ISO 25387:2026-06 (E)

Microbeam analysis - Analytical electron microscopy - Procedures for determining the point resolution of high-resolution transmission electron microscope

Contents

Page

Foreword ... **iv**

Introduction ... **v**

1 Scope ... **1**

2 Normative references ... **1**

3 Terms and definitions ... **1**

4 Symbols and abbreviated terms ... **5**

5 Definition of point resolution based on information theory ... **7**
5.1 General ... 7
5.2 Definition of Scherzer condition ... 7
5.3 Definition of the theoretical point resolution ... 9

6 Diffractogram ... **11**

7 Effect of the envelope function ... **13**
7.1 General ... 13
7.2 Envelope function for temporal coherency ... 13
7.3 Envelope function for spatial coherency ... 14
7.4 Effect of the total envelope function on the contrast distribution of diffractogram ... 15

8 Sample for point resolution measurement ... **18**
8.1 General ... 18
8.2 Sample for point resolution measurement ... 18

9 Measurement procedures for determining experimental point resolution of HREM ... **18**
9.1 General ... 18
9.2 Calculation of provisional Scherzer focus value ... 20
9.3 Sample preparation ... 20
9.4 Set up the TEM ... 20
9.5 Defocus setting and image recording ... 22
9.6 Obtain diffractogram series ... 23
9.6.1 Set a ROI in the image ... 23
9.6.2 Obtain a series of diffractogram ... 24
9.7 Obtain two different line-profiles from two lines drawn on a diffractogram ... 25
9.8 Measure distance between two spots reflecting Au lattice plane spacing ... 27
9.9 Measure diameter of dark rings reflecting 1st, 2nd and 3rd zero position in square of realistic PCTF function ... 28
9.10 Calibrate the spatial frequency axis ... 29
9.11 Calculate three defocus values from the diameter of three dark rings ... 30
9.11.1 Relationship between defocus value and diameter of dark ring ... 30
9.11.2 Calculate average defocus value of the image ... 30
9.12 Determine real spherical aberration coefficient ... 30
9.13 Determine the experimental point resolution ... 33
9.13.1 Relationship between square of spatial frequency and defocus ... 33
9.13.2 Procedure for determining experimental point resolution ... 33

10 Uncertainty in point resolution measurement ... **34**

Annex A (informative) **Crystal lattice spacing of gold** ... **36**

Annex B (informative) **Example of measurement procedure for experimental point resolution determination** ... **37**

Bibliography ... **52**