

Appendix 1

Information about the substances in the list of the proposal and divided by the same headings

1 Included substances

The tables in the suggestion list 291 substances for which an indication of possible presence in textile or clothing articles was publicly available from at least one of a number of references. For clarity, the substances are divided into three lists (i.e. groups);

1. Classified dyes and carcinogenic amines,
2. Other substances
3. Petroleum and coal stream substances.

Concentration limits in the suggestion are based on specific concentration limits, when available in legislation. For all other cases, a generic concentration limit of 50 ppm is suggested.

In Appendix 2, the tables 3-5 describe the substances included in the EU commission's regulation proposal (yellow). In addition, described by Swerea IVF, textile relevance, test methods and comments on the substance are included in table 2-4 (blue) (when easily accessed information or for the most relevant substances).

1.1 *Classified dyes and carcinogenic amines*

This group includes arylamine salts, arylamines¹, azo-compounds and carcinogenic dyes/colorants with carcinogenic potential. The included arylamines are breakdown products of a number of azo dyestuffs and pigments.

Azo compounds are a major structural group of dyestuffs that originate from arylamine precursors e.g aniline and other arylamines including the banned arylamines in the REACH regulation.

Arylamines derived from certain azo dyestuffs and pigments. Remains of the auxiliary chemical substances, as well as unreacted raw materials and impurities (i.e., unintended chemical substances) may, however, be found in the finished articles and can cause health and/or environmental problems. (Swedish Chemicals Agency, 2014). In addition, arylamines may occur as degradation products from azo compounds in textile applications. Many of these substances are included on the Candidate List of Substances of Very High Concern (SVHC).

The concentration limits for these substances are set to 30 mg/kg (0.003% by weight) in accordance with entry 43 of Annex XVII in REACH.

1.2 *Other substances*

This category includes a large variety of chemical substances with different uses in textile application (i.e. solvents, monomers, pesticides and plasticizers). Below, they are presented in the same substance groups as in the EU commission consultation. The concentration limits for all these substances have in the proposal been set to the generic limit 50 ppm.

The substances included in this list may be used as raw material or process additives in the manufacturing or to give function to the end product (i.e. garment). In some cases the substances included in this part of the list may relate to accessories and other non-textile parts of clothing, for example brass used for metal buttons.

¹ Arylamines are named as solvent dyes according to the Color Index system, but never used in textile applications.

1.2.1 Aldehydes

Aldehydes are by products from textile and leather production. The best known is formaldehyde that mainly originates from crosslinking reactions for e.g. wrinkle free treatment of textiles. Can also be used for dirt-repellent treatment, as a dye fixing agent and as preservative.

1.2.2 Arsenic compounds

The main uses are in glass, semiconductors, metal alloys and preservatives in wood. Might be used as preservative also in textiles.

1.2.3 Boron compounds

The main uses are in wood veneers/pressed wooden panels and boards. Boric acid may be used as flame retardant in cellulosic materials, mainly wood, and biocidal agent in boards. Borate compounds may be used as bleaching agents in chemical preparations. No textile relevance.

1.2.4 Chlorinated aromatic hydrocarbons

The substances are solvents used in the manufacture of rubber, metal paint and fur industry. They are used for grease and oil, e.g. in stain removers. Also used in cleaning agents and detergents, as solvents in lubricating oils and as solvents in dyeing of synthetic fibres (carriers). They can also be used as solvents in printing for textile and leather, as finishing agents and fabric softeners. Another use is as moth-proofing agent in textiles and for the manufacture of silk and pearls.

1.2.5 Epoxide compounds

They are used as hardeners in resin production. Not used in textile production

1.2.6 Formamides

These substances belong to the group of heterocyclic solvents, see below.

1.2.7 Glymes

Glycol diethers, or glymes, are aprotic, saturated polyethers. 1,3-Dioxolane is a solvent for polar polymers. It is used to produce coatings, films, in paint stripping formulations, for photoresist removal and as a general clean-up solvent for epoxy and urethane. 1,4-Dioxane is an aprotic, relatively inert solvent capable of solubilizing a large range of organic and even some inorganic compounds and miscible with water in all proportions. In textile production processes, glymes can be used as solvents. It is used as a raw material for polyurethane and as precursors to resins.

