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.

Designation: F2931 – 16ε1

# Standard Guide for Analytical Testing of Substances of Very High Concern in Materials and Products[1]

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 (ε) indicates an editorial change since the last revision or reapproval.

ε1 NOTE—Keywords were added editorially in March 2017.

## 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 and health practices and determine the applicability of regulatory limitations prior to use.*

## 2. Referenced Documents

2.1 *ASTM Standards:*[2]

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

D5831 Test Method for Screening Fuels in Soils

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, Regulated Phthalates in Poly (Vinyl Chloride) Plastics by

[1] 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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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

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Thermal Desorption—Gas Chromatography/Mass Spectrometry

D7968 Test Method for Determination of Perfluorinated 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

2.2 *European Commission:*[3]

Article 57 of the European Union Regulation #1907/2006

2.3 *International Electrotechnical Commission TC111:*[4]

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):*[5]

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.[6]

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*."[5]

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 Spectometry

3.3.5 *BFR*—Brominated Flame Retardant

3.3.6 *CAS*—Chemical Abstract Services

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

3.3.8 *CPSC*—United States Consumer Product Safety Commission

3.3.9 *DMF*—Dimethylformamide

3.3.10 *ECD*—Electron Capture Detection

3.3.11 *ECHA*—European Chemicals Agency

3.3.12 *ECNI*—Electron Capture Negative Ion

3.3.13 *EEE*—Electrical and Electronic Equipment

3.3.14 *EIA*—Electronic Industries Alliance

3.3.15 *EPA*—United States Environmental Protection Agency

3.3.16 *EU*—European Union

3.3.17 *FID*—Flame Ionization Detection

3.3.18 *FPD*—Flame Photometric Detection

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

3.3.20 *GFAA*—Graphite Furnace Atomic Absorption Spectrometry

3.3.21 *HAFID*—Hydrogen Atmosphere Flame Ionization Detection

3.3.22 *HFAA*—Heptaflurobutyric acid anhydride

3.3.23 *HIPS*—High Impact Polystyrene

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

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

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

3.3.27 *IR*—Infrared Spectrometry

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

3.3.29 *MSP*—Microspectrophotometer

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

3.3.31 *PAH*—Polycyclic Aromatic Hydrocarbon

3.3.32 *PTFE*—Polytetrafluoroethylene (Teflon)

3.3.33 *PVC*—Polyvinyl Chloride

[3] Europese Commissie, B-1049, Brussels, Belgium, http://ec.europa.eu/index_en.htm.

[4] Available from International Electrotechnical Commission (IEC), 3, rue de Varembé, P.O. Box 131, CH-1211 Geneva 20, Switzerland, http://www.iec.ch.

[5] Available from the Consumer Electronics Association, 1919 S. Eads St. Arlington, VA 22202, http://www.ce.org

[6] ASTM Dictionary of Engineering Science & Technology, 10th Edition. Available from www.astm.org.

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

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

3.3.36 *UV-VIS*—UltraViolet-Visible Spectrometry

3.3.37 *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 $CoCl_2$. 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 $CoCl_2$ 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 in Table 1 were derived from the ECHA SVHC Candidate List published in October 2008. Any substances that have been subsequently added after October 2008 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.

7.3 In many cases, test methods that are specific for a particular substance have not been developed. Therefore, the approach to quantitative analysis is not straightforward. A combination of test methods and the use of logical assumptions are required. These assumptions shall be clearly articulated because they will determine the limitations of the approach.

7.4 Screening methods can be utilized to determine whether a detectable amount of a substance is present. In many situations the application of a screening process can obviate the need to perform full quantitative analysis. See Appendix X2 for more information on screening methodologies.

7.5 In some cases, sample preparation methods are dependent upon the physical state of the sample to be analyzed. For many of the test methods, several sample preparation references are cited when applicable.

7.6 In some cases, limitations in the sample preparation method cited in Appendix X1.2 can produce a sample for analysis that is non-optimal. Incomplete extraction, incomplete digestion, loss of analyte, etc. often require adjustments to the sample preparation methods to obtain the desired analytical result. At a minimum the limitations in the sample preparation method shall be accounted for, when possible, in the calculation of the analytical result. Additionally, if these adjustments to the method do not produce a satisfactory sample for analysis, it may be necessary to develop an alternative method. Validation of the sample preparation method will thus be required.

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**TABLE 1 SVHC Substances and Their Common Uses**

| Substance Name | Synonym | CAS Number | EU Number | Chemical Formula | Common Uses |
|---|---|---|---|---|---|
| 4,4'-Diaminodiphenylmethane | 4,4'-Methylene-dianiline, MDA | 101-77-9 | 202-974-4 | $C_{13}H_{14}N_2$ | Converted to methylenedipheny diisocyanate (MDI). MDI used for polyurethane production. Other uses include: (1) hardener for epoxy resins and adhesives, (2) basic ingredient of colorant, and (3) intermediate for high-performance polymer. |
| 5-tert-Butyl-2.4.6-Trinitro-m-Xylene | Musk Xylene (2,4,6-Trinitro-1,3-dimethyl-5-t-butylbenzene) | 81-15-2 | 201-329-4 | $C_{12}H_{15}N_3O_6$ | Used as a fragrant particularly for consumer cosmetic products. |
| Alkanes, C10-13, chloro | Short Chain Chlorinated Paraffins (SCCP) | 85535-84-8 | 287-476-5 | $C_xH_{(2X-y+2)}Cly$ where $x=10^{-13}$ and $y=1^{-13}$ | May act as a secondary plasticizer or flame retardant in PVC. Other uses include: (1) metal working lubricant, (2) rubber parts, (3) paints, (4) sealant, (5) leather work, and (6) fiber. |
| Anthracene | Paranaphthalene | 120-12-7 | 204-371-1 | $C_{14}H_{10}$ | An intermediate in the production of dyes; used in the manufacturer of pyrotechnic products. |
| Benzyl butyl phthalate | Phthalic acid, benzyl butyl ester | 85-68-7 | 201-622-7 | $C_{19}H_{20}O_4$ | Plasticizer in flooring material such as PVC foam. Other uses are as a plasticizer in traffic cones, food conveyor belts, artificial leather, etc. |
| Bis(2-ethylhexyl)phthalate | Dioctylphthalate | 117-81-7 | 204-211-0 | $C_{24}H_{38}O_4$ | Commonly used as a platicizer in manufacturing of articles made of PVC, resins, rubbers, packaging materials, some paper products, and various medical devices, including the blood bags. It can also be found in some hydraulic fluids or dielectric fluids in capacitors. It is often found in coatings, pigments, textiles, or used as a solvent in light sticks. |
| Bis (tributyltin) oxide | Distannoxane, hexabutyl- | 56-35-9 | 200-268-0 | $C_{24}H_{54}OSn_2$ | Primarily used as a biocide for boats, mildew proofing for leather work. |
| Cobalt dichloride | Cobaltous Chloride | 7646-79-9 | 231-589-4 | $CoCl_2$ | This substance can be used for (1) humidity indicator, (2) absorbent of ammonia gas, (3) gas mask, (4) production for vitamin $B_12$, (5) trace amount of nutrient factor for food, (6) trace amount of element for nitric-acid pesticides, (7) solvent in purifying magnesium. Additionally, it may be used for packaging. |
| Diarsenic pentaoxide | Diarsenic Pentoxide | 1303-28-2 | 215-116-9 | $As_2O_5$ | This substance can be used for (1) colorants, (2) metal refining, (3) special glass production, and (4) antiseptic agent for wood. |
| Diarsenic trioxide | Arsenic Trioxide | 1327-53-3 | 215-481-4 | $As_2O_3$ | This substance can be used for (1) decolorants for glasses and enamel, (2) purifying and oxidizing agent in production of special glasses and lead crystal, (3) antiseptic agent for wood, and (4) medicine for leukemia. |
| Dibutyl phthalate | 1,2-Benzenedicarboxylic acid di-n-butyl ester | 84-74-2 | 201-557-4 | $C_{16}H_{22}O_4$ | Common plasticizer used in various polymers to keep crystals from forming. It is also used in paints, pigments, or printing inks as an adhesive agent. It is soluble in various organic solvents. This property allows it to be used as fixatives in perfumes or as an ectoparasiticide. |
| Hexabromocyclododecane | Cyclododecane, hexabromo-isomers | 25637-99-4 | 247-148-4 | $C_{12}H_{18}Br_6$ | Used as a brominated flame retardant for polystyrene materials, for example,, HIPS case material and packaging. |
| Lead hydrogen arsenate | Lead Acid Arsenate | 7784-40-9 | 232-064-2 | $(AsO_4H)Pb$ | Insecticide or pesticide |
| Sodium dichromate dihydrate | Sodium Bichromate | 7789-12-0 | 234-190-3 | $Na_2Cr_2O_7.2H_2O$ | Used for: (1) production of other chromium compounds, (2) production of inorganic chromate pigments, (3) preservative supplement, finishing of metal plating, (4) production of vitamin K. |
| Triethyl arsenate | Arsenic acid Triethyl Ester | 15606-95-8 | 427-700-2 | $(C_2H_5O)_3AsO$ | Used for integrated circuit manufacturing as an intermediate for n-type doping of semiconductors. |
| 2,4-Dinitrotoluene | 1-methyl-2,4-dinitrobenzene | 121-14-2 | 204-450-0 | $C_7H_6N_2O_4$ | 2,4-dinitrotoluene is used in the production of toluene diisocyanate, which is used for the manufacture of flexible polyurethane foams. The substance is also used as gelatinizing-plasticizing agent for the manufacture of explosive mixtures (for example, for airbags in cars). |
| Aluminosilicate Refractory Ceramic Fibres | VITREOUS | 142844-00-6 | | | Refractory ceramic fibres are used for high-temperature insulation, almost exclusively in industrial applications (insulation of industrial furnaces and equipment, equipment for the automotive and aircraft/aerospace industry) and in fire protection (buildings and industrial process equipment). |
| Anthracene oil | Anthracene Phenanthrene Carbazole | 90640-80-5 | 292-602-7 | $C_{14}H_{10}$ $C_{12}H_9N$ | The substances are mainly used in the manufacture of other substances such as anthracene and carbon black. They may also be used as reducing agents in blast furnances, as components in bunker fuel, for impregnating, sealing and corrosion protection. |



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**TABLE 1** *Continued*

| Substance Name | Synonym | CAS Number | EU Number | Chemical Formula | Common Uses |
|---|---|---|---|---|---|
| Anthracene oil, anthracene paste | Anthracene Phenanthrene Carbazole | 90640-81-6 | 292-603-2 | $C_{14}H_{10}$ $C_{12}H_9N$ | The substances are mainly used in the manufacture of other substances such as anthracene and carbon black. They may also be used as reducing agents in blast furnances, as components in bunker fuel, for impregnating, sealing and corrosion protection. |
| Anthracene oil, anthracene paste, anthracene fraction | Anthracene Phenanthrene Carbazole | 91995-15-2 | 295-275-9 | $C_{14}H_{10}$ $C_{12}H_9N$ | The substances are mainly used in the manufacture of other substances such as anthracene and carbon black. They may also be used as reducing agents in blast furnances, as components in bunker fuel, for impregnating, sealing and corrosion protection. |
| Anthracene oil, anthracene paste,distn. lights | Anthracene Phenanthrene Carbazole | 91995-17-4 | 295-278-5 | $C_{14}H_{10}$ $C_{12}H_9N$ | The substances are mainly used in the manufacture of other substances such as anthracene and carbon black. They may also be used as reducing agents in blast furnances, as components in bunker fuel, for impregnating, sealing and corrosion protection. |
| Anthracene oil, anthracene-low | Anthracene Phenanthrene Carbazole | 90640-82-7 | 292-604-8 | $C_{14}H_{10}$ $C_{12}H_9N$ | The substances are mainly used in the manufacture of other substances such as anthracene and carbon black. They may also be used as reducing agents in blast furnances, as components in bunker fuel, for impregnating, sealing and corrosion protection. |
| Diisobutyl phthalate | Bis(2-methylpropyl) benzene-1,2-dicarboxylate | 84-69-5 | 201-553-2 | $C_{16}H_{22}O_4$ | Diisobutyl phthalate is used as plasticiser for nitrocellulose, cellulose ether, polyacrylate and polyacetate dispersions, and as a gelling aid in combination with other plasticisers, which are widely used for plastics, lacquers, adhesives, explosive material and nail polish. |
| Lead chromate | Lead(2+) chromate | 7758-97-6 | 231-846-0 | $CrH_2O_4.Pb$ | Lead chromate is used for manufacturing pigments and dyes, as a pigment or coating agent in industrial and maritime paint products or for embalming/restoring of art products. Further potential uses include as detergents and bleaches, photosensitive materials and for the manufacture of pyrotechnic powder. |
| Lead chromate molybdate sulphate red (C.I. Pigment Red 104) | Lead(2+) chromate lead(2+) sulfate lead(2+) molybdate | 12656-85-8 | 235-759-9 | $CrH_2O_4.Pb$ $H_2O_4S.Pb$ $PbMoO_4$ | Lead chromate molybdate sulphate red (C.I. Pigment Red 104) is used as a colouring, painting and coating agent in sectors such as the rubber, plastic and paints, coatings and varnishes industries. Applications comprise the production of agricultural equipment, vehicles and aircraft as well as road and airstrip painting. |
| Lead sulfochromate yellow (C.I. Pigment Yellow 34) | Lead(2+) chromate lead(2+) sulfate | 1344-37-2 | 215-693-7 | $CrH_2O_4.Pb$ $H_2O_4S.Pb$ | Lead sulfochromate yellow (C.I. Pigment Yellow 34) is used as a colouring, painting and coating agent in sectors such as the rubber, plastic and paints, coatings and varnishes industries. Applications comprise the production of agricultural equipment, vehicles and aircraft as well as road and airstrip painting. The substance is further used for camouflage or ammunition marking in the defence area. |
| Pitch, coal tar, high temperature | anode pitch, binder pitch, clay pigeon binder, electrode pitch, hard pitch, impregnating pitch, soft pitch, vacuum pitch | 65996-93-2 | 266-028-2 | not applicable | Pitch, coal tar, high temperature is mainly used in the production of electrodes for industrial applications. Smaller volumes are dedicated to specific uses such as heavy duty corrosion protection, special purpose paving, manufacture of other substances and the production of clay targets. |
| Tris(2-chloroethyl)phosphate | | 115-96-8 | 204-118-5 | $C_6H_{12}Cl_3O_4P$ | Tris(2-chloroethyl)phosphate is mainly used as an additive plasticiser and viscosity regulator with flame-retarding properties for acrylic resins, polyurethane, polyvinyl chloride and other polymers. Other fields of application are adhesives, coatings, flame-resistant paints and varnishes. The main industrial branches to use TCEP are the furniture, the textile and the building industry. |
| Zirconia Aluminosilicate Refractory Ceramic Fibres | | | | | Refractory ceramic fibres are used for high-temperature insulation, almost exclusively in industrial applications (insulation of industrial furnaces and equipment, equipment for the automotive and aircraft/aerospace industry) and in fire protection (buildings and industrial process equipment). |
| Acrylamide | Prop-2-enamide | 79-06-1 | 201-173-7 | $C_3H_5NO$ | Acrylamide is almost exclusively used for the synthesis of polyacrylamides, which are used in various applications, in particular in waste water treatment and paper processing. Minor uses of acrylamide comprise the preparation of polyacrylamide gels for research purposes and as grouting agents in civil engineering. |



