



Designation: F2931 – 19a

## Standard Guide for Analytical Testing of Substances of Very High Concern in Materials and Products<sup>1</sup>

This standard is issued under the fixed designation F2931; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

### 1. Scope

1.1 This guide contains a list of potential test methods for the analysis of Substances of Very High Concern (SVHC) as designated by ECHA, the European Chemicals Agency. Information on the test methods cited is publicly available and is drawn from a variety of sources. The guide is intended to assist in the selection of test methods that are applicable for the SVHCs identified.

1.2 The specific SVHCs covered within this guide are compiled from the ECHA Candidate List of Substances of Very High Concern. This list is also referred to as the REACH Candidate List.

1.3 This guide specifically addresses methods for the analysis of SVHCs in products. It is not intended to cover the many and varied analysis challenges associated in the manufacturing environment.

#### 1.4 Limitations:

1.4.1 This guide is intended to provide a compilation of available test methods for the SVHCs listed on the ECHA Candidate list and is not intended to be exhaustive. The test methods within this guide are not the only ones available for any specific substances and this guide does not recommend any specific test method.

1.4.2 Test methods for specific substances at the detection limits required for REACH reporting are not always available. In some cases, it is necessary to deduce the quantity of substance present through the analysis and quantification of its elements. Although this approach is routinely used some degree of uncertainty exists in the final result due to the reduced specificity of the test method.

1.4.3 Although this guide is intended to be updated on a periodic basis to capture new developments in the field, there is no assurance that the information provided is the most current.

1.5 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.6 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.7 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

### 2. Referenced Documents

#### 2.1 ASTM Standards:<sup>2</sup>

D1257 Specification for High-Gravity Glycerin

D1385 Test Method for Hydrazine in Water

D1971 Practices for Digestion of Water Samples for Determination of Metals by Flame Atomic Absorption, Graphite Furnace Atomic Absorption, Plasma Emission Spectroscopy, or Plasma Mass Spectrometry

D3335 Test Method for Low Concentrations of Lead, Cadmium, and Cobalt in Paint by Atomic Absorption Spectroscopy

D3545 Test Method for Alcohol Content and Purity of Acetate Esters by Gas Chromatography

D4309 Practice for Sample Digestion Using Closed Vessel Microwave Heating Technique for the Determination of Total Metals in Water

D5292 Test Method for Aromatic Carbon Contents of Hydrocarbon Oils by High Resolution Nuclear Magnetic Resonance Spectroscopy (Withdrawn 2018)<sup>3</sup>

D5831 Practice for Screening Fuels in Soils

<sup>1</sup> This guide is under the jurisdiction of ASTM Committee F40 on Declarable Substances in Materials and is the direct responsibility of Subcommittee F40.02 on Management Practices and Guides.

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<sup>2</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

<sup>3</sup> The last approved version of this historical standard is referenced on [www.astm.org](http://www.astm.org).

- D7065** Test Method for Determination of Nonylphenol, Bisphenol A, *p*-*tert*-Octylphenol, Nonylphenol Monoethoxylate and Nonylphenol Diethoxylate in Environmental Waters by Gas Chromatography Mass Spectrometry
- D7485** Test Method for Determination of Nonylphenol, *p*-*tert*-Octylphenol, Nonylphenol Monoethoxylate and Nonylphenol Diethoxylate in Environmental Waters by Liquid Chromatography/Tandem Mass Spectrometry
- D7823** Test Method for Determination of Low Level Phthalates in Poly (Vinyl Chloride) Plastics by Thermal Desorption—Gas Chromatography/Mass Spectrometry
- D7968** Test Method for Determination of Polyfluorinated Compounds in Soil by Liquid Chromatography Tandem Mass Spectrometry (LC/MS/MS)
- E1621** Guide for Elemental Analysis by Wavelength Dispersive X-Ray Fluorescence Spectrometry
- F2576** Terminology Relating to Declarable Substances in Materials
- F2853** Test Method for Determination of Lead in Paint Layers and Similar Coatings or in Substrates and Homogeneous Materials by Energy Dispersive X-Ray Fluorescence Spectrometry Using Multiple Monochromatic Excitation Beams

## 2.2 European Commission:<sup>4</sup>

**Article 57** of the European Union Regulation #1907/2006

## 2.3 International Electrotechnical Commission TC111:<sup>5</sup>

**IEC 62321** Electrotechnical Products – Determination of Levels of Six Regulated Substances (Lead, Mercury, Cadmium, Hexavalent Chromium, Polybrominated Biphenyls, Polybrominated Diphenyl Ethers)