1.2.8 Chromium compounds

Chrome (III) is an alternative as fixing agent in mordant dyeing of textiles. Use direct dyes or acid dyes with high colourfastness to avoid use of chromium salts for dyeing of polyamide, silk, wool and leather. Use hydrogen peroxide and other per-salts to avoid the use of chromium VI (6+) based salts. There are alternatives for leather tanning such as vegetable tanning. Tanning with titanium is an emerging technology.

1.2.9 Beryllium compounds

Beryllium is mostly used as a hardening agent in alloys. It can also be used in the production of brass and in electronic components. No textile relevance.

1.2.10 Cobalt compounds

Cobalt compounds are used for surface treatment (anti corrosive) in steel manufacturing. Cobalt dichloride is used in drying agent as humidity indicator. Cobalt may occur in metal complexing dyestuffs used in textiles.

1.2.11 Cadmium compounds

Table 1. Different uses for cadmium compounds.

Use in textile and leather:	Can occur in pigmented plastisol prints in textiles and leather.
Use in accessories and packaging:	Surface treatment. Pigment in colouring agent. Also in plastics as stabilizers and pigment. Cadmium based stabilizers are used to increase the endurance of the material. For recycled packaging cadmium may have had a different original use.

Other uses for cadmium are in lamps, metal construction parts, relays and switches and in batteries.

1.2.12 Lead compounds

Lead salts are additives in plastics as stabilizers to increase the service of life of the material. They may be used in paint and in coloured plastic material. They can also be used for metallic surface coating of buttons and accessories. For recycled packaging material lead may have had a different original use. Lead metal can also be used to increase ductility of other metals. Can be found in plastic accessories as pigments or in metal accessories as alloys.

1.2.13 Mercury compounds

Only known legacy uses of mercury and its salts in textiles. Used to be used as defoliants in cotton farming.

1.2.14 Nickel compounds

Nickel is often used to improve alloys used in clothing accessories such as zippers, buttons and rivets.

1.2.15 Tin-organic compounds

Dibutyltin compounds (DBT) and dioctyltin compounds (DOT) are used in consumer products as stabilizers (mainly PVC) or catalysts (PU and PVC). Organotin catalysts are used in a wide variety of polyurethane applications, aiding formation of the urethane bond and generally functioning as Lewis acid catalysts.

Trialkyltin compounds are biocides that may occur in textiles and leather.

1.2.16 Heterocyclic aromatic compounds

Often used as solvents for top coating and foams applied on textiles such as hydrazine, formamide, DMF and DMAC (see section on polar aprotic solvents). Formamide is a precursor and a degradation product from plastic foaming agents.

1.2.17 Hydrazine compounds

See heterocyclic solvents above.

1.2.18 Hydrocarbons

Aromatic organic solvents are volatile organic compounds (VOC). Use solvents of higher quality with lower levels of aromatic hydrocarbons or synthetic thickeners based on polycarboxylic acids.

Solvents for dyeing and printing. Solvents that have been used for cleaning of spinning oils from textiles are often found in amounts of 10-20 mg/kg. The limit for humans to sense a smell lies around 100 mg/kg for most substances.

1.2.19 Nitroaromatic hydrocarbons

These substances are parent precursors for arylamines that in turn are precursors for azo dyes. In a textile product, degradation to arylamines are more likely to occur than degradation to nitroaromatic hydrocarbons.

1.2.20 Nitrosamines

Nitrosamines are transformation products in rubber. No direct relevance in textiles. Can be relevant for rubber parts and accessories, e.g. outer sole in shoes.

1.2.21 Organic bromine compounds

These compounds are mainly used as flame retardants but may also be used as synthetic precursors. In the list from the EU Commission, the bromine compounds refers to pesticides, for instance as container gases during transport.