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**TABLE 1** *Continued*

| Substance Name | Synonym | CAS Number | EU Number | Chemical Formula | Common Uses |
|---|---|---|---|---|---|
| Ammonium dichromate | Diammonium dichromate, Ammonium bichromate, ammonium chromate, chromic acid [$H_2Cr_2O_7$] diammonium salt, diammonium dichromate, dichromic acid diammonium salt | 7789-09-5 | 232-143-1 | $Cr_2H_2O_7.2H_3N$ | Ammonium dichromate is mainly used as an oxidising agent. Other known uses are in the manufacture of photosensitive screens and as mordant in the manufacture of textiles. Minor uses seem to comprise metal treatment and laboratory analytical agent. |
| Boric acid | | 10043-35-3<br>11113-50-1 | 233-139-2<br>234-343-4 | $BH_3O_3$ | Boric acid is widely used on account of its consistency-influencing, flame-retarding, antiseptic and preservative properties. It is a component of detergents and cleaners, adhesives, toys, industrial fluids, brake fluids, glass, ceramics, flame retardants, paints, disinfectants, cosmetics, food additives, fertilisers, insecticides and other products. |
| Disodium tetraborate, anhydrous | Disodium tetraborate decahydrate, Disodium tetraborate anhydrous, Disodium tetraborate pentahydrate, borax decahydrate, boric acid, disodium salt, borax pentahydrate | 1303-96-4<br>1330-43-4<br>12179-04-3 | 215-540-4 | $Na_2B_4O_7{\cdot}10H_2O$<br>$Na_2B_4O_7$<br>$Na_2B_4O_7{\cdot}5H_2O$ | Disodium tetraborate and tetraboron disodium heptaoxide form the same compounds in aqueous solutions. Uses include a multitude of applications, for example, in detergents and cleaners, in glass and glass fibres, ceramics, industrial fluids, metallurgy, adhesives, flame retardants, personal care products, biocides, fertilisers. |
| Potassium chromate | Dipotassium chromate, Bipotassium chromate, Dipotassium monochromate, Bipotassium monochromate, Neutral potassium chromate, Potassium chromate (VI), Chromate of potash (potass), Chromic acid dipotassium salt | 7789-00-6 | 232-140-5 | $K_2CrO_4$ | Potassium chromate is used as a corrosion inhibitor for treatment and coating of metals, for manufacture of reagents, chemicals and textiles, as a colouring agent in ceramics, in the manufacture of pigments/inks and in the laboratory as analytical agent. |
| Potassium dichromate | Chromic acid [$H_2Cr_2O_7$] dipotassium salt, dichromic acid dipotassium salt, dipotassium bichromate, dipotassium dichromate, Lopezite, potassium bichromate, potassium dichromate[VI], dipotassium dichromium hepta-oxide | 7778-50-9 | 231-906-6 | $K_2Cr_2O_7$ | Potassium dichromate is used for chrome metal manufacturing and as corrosion inhibitor for treatment and coating of metals. It is further used as textile mordant, as laboratory analytical agent, for cleaning of laboratory glassware, in the manufacture of other reagents and as oxidising agent in photolithography. |
| Sodium chromate | Disodium chromate, Sodium monochromate, Disodium chromium tetraoxide | 7775-11-3 | 231-889-5 | $Na_2CrO_4$ | Sodium chromate is mainly used as an intermediate in the manufacture of other chromium compounds as well as a laboratory analytical agent, but this use is limited. Other potential uses are mentioned in the literature but whether they occur in the EU is not clear. |
| Tetraboron disodium heptaoxide, hydrate | | 12267-73-1 | 235-541-3 | $B_4Na_2O_7.x$ $H_2O$ | Disodium tetraborate and tetraboron disodium heptaoxide form the same compounds in aqueous solutions. Uses include a multitude of applications, for example, in detergents and cleaners, in glass and glass fibres, ceramics, industrial fluids, metallurgy, adhesives, flame retardants, personal care products, biocides, fertilisers. |
| Trichloroethylene | Acetylene trichloride, Ethinyl trichloride, Trichloroethene, TRI, TRIC, 1-Chloro-2,2-dichloroethylene, 1,1,2-Trichloroethylene, Trilene, Triklone® , Trimar. Industrial abbreviations include trichloroethylene, trichlor, Trike, Tricky and trichloroethylene. | 79-01-6 | 201-167-4 | $C_2$ H $Cl_3$ | Trichlororethylene is mainly used as intermediate in the manufacture of chlorinated and fluorinated organic compounds. Other uses are for cleaning and degreasing of metal parts or as solvent in adhesives. |
| Chromium trioxide | Trioxochromium | 1333-82-0 | 215-607-8 | $CrO_3$ | Formulation of mixtures containing chromium trioxide, which are mainly used for for example, metal finishing/surface treatment or in much smaller amounts as catalysts containing chromium trioxide. |



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**TABLE 1** *Continued*

| Substance Name | Synonym | CAS Number | EU Number | Chemical Formula | Common Uses |
|---|---|---|---|---|---|
| Acids generated from chromium trioxide and their oligomers | Dichromic acid ($H_2Cr_2O_7$), hydroxy-(hydroxy(dioxo)chromio)oxy-dioxochromium, Chromic acid ($H_2CrO_4$), dihydroxy(dioxo)chromium | 13530-68-2<br>7738-94-5 | 236-881-5<br>231-801-5 | $Cr_2H_2O_7$<br>$CrH_2O_4$ | Chromic acid, dichromic acid and oligomers of chromic and dichromic acid are spontaneously generated products of the reaction of chromic trioxide with water. Refer to the uses for chromium trioxide. |
| Cobalt (II) sulphate | Sulfuric acid, cobalt(2+) salt (1:1), | 10124-43-3 | 233-334-2 | $CoH_2O_4S$ | Mainly used in the production of other chemicals. Further applications may include manufacture of catalysts and driers, surface treatments (such as electroplating), corrosion prevention, production of pigments, decolourising (in glass, pottery), batteries, animal food supplement, soil fertilizer, and others. |
| Cobalt (II) dinitrate | | 10141-05-6 | 233-402-1 | $CoN_2O_6$ | Mainly used in the production of other chemicals and the manufacture of catalysts. Further applications may include surface treatment and batteries. |
| Cobalt (II) carbonate | | 513-79-1 | 208-169-4 | $CoCO_3$ | Mainly used in the manufacture of catalysts. Minor uses may include feed additive, production of other chemicals, production of pigments, and adhesion (in ground coat frit). |
| Cobalt (II) diacetate | Cobalt di(acetate) | 71-48-7 | 200-755-8 | $C_4H_6CoO_4$ | Mainly used in the manufacture of catalysts. Minor uses may include production of other chemicals, surface treatment, alloys, production of pigments, dyes, rubber adhesion, and feed additive. |
| 2-Methoxyethanol | ethylene glycol monomethyl ether; EGME, Ethanol, 2-methoxy- | 109-86-4 | 203-713-7 | $C_3H_8O_2$ | Mainly used as solvent, chemical intermediate and additive for fuels. |
| 2-Ethoxyethanol | ethylene glycol monoethyl ether; EGEE, Ethanol, 2-ethoxy- | 110-80-5 | 203-804-1 | $C_4H_{10}O_2$ | Mainly used as solvent and chemical intermediate. |
| 2-ethoxyethyl acetate | Ethanol, 2-ethoxy-, acetate, Ethylglycol acetate; ethylene glycol mono ethyl ether acetate; 2-EEA; acetic acid, 2-ethoxyethyl ester; ethoxyethanol acetate | 111-15-9 | 203-839-2 | $C_6H_{12}O_3$ | As solvent in coatings and in the chemical industry, intermediate in the manufacture of cyanoacrylate adhesives. |
| Strontium chromate | Chromic acid ($H_2CrO_4$), strontium salt (1:1), Chromium diolatodioxo-strontium salt (1:1), C.I. Pigment Yellow 32, Deep Lemon Yellow, Strontium chromate (VI), Strontium Yellow | 7789-06-2 | 232-142-6 | $SrCrO_4$ | As corrosion inhibitor in coating mixtures used in the aeronautic / aerospace sector, in the coil coating sector of steel and aluminium and in the vehicle coating sector. |
| 1,2-Benzenedicarboxylic acid, di-C7-11 branched and linear alkyl esters | Di-$C_7$-11-(linear and branched)-alkyl phthalate, Dialkyl phthalate ($C_7$-11) branched and linear phthalate ester; 711P; D711P; Di-711-phthalate; Dialkyl($C_7$-11-branched and linear) phthalate (DHNUP); Di(heptyl, nonyl, undecyl) phthalate (mixed isomers); Phthalic acid, dialkyl ($C_7$-$C_1$1) ester; Santicizer 711 | 68515-42-4 | 271-084-6 | $C_{22}H_{34}O_4$–$C_{30}H_{50}O_4$ | As plasticiser in PVC, foam, adhesives and coatings. |
| Hydrazine | $H_7$0; $H_7$0 (fuel); Levoxine; Nitrogen hydride($N_2H_4$);Oxytreat 35 | 7803-57-8<br>302-01-2<br>10217-52-4 | 206-114-9 | $H_4N_2$ | As intermediate in the manufacture of hydrazine derivatives, as a monomer in polymerisations, as a corrosion inhibitor in water treatment and for metal reduction and refining of chemicals. It is also used as a propellant for aerospace vehicles and as fuel in military (emergency) power units. |



