ISO 18589-5:2019-12 (E)

Measurement of radioactivity in the environment - Soil - Part 5: Strontium 90 - Test method using proportional counting or liquid scintillation counting

Contents

Page

Foreword v

Introduction vi

1 Scope 1

2 Normative references 1

3 Termsanddefinitions 2
3.1 Terms and definitions 2
3.2 Symbols 2

4 Principle 3
4.1 General 3
4.2 Chemical separation 3
4.3 Detection 4
4.3.1 General 4
4.3.2 Source preparation for liquid scintillation counter 4
4.3.3 Source preparation for proportional counter 4
4.3.4 Background determination 4

5 Chemical reagents and equipment 5

6 Procedure of strontium desorption 5
6.1 Principles 5
6.2 Technical resources 6
6.2.1 Equipment 6
6.2.2 Chemical reagents 6
6.3 Procedure 6

7 Chemical separation procedure by precipitation 7
7.1 Principles 7
7.2 Technical resources 7
7.2.1 Equipment 7
7.2.2 Chemical reagents 8
7.3 Procedure 8
7.3.1 Separation of alkaline metals and calcium 8
7.3.2 Separation of barium, radium and lead 9
7.3.3 Separation of fission products and yttrium 9
7.3.4 Strontium purification 9
7.3.5 Yttrium extraction 10
7.3.6 Determination of the chemical yields 11

8 Chemical separation procedure by liquid-liquid extraction 11
8.1 Principle 11
8.2 Technical resources 12
8.2.1 Equipment 12
8.2.2 Chemical reagents 12
8.3 Procedure 13
8.3.1 General 13
8.3.2 Chemical separation of yttrium 13

8.3.3 Source preparation to be measured by PC 14
8.3.4 Source preparation to be measured by LSC 14
8.3.5 Determination of the chemical yields 14

9 Chemical separation procedure by chromatography (crown ether resin) 15
9.1 Principles 15
9.2 Technical resources 15
9.2.1 Equipment 15
9.2.2 Chemical reagents 15
9.3 Procedure 16

9.3.1 General 16
9.3.2 Chemical separation of the strontium 16
9.3.3 Determination of chemical yield 17

10 Measurement 17
10.1 General 17
10.2 Liquid scintillation counter 17
10.3 Gas flow proportional counter 17
10.4 Calculation of counting efficiency 18

11 Expression of results 18
11.1 General 18
11.2 Determination of 90Sr in equilibrium with 90Y 18
11.2.1 Calculation of the activity per unit of mass 18
11.2.2 Standard uncertainty 19
11.2.3 Decision threshold 19
11.2.4 Detection limit 19
11.3 Determination of 90Sr by the 90Y 19
11.3.1 Calculation of the activity per unit of mass 19
11.3.2 Standard uncertainty 20
11.3.3 Decision threshold 20
11.3.4 Detection limit 21
11.4 Determination of 90Sr in presence of 89Sr when 90Sr is in equilibrium with 90Y 21
11.4.1 Calculation of the activity per unit of mass 21
11.4.2 Standard uncertainty 22
11.4.3 Decision threshold 22
11.4.4 Detection limit 23
11.5 Confidence limits 23

12 Test report 23

Annex A (informative) Examples of evaluation models 25

Bibliography 32