## 2.4 Joint Industry Guide (JIG):<sup>6</sup>

**JIG-101** Material Composition Declaration for Electrotechnical Products. Ed 4.0, 2011

## 3. Terminology

### 3.1 Definitions:

3.1.1 Terms and definitions related to declarable substances in materials may be found in Terminology **F2576**.

3.1.2 Terms and definitions in the guide not found in Terminology **F2576** are found in a common dictionary or other reference documents such as the ASTM Dictionary of Engineering Science & Technology.<sup>7</sup>

### 3.2 Definitions of Terms Specific to This Standard:

3.2.1 *article*—“an object which during production is given a special shape, surface or design which determines its function to a greater degree than its chemical composition” as defined in Article 3(3) of the REACH Regulation.

3.2.2 *brominated flame retardant*—a group of brominated organic compounds that are used to inhibit initiation of a fire.

3.2.3 *Joint Industry Guide*—An industry standard of the Electric Industries Alliance that “*establishes the relevant substances as well as reporting thresholds that the industry agrees should govern material content disclosures.*”<sup>6</sup>

3.2.4 *phthalates*—also known as *phthalate esters*, are esters of phthalic acid primarily used as a plasticizer for polyvinyl chloride or as solvents for many different types of consumer products.

3.2.5 *plasticizer*—any of a group of substances used in plastics and other materials to control viscosity, flexibility or softness of the finished product.

3.2.6 *Substances of Very High Concern (SVHC)*—substances that have hazards of serious consequences and meet the criteria for carcinogenic, mutagenic and reproductive toxic substances of category 1 and 2.

3.2.6.1 *Discussion*—SVHC can be persistent, bioaccumulative and toxic (PBT) substances or very persistent and very bioaccumulative (VPvB) substances. Other substances giving rise to an equivalent level of concern as potential SVHC include endocrine disruptors.

### 3.3 Acronyms:

3.3.1 *AAS*—Atomic Absorption Spectrometry

3.3.2 *AED*—Atomic Emission Detection

3.3.3 *AES*—Atomic Emission Spectrometry

3.3.4 *AFS*—Atomic Fluorescence Spectrometry

3.3.5 *BFR*—Brominated Flame Retardant

3.3.6 *CAS*—Chemical Abstract Services

3.3.7 *CES*—Specialty Chemicals Europe Silicones, Silicones Europe

3.3.8 *CMR*—Carcinogenic, Mutagenic and Toxic to Reproduction

3.3.9 *COE*—Coke Oven Emissions

3.3.10 *CPSC*—United States Consumer Product Safety Commission

3.3.11 *CTPV*—Coal Tar Pitch Volatiles

3.3.12 *cVMS*—Cyclic Volatile Methyl Siloxanes

3.3.13 *DMF*—Dimethylformamide

3.3.14 *ECD*—Electron Capture Detection

3.3.15 *ECHA*—European Chemicals Agency

3.3.16 *ECNI*—Electron Capture Negative Ion

3.3.17 *EDXRF*—Energy Dispersive X-ray Fluorescence

3.3.18 *EEE*—Electrical and Electronic Equipment

3.3.19 *EIA*—Electronic Industries Alliance

3.3.20 *EPA*—United States Environmental Protection Agency

3.3.21 *EU*—European Union

3.3.22 *FID*—Flame Ionization Detection

3.3.23 *FL*—Fluorescence

3.3.24 *FLAA*—Flame Atomic Absorption Spectroscopy

3.3.25 *FPD*—Flame Photometric Detection

3.3.26 *GC-MS*—Gas Chromatography-Mass Spectrometry

<sup>4</sup> Europese Commissie, B-1049, Brussels, Belgium, [http://ec.europa.eu/index\\_en.htm](http://ec.europa.eu/index_en.htm).

<sup>5</sup> Available from International Electrotechnical Commission (IEC), 3, rue de Varembe, P.O. Box 131, CH-1211 Geneva 20, Switzerland, <http://www.iec.ch>.

<sup>6</sup> Available from the Consumer Electronics Association, 1919 S. Eads St. Arlington, VA 22202, <http://www.ce.org>

<sup>7</sup> ASTM Dictionary of Engineering Science & Technology, 10th Edition. Available from [www.astm.org](http://www.astm.org).