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**TABLE 1** *Continued*

| Substance Name | Synonym | CAS Number | EU Number | Chemical Formula | Common Uses |
|---|---|---|---|---|---|
| 1-methyl-2-pyrrolidone | 2-Pyrrolidinone, 1-methyl-, 1-Methylpyrrolidin-2-one, 1-Methyl-2-pyrrolidinone 1-Methyl-5-pyrrolidinone 1-Methylazacyclopentan-2-one 1-Methylpyrrolidone AgsolEx 1 M-Pyrol Microposit 2001 N 0131 N-Methyl-α-pyrrolidinone N-Methyl-α-pyrrolidone N-Methyl-γ-butyrolactam N-Methyl-2-ketopyrrolidine N-Methyl-2-pyrrolidinone N-Methyl-2-pyrrolidone N-Methylbutyrolactam N-Methylpyrrolidone NMP NSC 4594 Pharmasolve Pyrol M SL 1332 | 872-50-4 | 212-828-1 | $C_5H_9NO$ | As solvent in coatings, cleaning products, for electronic equipment manufacture, as well as in semiconductor industry, petrochemical processing, pharmaceuticals and agrochemicals. |
| 1,2,3-trichloropropane | Propane, 1,2,3-trichloro-, Allyl trichloride; Glycerol trichlorohydrin; Glyceryl trichlorohydrin; NSC 35403; Trichlorohydrin; | 96-18-4 | 202-486-1 | $C_3\ H_5\ Cl_3$ | Intermediate in the manufacture of chlorinated solvents and agricultural products. It is also used as monomer. In the past, it was used as solvent, paint and varnish remover and as degreasing agent. |
| 1,2-Benzenedicarboxylic acid, di-C6-8-branched alkyl esters, C7-rich | $C_6$-8-(branched)-Alkyl benzene-1,2-dicarboxylate, $C_6$-8-(branched)-Alkyl phthalate, Diisoheptyl phthalate, DIHP | 71888-89-6 | 276-158-1 | | As plasticiser in PVC and in sealants, coatings and potentially printing inks. |
| Dichromium tris(chromate) | Chromic acid ($H_2CrO_4$), chromium(3+) salt (3:2), Dichromium(3+) trichromate, Chromic chromate, Chromium (III) chromate, Dichromium Trischromate, Accomet C; other trade names are confidential | 24613-89-6 | 246-356-2 | $Cr_5O_{12}$ $CrH_2O_4.2/3Cr$ | In mixtures for metal surface treatment in the aeronautic/aerospace, steel, and aluminium coating industries. |
| Potassium hydroxyoctaoxodizincatedi-chromate | | 11103-86-9 | 234-329-8 | | Aeronautic/ aerospace coating, steel and aluminium coil coating, and vehicle coating. |
| Pentazinc chromate octahydroxide | Zinc chromate hydroxide ($Zn5(CrO_4)(OH)8$), Zinc tetraoxychromate, Zinc tetroxy chromate, Zinc chromate, hydroxide, Basic zinc chromate, Zinc chromate, Trizinc, dioxido(dioxo)chromium dihydroxide | 49663-84-5 | 256-418-0 | $CrH_8O_{12}Zn_5$ | Vehicle coating and aeronautic / aerospace coating. |
| Formaldehyde, oligomeric reaction products with aniline (technical MDA) | Formaldehyde, polymer with benzenamine, polymeric MDA3, PMDA, MDA, technical grade, crude MDA | 25214-70-4 | 500-036-1 | $(C_6H_7N.CH_2O)x$ | Manufacture of other substances. Minor uses are as ion exchange resins in nuclear power plants, as hardener for epoxy resins. |
| Bis(2-methoxyethyl) phthalate | 1,2-Benzenedicarboxylic acid, 1,2-bis(2methoxyethyl) ester, Di(methoxyethyl) phthalate, Bis(methylglycol) phthalate | 117-82-8 | 204-212-6 | $C_{14}H_{18}O_6$ | Plasticiser in polymeric materials and paints, lacquers and varnishes, including printing inks. |



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**TABLE 1** *Continued*

| Substance Name | Synonym | CAS Number | EU Number | Chemical Formula | Common Uses |
|---|---|---|---|---|---|
| 2-Methoxyaniline; o-Anisidine | Benzenamine, 2-methoxy-, 2-methoxybenzenamine | 90-04-0 | 201-963-1 | $C_7H_9NO$ | Manufacture of dyes for tattooing and coloration of paper, polymers and aluminium foil. |
| 4-(1,1,3,3-Tetramethylbutyl)phenol, (4-tert-Octylphenol) | 4-(2,4,4-trimethylpentan-2-yl)phenol, Phenol, 4-(1,1,3,3-tetramethylbutyl)- | 140-66-9 | 205-426-2 | $C_{14}H_{22}O$ | Manufacture of polymer preparations and of ethoxylate surfactants. Also used as a component in adhesives, coatings, inks and rubber articles. |
| 1,2-Dichloroethane | Ethane, 1,2-dichloro-, Ethylene dichloride, dichloroethylene, 1,2-DCE,, 1,2-EDC | 107-06-2 | 203-458-1 | $C_2 H_4 Cl_2$ | Manufacture of other substances. Minor uses as solvent in chemical and pharmaceutical industries. |
| Bis(2-methoxyethyl) ether | Ethane, 1,1'-oxybis[2-methoxy-, 1-methoxy-2-(2-methoxyethoxy)ethane, Diglyme, DEGDME, Diethylenglycoldimethylether, Dimethyldiglycol, 2-(2-Methoxyethoxy)-1-methoxyethane, 2,5,8-Trioxanonane, Di(2, Methoxyethyl) ether, Dimethyl carbitol, Ether, bis(2-methoxyethyl), 1,1'-Oxybis[2-methoxyethane], Methyldiglyme, (CAS registry numbers still in use: 70-992-86-8, 54631-70-8, 142939-39-7 although deleted in CAS, registry) | 111-96-6 | 203-924-4 | $C_6H_{14}O_3$ | Used primarily as a reaction solvent or process chemical in a wide variety of applications. Also used as solvent for battery electrolytes, and possibly in sealants, adhesives, fuels and automotive care products. |
| Arsenic acid | Arsenic acid ($H_3AsO_4$), arsenic acid, trihydroxidooxidoarsenic (IUPAC 2005), Orthoarsenic acid | 7778-39-4 | 231-901-9 | $AsH_3O_4$ | Mainly used to remove gas bubbles from ceramic glass melt (fining agent) and in production of laminated printed circuit boards. Also used in the manufacture of semiconductors and as laboratory agent. |
| Calcium arsenate | Arsenic acid ($H_3AsO_4$), calcium salt (2:3), Tricalcium(2+) diarsenate, Arsenic acid calcium salt; calcium orthoarsenate; tricalcium arsenate | 7778-44-1 | 231-904-5 | $As_2Ca_3O_8$ | Present in complex raw materials that are used mainly for copper and lead refining. Also used to precipitate nickel from the molten metal and to manufacture diarsenic trioxide. |
| Trilead diarsenate | Arsenic acid ($H_3AsO_4$), lead salt (2:3), Trilead (2+) diarsenate, Lead (II) arsenate, lead arsenate | 3687-31-8 | 222-979-5 | $As_2O_8Pb_3$ | Present in complex raw materials for manufacture of copper, lead and a range of precious metals. |
| N,N-dimethylacetamide (DMAC) | Acetamide, N,N-dimethyl-, Acetdimethylamide, DMA, DMAA, DMAc, Dimethylamide acetate, N,N-Dimethylethanamide | 127-19-5 | 204-826-4 | $C_4 H_9 N O$ | Used as solvent, mainly in the manufacture of various substances and in the production of fibres for clothing. Also used as reagent, and in products such as industrial coatings, insulation paper, polyimide films, paint strippers and ink removers. |
| 2,2'-Dichloro-4,4'-methylenedianiline (MOCA) | 4,4'-methylenebis[2-chloroaniline], Benzenamine, 4,4'-methylenebis[2-chloro-, Bisamine A, 2,2'-Dichloro-4,4'-methylenedianiline, 3,3'-Dichloro-4,4'-diaminodiphenylmethane, Bis(4-amino-3-chlorophenyl)methane | 101-14-4 | 202-918-9 | $C_{13}H_{12}Cl_2 N_2$ | Mainly used as curing agent in resins and in the production of polymer articles and also for manufacture of other substances. |
| Phenolphthalein | 1(3H)-Isobenzofuranone, 3,3-bis(4-hydroxyphenyl)-; 3,3-Bis(4-hydroxyphenyl)-2-benzofuran-1(3H)-one; 3,3-Bis(p-hydroxyphenyl)phthalide; 3,3-Bis(4-hydroxyphenyl)phthalide; 3,3-Bis(4-hydroxyphenyl)-1(3H)-isobenzofuranone | 77-09-8 | 201-004-7 | $C_{20}H_{14}O_4$ | Mainly used as laboratory agent (pH indicator solutions). Minor uses are in pharmaceutical preparations and in some special applications. |
| Lead azide Lead diazide | Lead azide ($Pb(N_3)2$); Lead(2+) diazide | 13424-46-9 | 236-542-1 | $N_6$ Pb | Mainly used as initiator or booster in detonators for both civilian and military uses and as initiator in pyrotechnic devices. |



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**TABLE 1** *Continued*

| Substance Name | Synonym | CAS Number | EU Number | Chemical Formula | Common Uses |
|---|---|---|---|---|---|
| Lead styphnate | lead 2,4,6-trinitro-m-phenylene dioxide; 1,3-Benzenediol, 2,4,6-trinitro-, lead(2+) salt (1:1); Lead(2+) 2,4,6-trinitrobenzene-1,3-diolate; 2,4-Dioxa-3-plumbabicyclo[3.3.1]nona-1(9),5,7-triene; 3,3didehydro-6,8,9-trinitro-; Lead, [styphnato(2-)]-; Resorcinol, 2,4,6-trinitro-, lead(2+) salt (1:1); Lead styphnate; Lead tricinate; Lead trinitroresorcinate; Tricinat | 15245-44-0 | 239-290-0 | $C_6$ H $N_3$ $O_8$ Pb | Mainly used as a primer for small calibre and rifle ammunition. Other common uses are in ammunition pyrotechnics, powder actuated devices and detonators for civilian use. |
| Lead dipicrate | Phenol, 2,4,6-trinitro-, lead(2+) salt (2:1); Lead(2+) bis(2,4,6-trinitrophenolate); Lead, bis(picryloxy)-; Phenol, 2,4,6-trinitro-, lead(2+) salt; Picric acid, lead(2+) salt; Lead(II) picrate | 6477-64-1 | 229-335-2 | $C_{12}H_4$ $N_6$ $O_{14}Pb$ | The substance is an explosive like lead diazide and lead styphnate. |
| 1,2-bis(2-Methoxyethoxy)ethane (TEGDME; triglyme) | 2,5,8,11-tetraoxadodecane; Triglyme; TEGDME Triethylene glycol dimethyl ether; Ansul Ether 161; DMTG; Ethane, 1,2-bis(2-methoxyethoxy)-; Glyme 4; Hisolve MTM; Methyltriglyme; NSC 66400 | 112-49-2 | 203-977-3 | $C_8H_{18}O_4$ | Triglyme is used as an inert solvent for grignard-, reduction- and alkylation-reactions. Reactions involving alkali metals can be carried out in triglyme and alkali metal dispersions in triglyme are used for etching of Teflon and Fluoropolymers. Triglyme is also used as an inert solvent for reduction reactions using Sodium borohydride and used as a solvent to carry out methylation reactions using dimethyl carbonate (and other dialkyl carbonates). Triglyme is also used as part of absorbing liquids in the industrial cleaning of gases. Triglyme has been reported to be used in Brake fluids. |
| 1,2-Dimethoxyethane; ethylene glycol dimethyl ether (EGDME) | Ethane, 1,2-dimethoxy-; EGDME; Ethylene glycol dimethyl ether; 1,2-Dimethoxyethane; 1,2-Ethanediol, dimethyl ether; 2,5-Dioxahexane;DME; DME (glycol ether); Dimethyl Cellosolve; Ethylene dimethyl ether; Glycol dimethyl ether; Glyme;Hisolve MMM; Monoethylene glycol dimethyl ether; Monoglyme; NSC 60542; α,β-Dimethoxyethane. | 110-71-4 | 203-794-9 | $C_4H_{10}O_2$ | EGDME is used as a solvent or processing aid in the manufacture or formulation of industrial chemicals. The large majority of the EGDME sold by the producer is used as a site limited processing aid for industrial chemical manufacture. |
| Ammoniumpentadecafluoro otanoate (APFO) | APFO | 3825-26-1 | 223-320-4 | $C_8H_4NF_{15}NO_2$ | PFOA is used as a group name for PFOA and its salts, and PFOA is mainly produced and used as its ammonium salt, ammoniumpentadecafluorootanoate (APFO, CAS Number: 3825-26-1). However, the perfluorooctanoate anion is the molecule of primary interest. APFO and PFOA are sometimes used interchangeably as both PFO-anion and PFOA (neutral species) exist in solution. |



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**TABLE 1** *Continued*

| Substance Name | Synonym | CAS Number | EU Number | Chemical Formula | Common Uses |
|---|---|---|---|---|---|
| C.I. Basic Blue 26 ([4-[[4-anilino-1-naphthyl][4-(dimethylamino)phenyl]methylene]cyclohexa-2,5-dien-1-ylidene]dimethylammonium chloride) | Methanaminium, N-[4-[[4-(dimethylamino)phenyl][4-(phenylamino)-1-naphthalenyl]methylene]-2,5-cyclohexadien-1-ylidene]-N-methyl-, chloride (1:1); 4-{[4-(Dimethylamino)phenyl][4-(phenylamino)naphthalen-1-yl]methylidene}-N,N-dimethylcyclohexa-2,5-dien-1-iminium Chloride; C.I. Basic Blue 26; Methanaminium, N-[4-[[4-(dimethylamino)phenyl][4-(phenylamino)-1-naphthalenyl]methylene]-2,5-cyclohexadien-1-ylidene]-N-methyl-; chloride; Victoria Blue B; ADC Victoria Blue B; Aizen Victoria Blue BH; BTK Victoria Blue; Basazol C Blue 57; Basic Blue; 26; Basic Blue B; Basic Victoria Blue B; Basonyl Blue 640; Basonyl Blue 644; Basovict Victoria Blue; C-WR Blue 8; C.I. 44045; Calcozine Blue B; Conbasic Blue AK; Dycosbasic Victoria Blue B; Flexo Blue 630; Flexo Blue 640; Hecto Blue B; Hidaco Victoria Blue B; Libbase Victoria Blue LB; Lowacryl Blue 26; Mitsui Victoria Blue B; Ravi Victoria Blue ;Tertrophene Blue; Victoria Blue; Victoria Blue 2B; Victoria Blue B 353; Victoria Blue B chloride; Victoria Blue BA; Victoria Blue BH; Victoria Blue BN; Victoria Blue BN CI 44045; Victoria Blue BP; Victoria Blue BS; Victoria Blue BSA; Victoria Blue BX; Victoria Blue FB; Victoria Pure Blue B; Victoria Pure Blue BC | 2580-56-5 | 219-943-6 | $C_{33}H_{32}ClN_3$ | Basic Blue 26 is used in inks, dyes, paints, and pigments. Among potential uses registered by companies in the Colour Index (2012)7, for products (dyestuff) containing Basic Blue 26, are in printing inks (according to Gessner and Mayer, 2000, melted in oleic or stearic acid), spirit inks, and pigments. According to Denmal et al. (2010), blue and black ball point pen inks may contain Basic Blue 26; with around 80% of blue and black ball point pen inks containing “Basic Violet 3 and its homologues”. |



