ISO 21362:2026-02 (E)

Nanotechnologies - Analysis of nano-objects using asymmetrical flow and centrifugal field-flow fractionation

Contents

Page

Foreword ..... **v**

Introduction ..... **vi**

1 Scope **1**

2 Normative references **1**

3 Terms and definitions **1**

4 Symbols and abbreviated terms **8**

5 Principles of operation **10**
5.1 Field-flow fractionation (FFF) — General 10
5.2 Specific applications by applied field 11
5.2.1 Flow field 11
5.2.2 Centrifugal field 13

6 Method development for asymmetrical flow field-flow fractionation (AF4) **15**
6.1 General 15
6.2 Sample specifications 15
6.3 Mobile phase specifications 16
6.4 Fractionation 17
6.4.1 Channel and membrane selection 17
6.4.2 Injection and relaxation 19
6.4.3 Optimizing flow conditions 20
6.4.4 Elution programme 20
6.4.5 Using field-flow fractionation (FFF) theory to select initial flow settings 21

7 Method development for centrifugal field-flow fractionation (CF3) **21**
7.1 General 21
7.2 Choice of mobile phase 21
7.3 Field strength selection 22
7.4 Field decay programme 22
7.5 Channel flow rate selection 22
7.6 Calculation of the relaxation time 23
7.7 Calculation of sample injection delay 23
7.8 Using field-flow fractionation (FFF) theory to select initial settings 23

8 Analysis of nano-objects **23**
8.1 General 23
8.2 Online size analysis 23
8.3 Online concentration analysis 25
8.3.1 General 25
8.3.2 Mass-based methods 25
8.3.3 Number-based methods 26
8.4 Online material identification or composition 27
8.5 Off-line analysis (fraction collection) 27
8.6 Alternative and emerging methods 28

9 Qualification, performance criteria and measurement uncertainty **29**
9.1 System qualification and quality control 29
9.1.1 Basic system qualification 29
9.1.2 Focusing performance 30
9.1.3 Flow rate of the carrier liquid 30
9.1.4 Separation field 30

9.2 Method performance criteria 31
9.2.1 Recovery 31
9.2.2 Selectivity 32
9.2.3 Retention ratio 32
9.2.4 Resolution 32
9.3 Method precision and measurement uncertainty 32
10 General procedures for measurement of samples 33
10.1 Introduction 33
10.2 Calibration of retention time for online size analysis 33
10.2.1 Calibration of the asymmetrical flow field-flow fractionation (AF4) channel 33
10.2.2 Calibration of asymmetrical flow field-flow fractionation (AF4) retention time for online size measurements 34
10.3 Asymmetrical flow field-flow fractionation (AF4) general measurement procedure 34
10.4 Centrifugal field-flow fractionation (CF3) general measurement procedure 35
11 Test report 36
11.1 General 36
11.2 Apparatus and measurement parameters 36
11.2.1 Asymmetrical flow field-flow fractionation (AF4) recording and reporting specifications 36
11.2.2 Centrifugal field-flow fractionation (CF3) recording and reporting specifications 37
11.3 Test report 38
Annex A (informative) **Summary of interlaboratory comparison 39**
Bibliography 54