have been revised;

— the term “standard excitation condition” (3.32) has been updated;

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— the keys 11 and 15 in Figure 1 have been updated;

— 6.1, 6.2, 6.3 g), i), l), m), p) and q), 6.4, 6.5.1, 6.5.2, Formula (1), 6.6.1, 6.6.2 b), d), e) and f), 6.7 a), 6.8.2, 6.8.3, 6.9.2 and 6.9.3 have been revised and updated;

— Clause 7 has been revised;

— Clause 8 has been revised;

— Formulae (18), (19), and (20) have been revised;

— the first paragraph and e) in 9.2 have been revised;

— D.1 has been revised;

— URLs have been added to D.2.2, D.2.3 and D.2.4;

— D.2.4 and D.5 have been added;

— the first paragraph in Annex E has been revised;

— in Annex E, Calibration Results (For photographic film or imaging plate use) and Calibration Results (For digital camera use) have been revised;

— the figures have been modified;

— the Bibliography has been updated.

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Introduction

The transmission electron microscope (TEM) is widely used to investigate the micro/nano-structure of a range of important materials such as semiconductors, metals, nano-particles, polymers, ceramics, glass, food and biological materials. The technique used involves the transmission of electrons through an ultra-thin specimen, interacting with the specimen as they pass through. This interaction results in a magnified image which is focused onto an imaging device, such as a photographic film, an imaging plate, or an image sensor built into a digital camera. A TEM is capable of imaging at significantly higher resolutions than ordinary (light) microscopes. It can be used to examine fine details as small as a single atomic column in a given specimen. This document addresses the need for magnification calibration of the images. It describes the requirements for calibration of the image magnification in the transmission electron microscope using a certified reference material or a reference material with periodic structures.

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