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**TABLE 1** *Continued*

| Substance Name | Synonym | CAS Number | EU Number | Chemical Formula | Common Uses |
|---|---|---|---|---|---|
| C.I. Basic Violet 3 | [4-[4,4'-bis(dimethylamino) benzhydrylidene]cyclohexa-2,5-dien-1-ylidene] dimethylammonium chloride; Methanaminium, N-[4-[bis[4-(dimethylamino)phenyl] methylene]-2,5-cyclohexadien-1-ylidene]-N-methyl-, chloride(1:1); 4-{Bis[4-(dimethylamino)phenyl] methylidene}-N,N-dimethylcyclohexa-2,5-dien-1-iminium; Chloride; Basic Violet 3; Crystal Violet Technical; Crystal Violet USP; Gentersal; Gentian violet; Gentian Violet B; Gentiaverm; Genticid; Gentioletten; Hecto Violet R; Hectograph Violet SR; Hexamethyl violet; Hexamethyl-p-rosaniline chloride; Hexamethylpararosaniline chloride | 548-62-9 | 208-953-6 | $C_{25}H_{30}ClN_3$ | The main uses of C.I. Basic Violet 3 are as a dye in ink applied in cartridges for printers and in ball pens and as dyestuff for paper colouring. Minor dyestuff uses include carbon papers (where dyestuff is suspended in wax and applied to a thin impregnated paper), staining of dried flowers/plants (dried plants dyed by immersion in a hot water solution of the dyestuff) and as a marker (i.e. where dyestuff is used to improve the visibility of a liquid). Furthermore, C.I. Basic Violet 3 is used in microbial and clinical laboratories (for example, as stain to distinguish gram negative from gram positive bacteria) in presumably thousands of laboratories and teaching institutions around Europe. |
| C.I. Solvent Blue 4;(α,α-bis[4-(dimethylamino)phenyl]-4 (phenylamino)naphthalene-1-methanol); | [4-(Dimet; hylamino)-5,8-dihydronaphthalen-1-yl]{bis[4-(dimethylamino)phenyl]}methanol; Victoria Blue B; Base B Baso Blue 645; Aizen Victoria Blue B Base; Brilliant Oil Blue B Base; C.I. 44045B; Fast Oil Blue B Base; Victoria Blue B Base; -Victoria Blue BA Base; Victoria Blue BDP Base; Victoria Blue Base; Victoria Blue Base B; Victoria Blue Base FB; Waxoline Victoria Blue B | 6786-83-0 | 229-851-8 | $C_{33}H_{33}N_3$ O | The main use of the substance is in the production of inks. |
| C.I. Solvent Violet 8;(4,4'-bis(dimethylamino)-4''-(methylamino)trityl alcohol) | Benzenemethanol, α,α-bis[4-(dimethylamino)phenyl]-4-(methylamino)-; Bis[4-(dimethylamino)phenyl][4-(methylamino)phenyl]methanol; | 561-41-1 | 209-218-2 | $C_{24}H_{29}N_3$ O | Uses of 4,4'-bis(dimethylamino)-4''-(methylamino)trityl alcohol are as formulation and production of writing inks. |
| Di-n-pentyl phthalate | | 131-18-0 | 205-017-9 | | Undetermined |
| Diboron trioxide, boric oxide | Boron oxide ($B_2O_3$); diboron trioxide | 1303-86-2 | 215-125-8 | $B_2O_3$ | Undetermined |
| Diisopentylphthalate | | 605-50-5 | 210-088-4 | | Undetermined |
| Distillates (coal tar), heavy oils | | 90640-86-1 | 292-607-4 | | Undetermined |
| Distillates (coal tar), heavy oils, pyrene fraction | | 91995-42-5 | 295-304-5 | | Undetermined |
| Distillates (coal tar), pitch, pyrene fraction | | 91995-52-7 | 295-313-4 | | Undetermined |
| Formamide | | 75-12-7 | 200-842-0 | $CH_3NO$ | Although formamide is not registered for consumer use it was measured in toys like wooden toys (Danish EPA, 2005) and foam puzzle mats as well as in fitness and exercise mats which are made of ethylene vinyl acetate (EVA). |
| Further Arsenic compounds | | | | | Undetermined |



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**TABLE 1** *Continued*

| Substance Name | Synonym | CAS Number | EU Number | Chemical Formula | Common Uses |
|---|---|---|---|---|---|
| Lead(II) bis(methanesulfonate) | Methanesulfonic acid, lead(2+) salt (2:1); Methanesulfonic acid, lead(2+) salt; Lead methane sulphonate; Lead salt FP (trade name); Methanesulfonicacid,lead(2+)salt; Lead Methane Sulfate; lmethanesulfonic acid, lead(II) salt; Lead methyl sulfonate | 17570-76-2 | 401-750-5 | $C_2 H_6 O_6 Pb S_2$ | Methanesulphonic acid-based plating technology is the dominant electrolytic plating process for high-speed reel-to-reel processing of electronic components. |
| Michler's Base;(N,N,N',N'-tetramethyl-4,4'-methylenedianiline) | Benzenamine, 4,4'-methylenebis[N,N-dimethyl-; 4,4'-methylenebis(N,N-dimethylaniline); Aniline, 4,4'-methylenebis[N,N-dimethyl-(6CI,7CI,8CI); Aniline, p,p'-methylenedi- (4CI); 4,4'-(Dimethylamino)diphenylmethane; 4,4'-Bis(dimethylamino)diphenylmethane; 4,4'-Bis(dimethylaminophenyl)methane; 4,4'-Methylenebis[N,N-dimethylaniline]; 4,4'-Methylenebis[N,N dimethylbenzenamine]; 4,4'-Tetramethyldiaminodiphenylmethane; Arnold's base; Bis[4-(N,N-dimethylamino)phenyl]methane; Bis[4-(dimethylamino)phenyl]methane; Bis[p-(N,N-dimethylamino)phenyl]methane; Bis[p-(dimethylamino)phenyl]methane; Michler's Base; Michler's hydride; Michler's methane; N,N,N',N-Tetramethyl-4,4'-methylenedianiline; N,N,N',N'-Tetramethyl-4,4'-diaminodiphenylmethane; N,N,N',N'-Tetramethyl-p,p'-diaminodiphenylmethane; NSC 36782; NSC 4892; NSC 9029; Reduced Michler's ketone; Tetrabase; Tetramethyldiaminodiphenylmethane; p,p'-Bis(dimethylamino)diphenylmethane; p,p'-Tetramethyldiaminodiphenylmethane | 101-61-1 | 202-959-2 | $C_{17}H_{22}N_2$ | Used as chemical intermediate in the manufacture of dyes and pigments, also used as chemical intermediate in the manufacture of its hydrochloric salt. The latter is used as an analytical reagent for the determination of lead. |



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**TABLE 1** *Continued*

| Substance Name | Synonym | CAS Number | EU Number | Chemical Formula | Common Uses |
|---|---|---|---|---|---|
| Michler's Ketone;(4,4'-bis(dimethylamino) benzophenone) | Methanone, bis[4-(dimethylamino)phenyl]-; bis[4-(dimethylamino)phenyl]methanone; Benzophenone, 4,4'-bis(dimethylamino)- (6CI,8CI); 4,4'-Bis(N,N-dimethylamino)benzophenone; 4,4'-Bis(dimethylamino)benzophenone; 4,4'-Tetramethyldiaminobenzophenone; Bis(4-dimethylaminophenyl) ketone; Bis[(4-dimethylamino)phenyl]methanone; Bis[p-(N,N-dimethylamino)phenyl] ketone; DABP; Di(p-dimethylamino)benzophenone; Michler's ketone; N,N,N',N'-Tetramethyl-4,4'-diaminobenzophenone; NSC 9602; Nisso Cure MABP; S 112; S 112 (ketone); p,p'-Bis(dimethylamino)benzophenone; p,p'-Tetramethyldiaminobenzophenone | 90-94-8 | 202-027-5 | $C_{17}H_{20}N_2O$ | Michler's ketone is an important intermediate in the manufacture of triphenylmethane dyes. |
| Perfluorooctanic acid (PFOA) | Pentadecafluorooctanoic acid | 335-67-1 | 206-397-9 | $C_8HF_{15}O_2$ (PFOA) | PFOA is used in a variety of commercial applications as refrigerants, surfactants and polymers, and as components of pharmaceuticals, fire retardants, lubricants, adhesives, paints, cosmetics, paper coatings, and insecticides. |
| Residues (coal tar), pitch distn. | | 92061-94-4 | 295-507-9 | | Undetermined |



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**TABLE 1** *Continued*

| Substance Name | Synonym | CAS Number | EU Number | Chemical Formula | Common Uses |
|---|---|---|---|---|---|
| TGIC (1,3,5-tris(oxiranylmethyl)-1,3,5-triazine-2,4,6(1H,3H,5H)-trione) | 1,3,5-Triazine-2,4,6(1H,3H,5H)-trione, 1,3,5-tris(2-oxiranylmethyl)- (a combination of α and ß isomers of TGIC); 1,3,5-Tris(oxiran-2-ylmethyl)-1,3,5-triazinane-2,4,6-trione (a combination of α and ß-isomers); triglycidyl isocyanurate; TGIC; 1,3,5-triglycidyl isocyanurate; 1,3,5-triglycidyl-s-triazinetrione; 1,3,5-tris(2,3-epoxypropyl)-s-triazine-2,4,6(1H,3H,5H)-; trione; tris(2,3-epoxypropyl)isocyanurate; 1,3,5-Triglycidyl-s-triazine-2,4,6-trione; 1,3,5-Triglycidylhexahydro-1,3,5-triazine-2,4,6-trione; 1,3,5-Triglycidylisocyanuric acid; 1,3,5-Tris(2,3-epoxypropyl) isocyanurate; 1,3,5-Tris(oxiran-2-ylmethyl)-1,3,5-triazine-2,4,6-trione; 1,3,5-Tris(oxiranylmethyl)-1,3,5-triazine-2,4,6-trione; Glycidyl isocyanurate; N,N',N''-Triglycidyl isocyanurate; NSC 269934; PTGIC; TGT; Triglycidyl isocyanurate; Tris(2,3-epoxypropyl) isocyanurate; Tris(epoxypropyl) isocyanurate; TEPIC; Araldite PT 810; TK 10622 | 2451-62-9 | 219-514-3 | $C_{12}H_{15}N_3O_6$ | TGIC is an epoxy compound that is used as a hardener in resins and coatings. The main use is in polyester powder coatings for metal finishing. |
| β-TGIC; (1,3,5-tris[(2S and 2R)-2,3-epoxypropyl]-1,3,5-triazine-2,4,6-(1H,3H,5H)-trione) | 1,3,5-Triazine-2,4,6(1H,3H,5H)-trione, 1,3,5-tris[(2R)-2-oxiranylmethyl]-, rel-; reaction mass of 1,3,5-tris[(2R)-oxiran-2-ylmethyl]-1,3,5-triazinane-2,4,6-trione and 1,3,5-tris[(2S)-oxiran-2-ylmethyl]1,3,5-triazinane-2,4,6-trione; triglycidyl isocyanurate; TGIC; 1,3,5-triglycidyl isocyanurate;1,3,5-triglycidyl-s-triazinetrione; 1,3,5-tris(2,3-epoxypropyl)-s-triazine-2,4,6(1H,3H,5H)-trione; tris(2,3-epoxypropyl)isocyanurate; ß—Triglycidyl isocyanates; NSC 296964; TEPIC-H | 59653-74-6 | 423-400-0 | $C_{12}H_{15}N_3O_6$ | TGIC is an epoxy compound that is used as a hardener in resins and coatings. The main use is in polyester powder coatings for metal finishing. |



