ISO 23420:2021 (E)

Microbeam analysis — Analytical electron microscopy — Method for the determination of energy resolution for electron energy loss spectrum analysis

Contents

Foreword

Introduction

1 Scope

2 Normative references

3 Terms and definitions

4 Symbols and abbreviated terms

5 Definition of the energy resolution

6 Reference materials and energy determination

6.1 General
6.2 Materials selection for energy scale calibration
6.3 Binding energy measurement of graphite in the XPS

7 Measurement procedure and energy resolution determination

7.1 General
7.2 Predetermination of binding energy
7.2.1 Obtain graphite and the other reference sample
7.2.2 Measure C1s of graphite by using the XPS
7.3 Setup of the S/TEM and the EELS, and sample setting
7.4 First energy step, δE1, calibration
7.4.1 EELS acquisition set-up
7.4.2 Determining the EELS first energy step, δE1
7.4.3 Acquisition of carbon K-edge EEL spectrum
7.4.4 Calculate calibrated energy step δE1C
7.5 Measurement of peak close to the zero-loss peak, ECZLP, for the other reference sample using energy step δE1
7.5.1 EEL spectrum acquisition of the second reference sample using energy step δE1
7.5.2 Obtain the value for CH2 between the zero-loss peak and the peak ECZLP
7.5.3 Calculate the peak ECZLP energy
7.6 Second energy step, δE2, calibration
7.6.1 Determining the EELS second energy step, δE2
7.6.2 Acquire ECZLP EEL spectrum
7.6.3 Obtain the value for CH3 between the zero-loss peak and peak ECZLP
7.6.4 Calculate calibrated energy step δE2C
7.7 Determining the calibrated EEL spectrometer energy resolution, ΔE
7.7.1 Acquisition of a ZLP EEL spectrum
7.7.2 Obtain the value for CH4 for the zero-loss peak
7.7.3 Calculate EEL spectrometer energy resolution, ΔE
7.8 Record items

8 Uncertainty for the measurement result of energy resolution

Annex A (informative) Example of measurement procedure for energy resolution determination

A.1 General
A.2 Samples
A.2.1 Graphite as first reference sample
A.2.2 Boron-nitride as the other reference sample

A.2.3 Sample for the S/TEM
A.3 Results of example
A.3.1 Setup conditions of S/TEM
A.3.2 First energy step, δE1, calibration
A.3.2.1 Determining the EELS first energy step, δE1
A.3.2.2 Acquisition of carbon K-edge EEL spectrum
A.3.2.3 Obtain the value for CH1 between the zero-loss peak and carbon K edge of graphite
A.3.2.4 Calculate calibrated energy step δE1C
A.3.3 Measurement of peak close to the zero-loss peak, ECZLP, for the other reference sample using energy step δE1
A.3.3.1 EEL spectrum acquisition of the second reference sample using energy step δE1
A.3.3.2 Obtain the value for CH2 between the zero-loss peak and the peak ECZLP
A.3.3.3 Calculate the peak ECZLP energy
A.3.4 Second energy step, δE2, calibration
A.3.4.1 Determining the EELS second energy step, δE2
A.3.4.2 Acquire ECZLP EEL spectrum
A.3.4.3 Obtain the value for CH3 between the zero-loss peak and peak ECZLP
A.3.4.4 Calculate calibrated energy step δE2C
A.3.5 Determining the calibrated EEL spectrometer energy resolution, ΔE
A.3.5.1 Acquisition of a ZLP EEL spectrum
A.3.5.2 Obtain the value for CH4 for the zero-loss peak, and calculate EEL spectrometer energy resolution, ΔE

Annex B (informative) Correspondence between energy values of XPS C1s and EELS carbon K edge

B.1 General
B.2 Detail

Page count: 28