1.2.22 Organic chlorine compounds

Solvent used in the manufacture of rubber, metal paint and fur industry used for grease and oil, e.g. in stain removers. Also used in cleaning agents and detergents. Solvents in lubricating oils, in dyeing of synthetic fibres (carriers) and in printing for textile and leather and as solvent based finishing agents and fabric softeners. These substances are also used as moth-proofing agent in textiles and for the manufacture of silk and pearls.

1.2.23 Organic compounds (saturated and unsaturated)

In the list from the EU Commission, acrylamide, acrylonitrile and buta-1,3-diene are listed under this heading. These substances are mainly used as monomers, precursors for thickeners and synthetic building blocks (possibly for dyes).

1.2.24 Phthalates

Phthalates may be used as plasticizers in polymers. Additives in adhesives, paints, lacquers, varnishes and solvents. Relevant for prints, accessories, plastic parts and coatings.

1.2.25 Polar aprotic solvents

As far as it is understood these means alcohols and ethers that may well have the same uses as aromatic solvents described above. Main uses are as solvents in binders (glues). In this category is for instance dimethylformamide (DMFa) included. DMFa is used as a solvent and for production of leather imitation.

DMAC (N, N-dimethylacetamide) is used as solvent and in industrial coatings, polyamide films, paint strippers and ink removers.

NMP (N-methyl-2-pyrrolidone) has good solvency properties for polymers. It can be used for surface treatment of textiles, resins and metal coated plastics or as a paint stripper. It is also an intermediate for textile auxiliaries, plasticizers, stabilizers and specialty inks. It can also be used as polyamide precursor and for SBR (styrene-butadiene) latex production.

DMFa, DMAC and NMP are polar aprotic solvents that efficiently dissolve prepolymerised polyurethane (PU) for further processing e.g. PU top coatings on textiles. Due to these polar and excellent solvent properties, these solvents become completely integrated into PU and are hard to remove. Therefore in analysis only the extractable fraction in PU of these solvents may be analysed. That makes the preparation performance of PU samples for analysis very sensitive for variations in the analytical result. This may cause substantial variations between laboratories when performing and comparing analytical results for DMFa, DMAC and/or NMP, meaning that results may vary between different laboratories. Therefore it is essential to develop international validated analytical mandated standards to assure legal compliance.

1.2.26 Thiourea compounds

These substances are mainly used as vulcanizing agents for rubber production. Used as reduction agent or as a precursor for flame retardants.

1.2.27 Triarylmethyl dyes

The substance in the list can be part of a dyestuff. May pose a risk to occur as a degradation product.

1.3 Petroleum and coal stream substances

This group includes anthracene oils, aromatic hydrocarbons, coal derivatives, petroleum derivatives and polyaromatic hydrocarbons (PAHs). According to the Commission, these substances are included because they might be used as raw materials in the textile supply chain. The Commission does not have evidence of their presence in final textile products. According to expertise at Swerea IVF, petroleum products are solely used as processing auxiliary chemicals in textile processing, which means that these chemicals do not provide any intended and required properties to the final textile product. Petroleum products are used as solvents and as carriers for other chemicals in the textile process and never as property lending chemicals to the final textile product. Any occurrence observed in the final textile products are always accidental residues. Petroleum chemicals should not be considered as normal constituents in textiles since occasionally observed residues of these chemicals are a result from bad process management and control at source. It is unlikely to detect these substances in finished textile goods.

No concentration limits are included in the consultation document.

The substances included in this list are predominately used as raw material or process additives in the manufacturing. However some degradation substances are also included.

1.3.1 Anthracene oils

Precursors to anthraquinone to produce anthraquinone dyestuffs. This is the only relevance to textiles that I can find.

1.3.2 Aromatic hydrocarbons

See solvents above.

1.3.3 Coal derivatives

Not exactly clear what they mean?

1.3.4 Petroleum derivatives

See solvents above

1.3.5 Polyaromatic Hydrocarbons (PAH:s)

PAHs are not synthesized chemically for industrial purposes. The major source of PAHs is the incomplete combustion of organic material such as coal, oil and wood.

They are mostly used as intermediaries in pharmaceuticals, agricultural products, photographic products, thermosetting plastics, lubricating materials, and other chemical industries.

May be found as impurities in rubber materials and leather