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**TABLE 1** *Continued*

| Substance Name | Synonym | CAS Number | EU Number | Chemical Formula | Common Uses |
|---|---|---|---|---|---|
| Cadmium | Cd rod<br>Cd stangen<br>kadmium stangen | 7440-43-9 | 231-152-8 | Cd | In the environment cadmium is mainly associated with zinc but also with lead and copper. Anthropogenic sources include by-products of the metallurgy of these elements. The release of cadmium into the human environment occurs via emission from mining activities and metal industries (the smelting of other metals), the combustion of fossil fuels, the incineration of waste materials or inappropriate waste disposal, leaching from landfill sites and the use of cadmium-rich phosphate fertilizers and sewage sludge. These anthropogenic activities have contributed to the contamination by cadmium of the food chain. However, there are also areas with naturally elevated cadmium concentrations in soil. Because cadmium is easily taken up by many plants, plant-based food, in particular wheat, rice and potatoes, is a major source of exposure to cadmium. Another source of exposure is tobacco smoking, mainly because the absorption in the lungs is higher than in the gastrointestinal tract. |
| Dipentyl phthalate (DPP) | 1,2-Benzenedicarboxylic acid, 1,2-dipentyl ester<br>1,2-Benzenedicarboxylic acid, dipentyl ester<br>Amoil<br>Amyl phthalate<br>Di-N-Pentyl Phthalate<br>Di-n-pentylphthalatediamyl phthalate<br>Dipentyl 1,2-benzenedicarboxylate<br>Dipentyl phthalate<br>Phthalic acid, diamyl ester<br>Phthalic acid, dipentyl ester<br>di-n-pentylphthalate<br>Diamyl Phthalate<br>Dipentyl phthalate | 131-18-0 | 205-017-9 | $C_{18}H_{26}O_4$ | Phthalates in general are used in a large variety of products, from enteric coatings of pharmaceutical pills and nutritional supplements to viscosity control agents, gelling agents, film formers, stabilizers, dispersants, lubricants, binders, emulsifying agents, and suspending agents. End-applications include adhesives and glues, agricultural adjuvants, building materials, personal-care products, medical devices, detergents and surfactants, packaging, children's toys, modeling clay, waxes, paints, printing inks and coatings, pharmaceuticals, food products, and textiles. Phthalates are also frequently used in soft plastic fishing lures, caulk, paint and pigments. Phthalates are used in a variety of household applications such as shower curtains, vinyl upholstery, adhesives, floor tiles, food containers and wrappers, and cleaning materials. Personal-care items containing phthalates include perfume, eye shadow, moisturizer, nail polish, liquid soap, and hair spray. They are also found in modern electronics and medical applications such as catheters and blood transfusion devices. |
| 4-Nonylphenol, branched and linear, ethoxylated [substances with a linear and/or branched alkyl chain with a carbon number of 9 covalently bound in position 4 to phenol, ethoxylated covering UVCB- and well-defined substances, polymers and homologues, which include any of the individual isomers and/or combinations thereof] | | Including<br>26027-38-3<br>7311-27-5<br>20427-84-3<br>34166-38-6<br>27942-27-4<br>14409-72-4 | Including<br>230-770-5<br>243-816-4<br>248-743-1 | $(C_2H_4O)n$<br>$C_{15}H_{24}O$,<br>with $n \geq 1$<br>Including<br>$(C_2H_4O)n$<br>$C_{15}H_{24}O$<br>$C_{23}H_{40}O_5$<br>$C_{19}H_{32}O_3$<br>$C_{27}H_{48}O_7$<br>$C_{29}H_{52}O_8$<br>$C_{33}H_{60}O_{10}$ | 4-Nonylphenol, branched and linear, ethoxylated (4-NPnEO) degrade to 4-Nonylphenol, branched and linear, either already in wastewater treatment plants, or via further degradation processes in sediments (e.g. of aquatic bodies receiving the wastewater effluents) and soils (e.g. receiving sewage sludge). Available information for 4-NPnEO indicate that 4-NPnEO contribute to the 4-NP concentration in the environment. A significant amount is either degraded to 4-NP itself in waste water treatment plants or is released to rivers in a form which may undergo further degradation to 4-NP. According to available data from sewage treatment plants, 4-NP formed from degradation of 4-NPnEO is responsible for an increase of the 4-NP load to the environment (soil, sediment and water) by 54 to 758 %. Sediment organisms may be exposed to 4-NP, which results from the degradation of 4-NPnEO, either directly, downstream of the effluent, or in the longer term after its adsorption to sediment and soil. Similar holds true for pelagic organisms such as fish which may be exposed via remobilization of 4-NP from sediment to the water body. |



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**TABLE 1** *Continued*

| Substance Name | Synonym | CAS Number | EU Number | Chemical Formula | Common Uses |
|---|---|---|---|---|---|
| Cadmium oxide | Cadmium(II)oxide<br>Cadmium monoxide<br>Monteponite<br>Tienek kadmu | 1306-19-0<br>12139-21-8<br>(Monteponite (CdO)) | 215-146-2 | CdO | Cadmium is a natural element, which is present in all environmental compartments (as $Cd^{++}$). Cadmium emissions to the environment may therefore arise from both natural and anthropogenic or man-made sources. Estimates of the proportion of total cadmium emissions due to natural sources have ranged from 10 % to 50 %. Some of these natural emission sources include weathering and erosion of parent rocks, volcanic activity and forest fires (ICdA 2012). The overall cadmium anthropogenic exposure is then in the range of 50 to 90 %. When cadmium ions are present in the environment, they will interact with the environmental matrix and biota. The fate will depend on processes like dissolution, absorption, precipitation, complexation, inclusion into (soil) matrix, etc. In freshwater or seawater cadmium may occur in both suspended and dissolved forms and is partitioned over a number of chemical species. In the water, cadmium interacts with components of the water and influences the bioavailability. In sediment, cadmium binds to the sulphide fraction to form less soluble CdS. |
| Hexahydromethylphthalic anhydride [1], Hexahydro-4-methylphthalic anhydride [2], Hexahydro-1-methylphthalic anhydride [3], Hexahydro-3-methylphthalic anhydride [4] [The individual isomers [2], [3] and [4] (including their cis- and trans- stereo isomeric forms) and all possible combinations of the isomers [1] are covered by this entry] | MHHPA<br>HN-5500<br>Methylhexahydrophthalic anhydride<br>Hexahydromethylphthalic anhydride<br>1,3-Isobenzofuranedion, hexahydromethyl | 25550-51-0<br>19438-60-9<br>48122-14-1<br>57110-29-9 | 247-094-1<br>243-072-0<br>256-356-4<br>260-566-1 | $C_9H_{12}O_3$ | MHHPA is a thermo-setting epoxy resin curing agent mainly used in electric and electron field. MHHPA is widely used for impregnating electrical coils, casting electricity components and sealing semiconductors, e.g. outdoor insulators, capacitors, light emitting diodes and digital displays. MHHPA is commonly used in a specific mixture with HHPA. |
| 6-methoxy-m-toluidine (p-cresidine) | Benzenamine, 2-methoxy-5-methyl-<br>Anisidine, 5-methyl-<br>1-Amino-2-methoxy-5-methylbenzene<br>2-Methoxy-5-methylaniline<br>2-Methoxy-5-methylbenzenamine<br>3-Amino-4-methoxytoluene<br>3-Methyl-6-methoxyaniline<br>4-Methyl-2-aminoanisole<br>5-Methyl-2-methoxyaniline<br>5-Methyl-o-anisidine<br>6-Methoxy-m-toluidine<br>Cresidine<br>Krezidin<br>m-Amino-p-cresol methyl ether<br>p-Cresidine | 120-71-8 | 204-419-1 | $C_8H_{11}NO$ | P-Cresidine is used exclusively as a synthetic chemical intermediate to produce azo dyes and pigments, such as Direct Orange 72, FD&C Red 40, and Direct Violet 9. These dyes are produced commercially in the United States and are used in the textile industry. P-Cresidine was selected for bioassay by the National Cancer Institute in response to the high incidence of bladder cancer observed among dye manufacturing industry workers. |



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**TABLE 1** *Continued*

| Substance Name | Synonym | CAS Number | EU Number | Chemical Formula | Common Uses |
|---|---|---|---|---|---|
| Cyclohexane-1,2-dicarboxylic anhydride [1], cis-cyclohexane-1,2-dicarboxylic anhydride [2], trans-cyclohexane-1,2-dicarboxylic anhydride [3] [The individual cis- [2] and trans- [3] isomer substances and all possible combinations of the cis- and trans-isomers [1] are covered by this entry] | hexahydro-2-benzofuran-1,3-dione<br>HHPA<br>Hexahydro-isobenzofuran-1,3-dione<br>Hexahydrophthalic anhydride<br>Cyclohexane-1,2-dicarboxylic anhydride<br>1,3-Isobenzofurandione, hexahydro-<br>1,2-Cyclohexanedicarboxylic Anhydride<br>1,3-Isobenzofurandione, hexahydro-, (3aR,7aR)-rel-(3aR*,7aR*)-Hexahydro-2-benzofuran-1,3-dione<br>trans-Cyclohexane-1,2-dicarboxylic anhydride<br>Hexahydro-2-benzofuran-1,3-dione, trans | 85-42-7<br>13149-00-3<br>14166-21-3<br>Including<br>95327-28-9<br>102483-85-2<br>109265-67-0<br>117276-22-9<br>97233-90-4<br>128049-67-2 | 201-604-9<br>236-086-3<br>238-009-9 | $C_8H_{10}O_3$ | The substance can be found in plant producing capacitors, fixed and isolated with epoxy resin with HHPA and MHHPA as hardeners. |
| Pyrochlore, antimony lead yellow | C.I. Pigment Yellow 41<br>Lead antimonite<br>Antimony lead yellow<br>Antimony yellow<br>C.I. 77588<br>Lead antimonate yellow<br>Lead antimonate yellow pyrochlore<br>Lead antimony yellow pyrochlore<br>Naples yellow<br>Pigment Yellow 41<br>Sicocer F Orange 2208 | 8012-00-8 | 232-382-1 | | It is a poisonous, water-insoluble orange-yellow powder, used as a paint pigment and to stain glass and ceramics. |
| Henicosafluoroundecanoic acid | Henicosafluoroundecanoic acid<br>C11-PFCA<br>Perfluoroundecanoic acid<br>Perfluoroundecylic acid | 2058-94-8<br>110961-38-1 | 218-165-4 | $C_{11}HF_{21}O_2$ | Perfluoroalkyls are stable unique chemicals that they repel oil, grease, and water. They have been used in surface protection products such as carpet and clothing treatments and coatings for paper and cardboard packaging. Perfluoroalkyls have been used in fire-fighting foams. |
| 4-Aminoazobenzene | Benzenamine, 4-(2-phenyldiazenyl)-<br>4-(Phenylazo)aniline<br>Benzenamine, 4-(phenylazo)-<br>C.I. Solvent Yellow 1<br>4-(Phenylazo)aniline<br>4-(Phenylazo)benzenamine;<br>4-Aminoazobenzene<br>4-Aminoazobenzol<br>Aniline yellow; Brasilazina Oil Yellow G; p-(Phenylazo)aniline<br>p-Aminoazobenzene<br>p-Aminoazobenzol<br>p-Aminodiphenylimide | 60-09-3 | 200-453-6 | $C_{12}H_{11}N_3$ | It is used in the form of its salts as a dye and as an intermediate in manufacture of Acid Yellow, diazo dyes, and indulines. |
| Silicic acid, lead salt | Lead(2+) silicate | 11120-22-2 | 234-363-3 | $O_3PbSi$ | It is used in ceramics and fireproofing fabrics. This material is used as anti-X-ray absorbers CPT, but also for the glass enamel industry. It is an important raw material and intermediate used in Organic Synthesis, Pharmaceuticals, and Agrochemicals. |



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**TABLE 1** *Continued*

| Substance Name | Synonym | CAS Number | EU Number | Chemical Formula | Common Uses |
|---|---|---|---|---|---|
| Lead titanium zirconium oxide | Lead titanium zirconium oxide ($Pb(Ti,Zr)O_3$)<br>Lead titanium zirconium trioxide<br>Lead titanate zirconate<br>Lead titanate zirconate ($Pb(Ti,Zr)O_3$)<br>Lead titanate zirconate (PbTi0-1Zr0-1$O_3$)<br>Lead titanium zirconium oxide (PbTi0-1Zr0-1$O_3$)<br>Lead zirconate titanate | 12626-81-2 | 235-727-4 | (Pbx Tiy Zrz) $O_3$ | It is used in electronics (stereos, transducers, computer memory, ceramic filters, resonators, traps, piezoelectric). |
| Lead monoxide (lead oxide) | C.I. 77577<br>C.I. Pigment Yellow 46<br>Lead monooxide<br>Lead oxide<br>Lead oxide yellow<br>Lead protoxide<br>Lead(2+) oxide<br>Lead(II) oxide<br>Pigment Yellow 46<br>Plumbous oxide<br>Yellow lead ochre | 1317-36-8 | 215-267-0 | OPb | It is used in lead-based industrial glass and industrial ceramics, including computer components. Other less dominating applications include the vulcanization of rubber and the production of certain pigments (e.g., litharge, massicot) and paints (yellow, exterior primers). |
| o-Toluidine | Benzenamine, 2-methyl-<br>2-Methylaniline<br>1-Amino-2-methylbenzene<br>2-Amino-1-methylbenzene<br>2-Aminotoluene<br>2-Methyl-1-aminobenzene<br>2-Methylbenzenamine<br>2-Methylphenylamine<br>2-Tolylamine<br>o-Aminotoluene<br>o-Methylaniline<br>o-Methylbenzenamine | 95-53-4 | 202-429-0 | $C_7H_9N$ | 2-Tolidine is a commercially important aromatic amine used mainly for dye production, but also for the production of certain elastomers. 2-Tolidine is an intermediate for the production of soluble azo dyes and insoluble pigments used particularly in the textile, leather and paper industries. 2-Tolidine also widely used as a reagent or indicator in analytical, clinical and forensic chemistry, such as in the analytical determination of gold. |
| 3-ethyl-2-methyl-2-(3-methylbutyl)-1,3-oxazolidine | Oxazolidine, 3-ethyl-2-methyl-2-(3-methylbutyl)-<br>Zoldine MS-PLUS | 143860-04-2 | 421-150-7 | $C_{11}H_{23}NO$ | It is a fast reacting, low viscosity oxazolidine-based moisture scavenger for use in urethane coatings, sealants and elastomers. |
| Dibutyltin dichloride (DBTC) | stannane, dibutyldichloro-<br>Axion CS 2430<br>DBTCl<br>Dibutyltindichloride (DBTC)<br>Dibutyldichlorostannane<br>Tin dibutyl-dichloride | 683-18-1 | 211-670-0 | $C_8H_{18}Cl_2Sn$ | Dibutyltin dichloride (DBTC) is widely used as a stabilizer for polyvinylchloride plastics. |
| Lead bis(tetrafluoroborate) | Borate(1-), tetrafluoro-, lead(2+) (2:1)<br>Lead(2+) ditetrafluoroborate<br>Borate(1-), tetrafluoro-, lead(2+)<br>Lead fluoborate ($Pb(BF_4)_2$)<br>Lead tetrafluoroborate ($Pb(BF_4)_2$)<br>Lead boron fluoride<br>Lead fluoroborate<br>Lead fluoroborate ($Pb(BF_4)_2$)<br>Lead(II) tetrafluoroborate | 13814-96-5 | 237-486-0 | $B_2F_8Pb$ | Fluoroboric acid is used in plating circuits; metal finishing; electropolishing of aluminium and its alloy; component of galvanic baths; organic synthesis as catalyst for alkylations and polymerisation; stabilisation of diazo salts; manufacturing of inorganic fluoroborate salts.<br>Inorganic fluoroborate salts are used as components of fluxing and plating, as catalysts, in flame-retardant manufacture, in metal treatment; grain refining agents; as active fillers in resin bonded abrasives; in electrolytic generation of boron, preparation of glazing frits. |



