ISO 7012-1:2025-04 (E)

Paints and varnishes - Determination of preservatives in water-dilutable coating materials - Part 1: Determination of in-can free formaldehyde

Contents

Page

Foreword ..... **v**

1 Scope **1**

2 Normative references **1**

3 Terms and definitions **1**

4 Principle **3**
4.1 General 3
4.2 Equilibria of in-can free formaldehyde in the coating matrix 3
4.3 Equilibria of in-can free formaldehyde during extraction 3
4.4 Equilibria of in-can free formaldehyde during derivatization 3
4.5 Principle of Method A: Derivatization with acetylacetone (ACAC) combined with photometric detection 3
4.5.1 Derivatization with ACAC 3
4.5.2 Detection and quantification with a spectral photometer 4
4.6 Principle of Method B: Derivatization with dinitrophenylhydrazine (DNPH) combined with liquid chromatography (LC) separation and UV/VIS detection 4
4.6.1 Derivatization with DNPH 4
4.6.2 Separation, detection and quantification with LC-UV/VIS 4
4.7 Principle of Method C: Liquid chromatography (LC) separation followed by post-column derivatization with ACAC and subsequent quantification with UV/VIS detection 4
4.7.1 Separation of free formaldehyde by liquid chromatography 4
4.7.2 Post-column derivatization with acetylacetone (ACAC) and quantification with UV/VIS detection 4

5 Apparatus **4**
5.1 General 4
5.2 General apparatus 4
5.3 Apparatus for extraction 4
5.4 Apparatus for method A 5
5.5 Apparatus for method B 5
5.5.1 LC [HPLC or ultra-performance liquid chromatography (UHPLC)] system 5
5.5.2 Appropriate column 5
5.5.3 Vials 5
5.6 Apparatus for method C 6
5.6.1 LC [HPLC or ultra-performance liquid chromatography (UHPLC)] system with post-column reactor 6
5.6.2 Appropriate column (e.g. RPC8, RPC18 column) 6

6 Reagents and materials **6**
6.1 General 6
6.2 General reagents 6
6.2.1 Demineralized water 6
6.2.2 Formaldehyde solution 6
6.2.3 Formaldehyde stock solution 6
6.2.4 Formaldehyde working solutions for calibration 6
6.2.5 Carrez solutions (optional) 7
6.3 Method A: Reagents for derivatization with ACAC 7
6.4 Method B: Reagents for derivatization with DNPH 7
6.5 Method C: Reagents for post-column derivatization with ACAC 7
6.6 Reagents for titration of formaldehyde standard 8

7 Procedure **8**
7.1 Sampling 8
7.2 Extraction 8
7.3 Analysis and detection of Method A 9
7.3.1 Procedure for derivatization with ACAC 9
7.3.2 Photometric analysis of calibration solutions 9
7.3.3 Sample measurement for photometric analysis 10
7.3.4 Quantification of the in-can free formaldehyde content 10
7.4 Analysis and detection of Method B 10
7.4.1 Procedure for derivatization with DNPH 10
7.4.2 Operation conditions 11
7.4.3 Blank determination 11
7.4.4 Analysis of calibration solution 11
7.4.5 Sample measurement 11
7.4.6 Quality check 12
7.4.7 Calculation of in-can free formaldehyde content 12
7.5 Analysis and detection of Method C 12
7.5.1 Operation conditions 12
7.5.2 Blank determination 12
7.5.3 Analysis of calibration solution 12
7.5.4 Sample measurement 13
7.5.5 Quality check 13
7.5.6 Calculation of in-can free formaldehyde content 13

8 Precision **14**
8.1 General 14
8.2 Repeatability limit, *r* 14
8.3 Reproducibility limit, *R* 14

9 Test report **14**

Annex A (normative) **Titration methods for the determination of formaldehyde content** **16**

Annex B (informative) **Example of HPLC conditions for method B** **18**

Annex C (informative) **Example of HPLC conditions for method C** **19**

Annex D (informative) **Results of the interlaboratory test** **20**

Bibliography **21**