3.3.27 *GFAA*—Graphite Furnace Atomic Absorption Spectrometry

3.3.28 *GFF*—Glass Fiber Filters

3.3.29 *HAFID*—Hydrogen Atmosphere Flame Ionization Detection

3.3.30 *HFAA*—Heptafluorobutyric acid anhydride

3.3.31 *HIPS*—High Impact Polystyrene

3.3.32 *HPLC*—High Performance (or Pressure) Liquid Chromatography

3.3.33 *ICP-MS*—Inductively Coupled Plasma – Mass Spectrometry

3.3.34 *ICP-OES*—Inductively Coupled Plasma – Optical Emission Spectrometry

3.3.35 *IR*—Infrared Spectrometry

3.3.36 *LC-MS-MS*—Liquid Chromatography-Tandem

3.3.37 *MSP*—Microspectrophotometer

3.3.38 *NIOSH*—United States National Institute for Occupational Health and Safety

3.3.39 *PAH*—Polycyclic Aromatic Hydrocarbon

3.3.40 *PTFE*—Polytetrafluoroethylene (Teflon)

3.3.41 *PVC*—Polyvinyl Chloride

3.3.42 *REACH*—Registration, Evaluation and Authorization of Chemicals

3.3.43 *RoHS*—Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment

3.3.44 *UV-VIS*—UltraViolet-Visible Spectrometry

3.3.45 *XRF*—X-ray Fluorescence Spectrometry

## 4. Summary of Guide

4.1 This guide provides a list of test methods for the determination of the Substances of Very High Concern as identified in the REACH Candidate list. Screening methods are discussed in [Appendix X2](#).

4.2 This guide provides identifiers for each substance such as chemical name, synonyms, chemical formulas, CAS and EU numbers.

4.3 Common uses for each of the substances are identified.

## 5. Significance and Use

5.1 The REACH Candidate list classifies substances as SVHCs thus making them subject to possible authorization. Compliance to the REACH regulation requires that any identified SVHC be present at a concentration of less than 0.1 % (w/w) of the total article weight to avoid triggering a reporting obligation. This guide is intended to assist in the identification of available test methods for quantitative analysis of the substance(s) of interest.

5.2 When possible, industry accepted standard test methods are cited. However, industry vetted test methods are not available for all of the substances contained in the REACH Candidate List. Thus, some caution and due diligence must be exercised when applying some of the methods listed in this guide.

5.3 In some cases, test methods for the identification and quantification of a specific substance are not available. An example would include  $\text{CoCl}_2$ . Methods currently in practice involve the individual determination of Co and Cl concentrations and use other sources of information or chemical judgment to assign the expected  $\text{CoCl}_2$  concentration. This approach obviously has its limitations and pitfalls and must be used judiciously.

5.4 Under the REACH regulation, EU manufacturers, importers or distributors of articles containing more than 0.1 % (w/w) of a substance that the Agency has listed as being an SVHC shall provide their customers with the name of the substance and information allowing the safe use of the article. Producers and distributors of articles containing SVHC shall also supply the same information to consumers, upon request. In situations where this information is not readily available from the supply chain it is incumbent upon the supplier to collect this information through actual chemical analysis or other means. This guide is intended to assist in the selection of appropriate test methods in the event that chemical analysis is required.

## 6. Substance List and Uses

6.1 The substances listed<sup>8</sup> in [Table 1](#) were derived from the ECHA SVHC Candidate List published from October 2008 to July 2019. Any substances that have been subsequently added after July 2019 are not included.

6.2 The CAS or EU numbers are unique identifiers for the substance. It is possible for a particular substance to have one or more commonly used names.

6.3 Common uses of the substance help to identify in which products or materials these substance is likely to be found. Note that the list of common uses is not exhaustive.

## 7. SVHC Test Methods

7.1 This guide is not intended to be exhaustive in the identification of available test methods. The intent is to provide guidance and some examples of available test methods relevant to the required analysis. Some of the SVHCs do not have industry standard test methods associated with them. Literature citations of these non-standard methods are meant to be for information only.

7.2 Standard test methods do not exist for all of the SVHCs listed. Therefore, the test methods cited for those substances must be validated for analytical accuracy before use in regulatory compliance demonstration. Moreover, when a method is applied outside of its intended scope, validation of the altered method is required. Considerations such as sample matrix, analytical requirements, etc. for the intended analysis will determine its applicability. All deviations from the published method must be clearly noted.

NOTE 1—If a standardized method is used beyond the stated scope, that addition must be validated. All deviations from published methods must be documented.

<sup>8</sup> ECHA, European chemical agency, Candidate List of substances of very high concern for Authorisation, <https://echa.europa.eu/candidate-list-table>.