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**TABLE 1** *Continued*

| Substance Name | Synonym | CAS Number | EU Number | Chemical Formula | Common Uses |
|---|---|---|---|---|---|
| Lead dinitrate | Nitric acid, lead(2+) salt (2:1)<br>Lead(2+) dinitrate<br>Nitric acid, lead(2+) salt<br>Lead dinitrate;<br>Lead nitrate;<br>Lead nitrate ($Pb(NO_3)_2$);<br>Lead(2+) bis(nitrate);<br>Lead(2+) nitrate;<br>Lead(II) dinitrate;<br>Lead(II) nitrate;<br>Plumbous nitrate | 10099-74-8 | 233-245-9 | $N_2O_6Pb$ | It is used as heat stabiliser in nylon and polyesters, as a coating for photothermographic paper, and in rodenticides. |
| Silicic acid ($H_2Si_2O_5$), barium salt (1:1), lead-doped [with lead (Pb) content above the applicable generic concentration limit for 'toxicity for reproduction' Repr. 1A (CLP) or category 1 (DSD); the substance is a member of the group entry of lead compounds, with index number 082-001-00-6 in Regulation (EC) No 1272/2008] | Barium silicate, lead-doped | 68784-75-8 | 272-271-5 | | It is used in specialty fluorescent lamps, particularly for tanning applications. |



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**TABLE 1** *Continued*

| Substance Name | Synonym | CAS Number | EU Number | Chemical Formula | Common Uses |
|---|---|---|---|---|---|
| Trilead bis(carbonate)dihydroxide | Lead carbonate hydroxide ($Pb_3(CO_3)_2(OH)_2$)<br>Lead(2+) carbonate hydroxide (3:2:2)<br>Lead carbonate ($2PbCO_3.Pb(OH)_2$)<br>Lead carbonate hydroxide ($2PbCO_3.Pb(OH)_2$)<br>Lead, bis(carbonato)dihydroxytri-<br>Lead, bis[carbonato(2-)] dihydroxytri-Almex<br>Basic carbonate white lead<br>Basic lead carbonate<br>Basic lead carbonate ($2PbCO_3.Pb(OH)_2$)<br>Berlin White<br>C.I. 77597<br>C.I. Pigment White 1<br>Carbonic acid, lead salt, basic<br>Cremnitz White<br>Dutch White Lead<br>Enpaku<br>Flake White<br>Krems White<br>Lead carbonate hydroxide ($Pb_3(OH)_2(CO_3)_2$)<br>Lead carbonate oxide ($Pb_3O(CO_3)_2$), monohydrate<br>Lead hydroxide carbonate [$2PbCO_3.Pb(OH)_2$]<br>Lead subcarbonate<br>Lead white<br>Novade<br>Rolite lead<br>Silver White<br>Slate White<br>Stabilisator 5012NS<br>Tricarbonatodihydroxytrilead<br>Venetian White<br>White Lead Wartburg<br>White lead | 1319-46-6 | 215-290-6 | $C_2H_2O_8Pb_3$ | Found naturally as the mineral hydrocerussite, it is used as pigment (exterior paints, ceramic glazes, temperature-sensitive inks, UV light reflective paints, and iridescent plastic sheets), catalyst for polyesters, curing agent for peroxides in polyethylene wire insulation, smudge-resistant film on electrically sensitive recording sheets, cool gun-propellant stabilizer, and heat stabilizer for PVC polymers. It is also used in lubricating greases, nylon-reinforced fish nets made from PVC fibers, cements, and for making putty and lead carbonate paper and parchment; no longer used as a white hiding pigment in paints. |



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**TABLE 1** *Continued*

| Substance Name | Synonym | CAS Number | EU Number | Chemical Formula | Common Uses |
|---|---|---|---|---|---|
| 4,4'-methylenedi-o-toluidine | Benzenamine, 4,4'-methylenebis[2-methyl-<br>4,4'-Methanediylbis(2-methylaniline)<br>Toluidine, 4,4'-methylenedi-<br>2,2'-Dimethyl-4,4'-methylenedianiline<br>3,3'-Dimethyl-4,4'-diaminodiphenylmethane<br>4,4'-Amino-3,3'-dimethyldiphenylmethane<br>4,4'-Diamino-3,3'-dimethyldiphenylmethane<br>4,4'-Methylenebis(o-toluidine)<br>4,4'-Methylenebis[2-methylaniline]<br>Bis(3-methyl-4-aminophenyl)methane<br>Bis(4-amino-3-methylphenyl)methane<br>Di(3-methyl-4-aminophenyl)methane | 838-88-0 | 212-658-8 | $C_{15}H_{18}N_2$ | The azo-dyes are used in textiles and leather articles, as well as tattoos. |
| Diethyl sulphate | Sulfuric acid, diethyl ester<br>Ethyl sulfate (Et2SO$_4$)<br>DES<br>Ethyl sulfate | 64-67-5 | 200-589-6 | $C_4H_{10}O_4S$ | Diethyl sulfate occurs as a colorless liquid with a peppermint odor. It is used as an alkylating agent to prepare ethyl derivatives of phenols, amines, and thiols. |
| Dimethyl sulphate | Sulfuric acid, dimethyl ester | 77-78-1 | 201-058-1 | $C_2H_6O_4S$ | It is mainly used as a methylating agent in organic synthesis. It is best known as a reagent for the methylation of phenols, amines, and thiols. |
| N,N-dimethylformamide | Formamide, N,N-dimethyl-<br>Dimethylformamide<br>DMF<br>N,N-Dimethylformamide<br>Formamide, N,N-dimethyl- (8CI, 9CI)<br>DMFA<br>N-Formyldimethylamine<br>N,N-Dimethylmethanamide<br>DMF (amide) | 68-12-2 | 200-679-5 | $C_3H_7NO$ | The primary use of dimethylformamide is as a solvent with low evaporation rate. It is used in the production of acrylic fibers and plastics. It is also used as a solvent in peptide coupling for pharmaceuticals, in the development and production of pesticides, and in the manufacture of adhesives, synthetic leathers, fibers, films, and surface coatings. |
| 4-(1,1,3,3-tetramethylbutyl)phenol, ethoxylated [covering well-defined substances and UVCB substances, polymers and homologues] | | | | $(C_2H_4O)n$<br>$C_{14}H_{22}O$ | It is a nonionic surfactant, with excellent emulsifying and high detergency properties. End applications include: detergents and Industrial cleaners, dispersants, Stabilizers, Sanitizers, defoaming agents. agrochemical emulsifiers, metal working, textile processing, paper de-inking, drilling products intermediate anionic surfactants synthesis, dust control, adhesive, plastic industry, lube oil, cosmetic and pharmaceuticals. |
| 4-Nonylphenol, branched and linear [substances with a linear and/or branched alkyl chain with a carbon number of 9 covalently bound in position 4 of phenol, covering also UVCB- and well-defined substances which include any of the individual isomers or a combination thereof] | | | | $C_{15}H_{24}O$ | Nonylphenol is a subset of the alkylphenols. Alkylphenols are subjected to ethoxylation to give alkylphenol ethoxylates, which are widely used as industrial surfactants. They are used in applications as disparate as the processing of wool and metals, as emulsifiers for emulsion polymerization, as laboratory detergents, and as pesticides. |
| Furan | | 110-00-9 | 203-727-3 | $C_4H_4O$ | Furan is good solvent. Its usage includes preservatives, fungicides, herbicides, disinfectants, therapeutic agents. It is also used in phenolic resins. Its additional applications include textile wetting agents, fuels, paper pulping agent, antifreezes, and floatation agents. |



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**TABLE 1** *Continued*

| Substance Name | Synonym | CAS Number | EU Number | Chemical Formula | Common Uses |
|---|---|---|---|---|---|
| Lead oxide sulfate | Lead oxide sulfate ($Pb_2O(SO_4)$)<br>Dilead oxide sulphate<br>Lead sulfate ($Pb_2O(SO_4)$)<br>Lead oxide sulfate ($Pb_2(SO_4)O$)<br>Lead sulfate ($Pb_2SO_5$) | 12036-76-9 | 234-853-7 | $O_5Pb_2S$ | Lead oxide sulfate is used in plastics for wire and cables, exterior construction, water pipes, and mini blinds. It is also used in protection for pipes and profiles for cables, gas pipes, and mirror backings. It is also used in manufacturing of active paste for lead acid batteries. |
| Lead titanium trioxide | Lead titanium oxide ($PbTiO_3$)<br>C.I. Pigment Yellow 47<br>Lead titanate<br>Lead titanate ($PbO.TiO_2$)<br>Lead titanate ($PbTiO_3$)<br>Pigment Yellow 47 | 12060-00-3 | 235-038-9 | $O_3PbTi$ | It is used as coloring matter in paints. Lead titanate is one of the end members of the lead zirconate titanate ($Pb[ZrxTi1\text{-}x]O_3$ $0 \leq x \leq 1$, PZT) system, which is technologically one of the most important ferroelectric ceramics. |
| Bis(pentabromophenyl) ether (decabromodiphenyl ether; DecaBDE) | Benzene, 1,1'-oxybis[2,3,4,5,6-pentabromo-]<br>1,1'-Oxybis(pentabromobenzene)<br>decabromodiphenyl ether<br>decabromodiphenyl oxide<br>bis(pentabromophenyl) oxide<br>decabromo biphenyl oxide<br>decabromo phenoxybenzene<br>benzene 1,1' oxybis-, decabromo derivative<br>decaBDE<br>DBDPE<br>DBBE<br>DBBO<br>DBDPO | 1163-19-5<br>109945-70-2<br>145538-74-5<br>1201677-32-8 | 214-604-9 | $C_{12}Br_{10}O$ | DecaBDE is widely detected in the European environment, residing mainly in sediments and soils at concentrations up to several milligrams per kilogram (parts per million) on a dry weight basis. It is also present in many types of aquatic and terrestrial wildlife species (including tissues of sensitive life stages such as bird eggs) at numerous geographical locations; although tissue concentrations are often low (close to the limits of analytical detection, or below), it can attain concentrations up to a few hundred micrograms per kilogram (parts per billion) on a wet weight basis in some top predators. |



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**TABLE 1** *Continued*

| Substance Name | Synonym | CAS Number | EU Number | Chemical Formula | Common Uses |
|---|---|---|---|---|---|
| Dinoseb (6-sec-butyl-2,4-dinitrophenol) | Phenol, 2-(1-methylpropyl)-4,6-dinitro-<br>Phenol, 2-sec-butyl-4,6-dinitro-<br>2,4-Dinitro-6-(1-methylpropyl)phenol<br>2,4-Dinitro-6-sec-butylphenol<br>2-(1-Methylpropyl)-4,6-dinitrophenol<br>2-sec-Butyl-4,6-dinitrophenol<br>4,6-Dinitro-2-(1-methyl-n-propyl)phenol<br>4,6-Dinitro-2-(2-butyl)phenol<br>4,6-Dinitro-2-sec-butylphenol<br>4,6-Dinitro-o-sec-butylphenol<br>6-sec-Butyl-2,4-dinitrophenol<br>Aatox<br>Blaartox BNP 20<br>BNP 30<br>Butaphen<br>Butaphene<br>Chemox P.E.<br>DBNF<br>Desicoil<br>Dibutox<br>Dibutox 20CE<br>DN 289<br>DNBP<br>DNOSBP<br>DNSBP<br>Dow General<br>Dytop<br>Hivertox<br>Ladob<br>Laseb<br>Liro DNBP<br>NSC 202753<br>Premerge<br>Super Kabrol<br>WSX 8365 | 88-85-7 | 201-861-7 | $C_{10}H_{12}N_2O_5$ | It is mainly used in herbicides, insecticides, and pesticides. |
| 1,2-Diethoxyethane | Ethane, 1,2- diethoxy-<br>ethylene glycol diethyl ether<br>EGDEE<br>Ethyl glyme<br>diethyl glycol<br>diethyl cellosolve | 629-14-1 | 211-076-1 | $C_6H_{14}O_2$ | The typical use is as solvents in manufacturing. |
| N-methylacetamide | Acetamide, N-methyl-<br>Monomethylacetamide<br>Methylacetamide | 79-16-3 | 201-182-6 | $C_3H_7NO$ | N-Methylacetamide is used as a chemical intermediate in the production of life science, agrochemicals, electronic materials and construction materials. |
| Tetralead trioxide sulphate | Lead oxide sulfate ($Pb_4O_3(SO_4)$) | 12202-17-4 | 235-380-9 | $O_7Pb_4S$ | Due to good flow properties Tribasic Lead Sulphate is used for making PVC and Board products (Stabilizer of Plastic PVC Products) e.g. rubber, cables, pipes, artificial leather and other products are made using it.<br>Tribasic Lead Sulphate is used in cable sheathing due to good electrical properties; used in production of Pipes for conveyance of gases and liquids and injection moulding. |
| Acetic acid, lead salt, basic | Lead(2+) hydroxide acetate (1:1:1) | 51404-69-4 | 257-175-3 | $C_2H_4O_3Pb$ | Acetic acid, lead salt, basic is used as a chemical intermediate in the manufacture of chemicals and chemical products. |



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**TABLE 1** *Continued*

| Substance Name | Synonym | CAS Number | EU Number | Chemical Formula | Common Uses |
|---|---|---|---|---|---|
| [Phthalato(2-)]dioxotrilead | Lead, [1,2-benzenedicarboxylato (2-)]dioxotri-<br>1,2-Benzenedicarboxylic acid, lead complex | 69011-06-9 | 273-688-5 | $C_8H_4O_6Pb_3$ | [Phthalato(2-)]dioxotrilead is used in plastics for wire and cables, exterior construction, water pipes, and mini blinds. It is also used in protection for pipes and profiles for cables, and gas pipes. |
| Tetraethyllead | Plumbane, tetraethyl-<br>Tetraethylplumbane | 78-00-2 | 201-075-4 | $C_8H_{20}Pb$ | Tetraethyllead (common name tetraethyl lead), abbreviated TEL, is an additive in performance gasoline fuels and some aviation fuels. |
| N-pentyl-isopentylphthalate | 1,2-benzenedicarboxylic acid, 1-(3-methylbutyl) 2-pentyl ester<br>1,2-Benzenedicarboxylic acid, 3-methylbutyl<br>pentyl ester | 776297-69-9 | | $C_{18}H_{26}O_4$ | Phthalates in general are used in a large variety of products, from enteric coatings of pharmaceutical pills and nutritional supplements to viscosity control agents, gelling agents, film formers, stabilizers, dispersants, lubricants, binders, emulsifying agents, and suspending agents. End-applications include adhesives and glues, agricultural adjuvants, building materials, personal-care products, medical devices, detergents and surfactants, packaging, children's toys, modeling clay, waxes, paints, printing inks and coatings, pharmaceuticals, food products, and textiles. Phthalates are also frequently used in soft plastic fishing lures, caulk, paint and pigments. Phthalates are used in a variety of household applications such as shower curtains, vinyl upholstery, adhesives, floor tiles, food containers and wrappers, and cleaning materials. Personal-care items containing phthalates include perfume, eye shadow, moisturizer, nail polish, liquid soap, and hair spray. They are also found in modern electronics and medical applications such as catheters and blood transfusion devices. |
| Pentalead tetraoxide sulphate | Lead oxide sulfate ($Pb_5O_4(SO_4)$)<br>Lead oxide sulfate ($4PbO.PbSO_4$)<br>Tetrabasic lead sulfate | 12065-90-6 | 235-067-7 | $O_8Pb_5S$ | It is used in plastics for exterior construction; plastics use for water pipes; plastics for mini-blinds; protection pipes and profiles for cables; gas pipes; battery plates; mirror backing. |
| Heptacosafluorotetradecanoic acid | Tetradecanoic acid, 2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9, 10,10,11,11,12,12,13,13,14, 14,14-heptacosafluoro-<br>C14-PFCA<br>Perfluoromyristic acid<br>Perfluorotetradecanecarboxylic acid<br>Perfluorotetradecanoic acid | 376-06-7 | 206-803-4 | $C_{14}HF_{27}O_2$ | Perfluoroalkyls are stable unique chemicals that they repel oil, grease, and water. They have been used in surface protection products such as carpet and clothing treatments and coatings for paper and cardboard packaging. Perfluoroalkyls have been used in fire-fighting foams. |
| Tricosafluorododecanoic acid | Dodecanoic acid, 2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9, 10,10,11,11,12,12,12-tricosafluoro-<br>Dodecanoic acid, tricosafluoro-<br>C12-PFCA<br>Perfluorododecanoic acid<br>Perfluorolauric acid | 307-55-1 | 206-203-2 | $C_{12}HF_{23}O_2$ | Perfluoroalkyls are stable unique chemicals that they repel oil, grease, and water. They have been used in surface protection products such as carpet and clothing treatments and coatings for paper and cardboard packaging. Perfluoroalkyls have been used in fire-fighting foams. |
| 1-bromopropane (n-propyl bromide) | Propane, 1-bromo-<br>1-Propyl bromide<br>Propyl bromide<br>n-Propyl bromide | 106-94-5 | 203-445-0 | $C_3H_7Br$ | It is a colorless liquid that is used as a solvent. It is used for the cleaning of metal surfaces, removal of soldering residues from electronic circuit boards. It is also a solvent for adhesives. It has been deployed as a replacement for perchloroethylene as a dry cleaning solvent. |
| Dioxobis(stearato)trilead | Lead, bis(octadecanoato)dioxotri-<br>Octadecanoic acid, lead complex | 12578-12-0 | 235-702-8 | $C_{36}H_{70}O_6Pb_3$ | Dioxobis(stearato)trilead is used as a stabilizer in plastics for wire and cables, exterior construction, water pipes, and mini blinds. It is also used in protection for pipes and profiles for cables, and gas pipes. |
| Pentacosafluorotridecanoic acid | Tridecanoic acid, 2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9, 10,10,11,11,12,12,13,13,13-pentacosafluoro-<br>C13-PFCA<br>Tridecanoic acid, pentacosafluoro-<br>Perfluorotridecanoic acid | 72629-94-8 | 276-745-2 | $C_{13}HF_{25}O_2$ | Perfluoroalkyls are stable unique chemicals that they repel oil, grease, and water. They have been used in surface protection products such as carpet and clothing treatments and coatings for paper and cardboard packaging. Perfluoroalkyls have been used in fire-fighting foams. |



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**TABLE 1** *Continued*

| Substance Name | Synonym | CAS Number | EU Number | Chemical Formula | Common Uses |
|---|---|---|---|---|---|
| Methoxyacetic acid | Acetic acid, 2-methoxy-<br>2-Methoxyacetic acid | 625-45-6 | 210-894-6 | $C_3H_6O_3$ | Methoxyacetic acid is the primary active metabolite of the industrial chemical ethylene glycol monomethyl ether, a component of paints, inks, varnishes and anti-icing additive in jet fuels. |
| Methyloxirane (Propylene oxide) | Oxirane, 2-methyl-<br>2-Methyloxirane<br>Oxirane, methyl-<br>Oxypropylene<br>Propane, 1,2-epoxy-<br>Propylene oxide<br>(±)-1,2-Epoxypropane<br>(±)-2-Methyloxirane<br>(±)-Epoxypropane<br>(±)-Methyloxirane<br>(±)-Propylene oxide<br>1,2-Epoxypropane<br>1,2-Propylene oxide<br>2,3-Epoxypropane<br>2-Methyloxirane<br>DL-1,2-Epoxypropane<br>Epihydrin<br>Epoxypropane<br>Methyloxacyclopropane<br>Methyloxirane<br>Propene oxide<br>Propozone<br>Propylene epoxide<br>dl-Propylene oxide | 75-56-9 | 200-879-2 | $C_3H_6O$ | The United States Food and Drug Administration has approved the use of propylene oxide to pasteurize raw almonds beginning on September 1, 2007 in response to two incidents of contamination by *Salmonella* in commercial orchards, one incident occurring in Canada, and one incident in the United States. Pistachio nuts can also be subjected to propylene oxide to control *Salmonella*. It is a method approved by the FDA. Propylene oxide is commonly used in the preparation of biological samples for electron microscopy, to remove residual ethanol previously used for dehydration. |
| Trilead dioxide phosphonate | Lead oxide phosphonate<br>($Pb_3O_2(HPO_3)$)<br>Lead oxide phosphite<br>Dibasic lead phosphite | 12141-20-7 | 235-252-2 | $HO_5PPb_3$ | It is used as stabilizer in plastics, in particular PVC for wire and cables, exterior construction, water pipes, and mini blinds. It is also used in protection for pipes and profiles for cables, and gas pipes. |
| o-aminoazotoluene | 4-o-tolylazo-o-toluidine<br>Benzenamine, 2-methyl-4-[2-(2-methylphenyl)diazenyl]-<br>2-Methyl-4-[(2-methylphenyl)diazenyl]aniline<br>Benzenamine, 2-methyl-4-[(2-methylphenyl)azo]-<br>C.I. Solvent Yellow 3<br>o-Toluidine, 4-o-tolylazo-<br>2,3'-Dimethyl-4'-aminoazobenzene<br>2-Aminoazotoluene<br>2-Methyl-4-[(2-methylphenyl)diazenyl]amine<br>2-Methyl-4-[(o-tolyl)azo]aniline<br>2',3-Dimethyl-4-aminoazobenzene<br>4-(o-Tolylazo)-otoluidine<br>4-Amino-2',3-dimethylazobenzene | 97-56-3 | 202-591-2 | $C_{14}H_{15}N_3$ | *O-Aminoazotoluene* is used to color oils, fats, and waxes. It is also used as a chemical intermediate for the production of the dyes C.I. solvent red 24 and C.I. acid red 115. |



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**TABLE 1** *Continued*

| Substance Name | Synonym | CAS Number | EU Number | Chemical Formula | Common Uses |
|---|---|---|---|---|---|
| 4-methyl-m-phenylenediamine (toluene-2,4-diamine) | 1,3-Benzenediamine, 4-methyl-<br>4-Methylbenzene-1,3-diamine<br>Toluene-2,4-diamine<br>1,3-Diamino-4-methylbenzene<br>2,4-Diamino-1-methylbenzene<br>2,4-Diaminotoluene<br>2,4-Tolylenediamine<br>3-Amino-4-methylaniline<br>4-Methyl-1,3-benzendiamine<br>4-Methyl-1,3-benzenediamine<br>4-Methyl-1,3-phenylenediamine<br>4-Methyl-m-phenylenediamine<br>C.I. Oxidation Base 35<br>TDA<br>TDA (diamine)<br>m-Toluenediamine<br>m-Tolylenediamine | 95-80-7 | 202-453-1 | $C_7H_{10}N_2$ | Toluene-2,4-diamine is used primarily in the production of toluene diisocyanate, which is used in the production of polyurethane. It is used as an intermediate in the synthesis of dyes and heterocyclic compounds. Toluene-2,4-diamine is also used to prepare direct oxidation black, a dye for hair and furs, and to prepare dyes for leather. Other uses of toluene-2,4-diamine include enhancement of thermal stability in polyamides, fatigue resistance and dyeability in fibers, and the preparation of impact-resistant resins, polyimides with superior wire-coating properties, benzimidazolethiols (antioxidants), hydraulic fluids, urethane foams, fungicide stabilizers, and sensitizers for explosives. |
| Biphenyl-4-ylamine | [1,1'-Biphenyl]-4-amine<br>Biphenyl-4-amine<br>4-Biphenylamine<br>(1,1'-Biphenyl-4-yl)amine<br>4-Amino-1,1'-biphenyl<br>4-Aminobiphenyl<br>4-Aminodiphenyl<br>4-Phenylaniline<br>4-Phenylbenzenamine<br>Xenylamine<br>p-Aminobiphenyl<br>p-Aminodiphenyl<br>p-Biphenylamine<br>p-Phenylaniline<br>p-Xenylamine | 92-67-1 | 202-177-1 | $C_{12}H_{11}N$ | It is used to prevent the growth of moulds. It is directly used in the preservation of citrus fruits as a fungistat in transportation containers. It is a raw material for polychlorinated diphenyls. is used as an intermediate for the production of a wide range of organic compounds (e.g. emulsifiers, optical brighteners, crop protection products, plastics), as a heat transfer medium alone or with diphenyl ether in heating fluids, as a dyestuff carrier for textiles and copying paper and as a solvent in pharmaceutical production. Aminodiphenyls are used as rubber antioxidants and intermediates for the synthesis of organic compounds (azo dyes and pharmaceuticals). |
| Fatty acids, C16-18, lead salts | C16-18-(even numbered)-fatty acids, lead salts | 91031-62-8 | 292-966-7 | $Pb_2$+[$H_3C(CH_2)14$-16C(O)O-]2 | It is used in the manufacture of polymer preparations and compounds and in the production of stabilizers, especially PVC. |
| Orange lead (lead tetroxide) | Lead oxide ($Pb_3O_4$) | 1314-41-6 | 215-235-6 | $O_4Pb_3$ | It is used as pigment for primer paints for iron objects and may be used in the manufacture of glass, especially lead glass. It is often used in paint, radiation protective agents including fluorescent light, vacuum tube, and cathode-ray tube, etc., optical glass, general glass, ceramic, enamel, storage battery, pigment, rubber, medicine, synthetic resin, electronic material. |



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**TABLE 1** *Continued*

| Substance Name | Synonym | CAS Number | EU Number | Chemical Formula | Common Uses |
|---|---|---|---|---|---|
| 4,4'-oxydianiline and its salts | Benzenamine, 4,4'-oxybis-<br>Aniline, 4,4'-oxydi-<br>1-Amino-4-(4-aminophenoxy)benzene<br>4,4'-Diaminobiphenyl ether<br>4,4'-Diaminobiphenyl oxide<br>4,4'-Diaminodiphenyl ether<br>4,4'-Diaminodiphenyl oxide<br>4,4'-Diaminophenyl ether<br>4,4'-Oxybis(aniline)<br>4,4'-Oxybis[benzenamine]<br>4,4'-Oxydianiline<br>4,4'-Oxydiphenylamine<br>4-(4-Aminophenoxy)phenylamine<br>4-Aminophenyl ether<br>Bis(4-aminophenyl) ether<br>Bis(p-aminophenyl) ether<br>Di(4-aminophenyl) ether<br>Oxybis(4-aminobenzene)<br>Oxydi-p-phenylenediamine<br>Oxydianiline<br>p,p'-Diaminodiphenyl ether<br>p,p'-Oxybis[aniline]<br>p,p'-Oxydianiline<br>p-Aminophenyl ether | 101-80-4 | 202-977-0 | $C_{12}H_{12}N_2O$ | Its primary use is in the manufacture of polyimide and poly(ester-imide) resins. Other applications include the manufacture of heat-resistant wire enamels and coatings, as an intermediates in the manufacture of epoxy resins and adhesives, and in the production of aromatic polyether imides. |
| Diazene-1,2-dicarboxamide (C,C'-azodi(formamide)) | 1,2-Diazenedicarboxamide<br>Azobiscarboxamide<br>Azodicarbonamide (ADCA, ADA)<br>Azobiscarbonamide<br>Azodicarboxylic acid diamide<br>1,1'-Azobis(formamide)<br>1,1'-Azobiscarbamide<br>Diazenedicarboxamide<br>1,1'-Azobisformamide | 123-77-3 | 204-650-8 | $C_2H_4N_4O_2$ | It is widely used in high density PVC, PE, PP pipe, NBR and PVC insulation, automobile parts. It is especially valuable to leather foaming agent of foam and wallpaper foam, PE molding foam, PVC molding foam, extrusion and coating, and rubber and extrusion molding foam. |
| Sulfurous acid, lead salt, dibasic | Lead(2+) hydroxide sulfite (2:2:1)<br>Dibasic lead sulfite | 62229-08-7 | 263-467-1 | $H_2O_5Pb_2S$ | It is used in plastics for wire and cables, exterior construction, water pipes, mini-blinds. It may also be used in protection pipes and projects for cable and gas pipes. |
| Lead cyanamidate | Cyanamide, lead(2+) salt (1:1)<br>Lead(2+) cyanamide | 20837-86-9 | 244-073-9 | $CH_2N_2Pb$ | It is used as a pigment in rust protective paint and as a corrosion inhibitor. |



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**TABLE 1** *Continued*

| Substance Name | Synonym | CAS Number | EU Number | Chemical Formula | Common Uses |
|---|---|---|---|---|---|
| Cadmium sulphide | Cadmium sulfide; C. P. Golden Yellow 55; Cadmium Golden 366; Cadmium Lemon Yellow 527; Cadmium Primrose 819; Cadmium Yellow 000; Cadmium Yellow 10G conc; Cadmium Yellow 892; Cadmium Yellow Conc. Deep; Cadmium Yellow Conc. Golden; Cadmium Yellow Conc. Lemon; Cadmium Yellow Conc. Primrose; Cadmium Yellow OZ dark; Cadmium Yellow Primrose 47-4100; Cadmium Yellow ST; Cadmium monosulfide; Cadmium sulfide yellow; Cadmium yellow; Cadmopur Golden Yellow N; Cadmopur Yellow; Capsebon; Ferro Lemon Yellow; Ferro Orange Yellow; Ferro Yellow; GSK; PC 108; Primrose 1466; Reckitt Yellow 12; Sicotherm Yellow L 1001 | 1306-23-6 | 215-147-8 | CdS | It is used as a high performance pigment and semiconducting substance in photoelectronics components like solar panels. |



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**TABLE 1** *Continued*

| Substance Name | Synonym | CAS Number | EU Number | Chemical Formula | Common Uses |
|---|---|---|---|---|---|
| Disodium 3,3'-[[1,1'-biphenyl]-4,4'-diylbis(azo)]bis(4-aminonaphthalene-1-sulphonate) (C.I. Direct Red 28) | 1-Naphthalenesulfonic acid, 3,3'-[[1,1'-biphenyl]-4,4'-diylbis(2,1-diazenediyl)]bis[4-amino-, sodium salt (1:2); Disodium 4-amino-3-[(4-{4-[(1-amino-4-sulfonatonaphthalen-2-yl)diazenyl]phenyl}phenyl)diazenyl] naphthalene-1-sulfonate;<br>AI3-63036<br>Atlantic Congo Red<br>Atul Congo Red<br>Azocard Red Congo<br>Benzo Congo Red<br>Brasilamina congo 4B<br>C.I. 22120<br>C.I. Direct Red 28<br>C.I. Direct Red 28, disodium salt<br>Cerven kongo<br>Cerven prima 28<br>Congazone sodium<br>Congo Red<br>Congo Red 4B<br>Congo Red 4BX<br>Congo Red CR<br>Congo Red H<br>Congo Red ICI<br>Congo Red L<br>Congo Red M<br>Congo Red N<br>Congo Red R<br>Congo Red W<br>Congo Red WS<br>Cotton Red 4BC<br>Cotton Red 5B<br>Cotton Red L<br>Diacotton Congo Red<br>Direct Red 28<br>Direct Red C<br>Direct Red DC-CF<br>Direct Red K<br>Erie Congo 4B<br>Haemomedical<br>Haemonorm<br>Hemorrhagyl<br>Hispamin congo 4B<br>Kayaku Congo Red<br>Mitsui Congo Red<br>NSC 56651<br>NSC 7232<br>Peeramine Congo Red<br>Red K<br>Sodium diphenyldiazo-bis(alphanaphthylaminesulfonate)<br>Solucongo<br>Sugai Congo Red<br>Tertrodirect Red C<br>Trisulfon Congo Red<br>UNII-3U05FHG59S<br>Vondacel Red CL | 573-58-0 | 209-358-4 | $C_{32}H_{24}N_6O_6S_2.2Na$ | It is used as pigment in textile and other dyes. Used as a pH indicator, as an addition to culture media and for biological staining as well as a gelling agent for poly (vinyl alcohol) in applications where coloured films or coatings can be tolerated. |



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**TABLE 1** *Continued*

| Substance Name | Synonym | CAS Number | EU Number | Chemical Formula | Common Uses |
|---|---|---|---|---|---|
| Disodium 4-amino-3-[[4'-[(2,4-diaminophenyl)azo][1,1'-biphenyl]-4-yl]azo] -5-hydroxy-6-(phenylazo)naphthalene-2,7-disulphonate (C.I. Direct Black 38) | 2,7-Naphthalenedisulfonic acid, 4-amino-3-[2-[4'-[2-(2,4-diaminophenyl)diazenyl][1,1'-biphenyl]-4-yl]diazenyl]-5-hydroxy-6-(2-phenyldiazenyl)-, sodium salt (1:2); Ahco Direct Black GX; Airedale Black ED; Aizen Direct Deep Black EH; Aizen Direct Deep Black GH; Aizen Direct Deep Black RH; Amanil Black GL; Amanil Black WD; Apomine Black GX; Atlantic Black BD; Atlantic Black C; Atlantic Black E; Atlantic Black EA; Atlantic Black GAC; Atlantic Black GG; Atlantic Black GXCW; Atlantic Black GXOO; Atlantic Black SD; Atul Direct Black E; Azine Deep Black EW; Azocard Black EW; Azomine Black EWO; Belamine Black GX; Bencidal Black E; Benzanil Black E; Benzo Deep Black E; BenzoLeather Black E; Benzoform Black BCN-CF; Black 2EMBL; Black 4EMBL; Brasilamina Black GN; Brilliant Chrome Leather Black H; C.I. 30235; C.I. Direct Black 38, disodium salt; Calcomine; Black; Calcomine Black EXL; Carbide Black E; Chloramine Black C; Chloramine Black EC; Chloramine Black ERT; Chloramine Black EX; Chloramine Black EXR; Chloramine Black XO; Chloramine Carbon Black S; Chloramine Carbon Black SJ; Chloramine Carbon Black SN; Chlorazol Black E; Chlorazol Black EA; Chlorazol Black EN; Chlorazol Burl Black E; Chlorazol Leather Black ENP; Chlorazol Silk Black G; Chlorozol Black E; Chrome Leather Black E; Chrome Leather Black EC; Chrome Leather Black EM; Chrome Leather Black G; Chrome Leather Brilliant Black ER; Coir Deep Black; Columbia Black EP; | 1937-37-7 | 217-710-3 | $C_{34}H_{25}N_9Na_2O_7S_2$ | Dye cellulose, wool, silk, bast, and hog's hair; print cellulose, wool and silk; dye leather, plastics, vegetable-ivory buttons and wood flour used as a resin filler; stain wool, silk, acetate, nylon, wood and biological materials, and produce aqueous inks. It has reportedly been used in hair dyes. |



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**TABLE 1** *Continued*

| Substance Name | Synonym | CAS Number | EU Number | Chemical Formula | Common Uses |
|---|---|---|---|---|---|
| | Coranil Direct | | | | |
| | Black F; Diacotton Deep Black; | | | | |
| | Diacotton Deep Black RX; | | | | |
| | Diamine Deep Black EC; | | | | |
| | Diamine | | | | |
| | DirectBlack E; Diaphtamine Black | | | | |
| | V; Diazine | | | | |
| | Black E; Diazine Direct Black E; | | | | |
| | Diazine Direct | | | | |
| | Black G; Diazol Black 2V; | | | | |
| | Diphenyl Deep Black G; | | | | |
| | Direct Black A; Direct Black BRN; | | | | |
| | Direct Black | | | | |
| | CX; Direct Black CXR; Direct | | | | |
| | Black E; Direct | | | | |
| | Black EW; Direct Black EX; | | | | |
| | Direct Black FR; | | | | |
| | Direct Black GAC; Direct Black | | | | |
| | GW; Direct Black | | | | |
| | GX; Direct Black GXR; Direct | | | | |
| | Black JET; Direct | | | | |
| | Black Meta; Direct Black methyl; | | | | |
| | Direct Black N; | | | | |
| | Direct Black RX; Direct Black | | | | |
| | SD; Direct Black | | | | |
| | WS; Direct Black Z; Direct Black | | | | |
| | ZSh; Direct Deep | | | | |
| | Black E; Direct Deep Black E | | | | |
| | Extra; Direct Deep | | | | |
| | Black E-EX; Direct Deep Black | | | | |
| | EA-CF; Direct | | | | |
| | Deep Black EAC; Direct Deep | | | | |
| | Black EW; Direct | | | | |
| | Deep Black EX; Direct Deep | | | | |
| | Black WX; Enianil | | | | |
| | Black CN; Erie Black B; Erie | | | | |
| | Black BF; Erie Black | | | | |
| | GAC; Erie Black GXOO; Erie | | | | |
| | Black JET; Erie | | | | |
| | Black NUG; Erie Black RXOO; | | | | |
| | Erie Brilliant Black | | | | |
| | S; Erie Fibre Black VP; Fenamin | | | | |
| | Black E; Fibre | | | | |
| | Black VF; Fixanol Black E; | | | | |
| | Formaline Black C; | | | | |
| | Formic Black C; Formic Black | | | | |
| | CW; Formic Black | | | | |
| | EA; Formic Black MTG; Formic | | | | |
| | Black TG; | | | | |
| | Hispamin Black EF; Interchem | | | | |
| | Direct Black Z; | | | | |
| | Kayaku Direct Deep Black EX; | | | | |
| | Kayaku Direct Deep | | | | |
| | Black GX; Kayaku Direct Deep | | | | |
| | Black S; Kayaku | | | | |
| | Direct Leather Black EX; Kayaku | | | | |
| | Direct Special | | | | |
| | Black AAX; Lurazol Black BA; | | | | |
| | Meta Black; Mitsui | | | | |
| | Direct Black EX; Mitsui Direct | | | | |
| | Black GX; | | | | |



Full document details: ASTM F2931-16e1

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