



Dyes – Carcinogenic or Equivalent Concern

Other Names: Restricted/ forbidden dyes, Substantive dyes, Many trade names exist for each specific dye Dyes: Acid, Basic, Direct, Solvent

Acid, Basic, Direct and Solvent Dyes represent a broad class of organic dyestuffs used to dye natural and synthetic fibres. They may be found in various other applications.

CAS Number	Substance
3761-53-3	C.I. Acid red 26
569-61-9	C.I. Basic red 9
548-62-9	C.I. Basic violet 3

Uses in the Supply Chain

Dyes in this class are widely used in a variety of fibre and material types.

List continued in “Additional Information”

May Be Found In:

- Animal based fibres (wool, alpaca, silk, etc.)
- Plant based fibres (cotton, linen, hemp, etc.)
- Synthetic fibres (nylon, acrylic, others)
- Polymer applications (solvent dyes)
- Solvents
- Waxes
- Natural fibres

Acid dyes are water-soluble anionic dyes used on fibres like wool, silk, modified acrylic fibres, and nylon. Commonly applied to textiles at low pH, they consist of acidic molecules. According to their levelling performance, economy of dyeing and fastness properties, acid dyes are categorised into three groups; neutral acid dyes, weak acid dyes, and strong acid dyes.

Basic dyes are water-soluble cationic dyes. Generally used on acrylic fibres, they can also be used to dye wool and silk. They are called cationic dyes because the cationic part of the molecule is responsible for the colour. Basic dyes are very important in the textile industry as they can be used to colour many different fibres, such as natural fibres.

Direct dyes are used to dye materials made from natural or regenerated cellulose, like cotton, jute, viscose, or paper, without employing other mordants. They are mainly sodium salts of aromatic compounds. Depending on the application, they fall into four categories: general direct dyes, direct fast dyes, direct copper dyes, and direct diazo dyes.

Solvent dyes are essentially insoluble in water but soluble in different organic solvents. They can be used on natural and synthetic fibres or to colour organic solvents, hydrocarbon fuel, waxes and other non-polar materials based on hydrocarbons.¹ Navy blue dye is a specific dye mixture used to dye leather and textiles.²

Why Dyes – Carcinogenic or Equivalent Concern are Restricted

- Legislation in major markets around the world restricts the presence of these dyes in final products.
- The dyes listed create a variety of toxicity concerns, either inherent to the dye itself, or caused by it breaking down into a more hazardous substance.
- Toxicity of the list of dyes includes suspected carcinogens, mutagens or reproductive toxicants, aquatic toxicity, and/or skin contact hazards.
- Navy blue dye is a hazardous example of a direct dye that has been restricted due to multiple concerns. These include extreme toxicity to aquatic life with long lasting effects, and potential human skin sensitisation.
- Chemical hazard information for many chemicals can be found in the following external databases:
 - GESTIS Substance Database: [http://gestis-en.itrust.de/nxt/gateway.dll/gestis_en/000000.xml?f=templates\\$fn=default.htm\\$vid=gestiseng:sdbeng\\$3.0](http://gestis-en.itrust.de/nxt/gateway.dll/gestis_en/000000.xml?f=templates$fn=default.htm$vid=gestiseng:sdbeng$3.0)
 - US National Library of Medicine: <https://toxnet.nlm.nih.gov/cgi-bin/sis/htmlgen?HSDB>
 - USA EPA Occupational Chemical Database: <https://www.osha.gov/chemicaldata/index.html>

Sourcing Compliant Materials from Your Suppliers

- Explain that you require materials to be compliant with current AFIRM RSL limits.³
- Request suppliers to submit a confirmation of material compliance and/or a test report from a third-party laboratory. When materials are received, consider performing random, risk-based testing to ensure current AFIRM RSL limits are met.
- Share this guidance sheet with your material suppliers. Using the guidance in the next section, instruct them to work with their chemical suppliers to source chemical formulations that comply with these requirements. If needed, highlight the existence of harmful substances in materials via chemical management trainings from the ZDHC Academy, existing guidelines, and laws.
- Make sure all your suppliers have a solid chemical management system in place.

Sourcing Compliant Formulations from Your Chemical Formulators

- Explain to chemicals suppliers that you require chemical formulations to comply with current ZDHC MRSL limits.
 - Search for formulations on the ZDHC Gateway Chemical Module. If your preferred formulations are not listed, encourage providers to register their formulations.
 - Ask for a ZDHC ChemCheck report.
- Prior to procuring any formulation, its chemical properties must be reviewed to ensure proper protective equipment, chemical storage facilities, facility engineering controls, and associated treatment/disposal facilities are appropriate for the chemical(s).
- Review your list of dye recipes to ensure the dyestuffs mentioned are not called out for use in any colour systems.
- Discuss with your chemical supplier whether any safer alternatives are available that are suitable substitutes for your manufacturing process.

Safer Alternatives

There are many alternatives to these colourants available on the market offering similar and/or the same performance attributes. Besides seeking dyestuff alternatives, consider different dyeing techniques like digital printing. Reputable producers of chemical formulations can point you towards more sustainable alternatives that do not contain any of the dyes listed in this document. Please note that any chosen alternative must comply with the ZDHC MRSL chemical formulation limits and AFIRM RSL limits for materials. Preference should be given to ETAD member companies whenever applicable.

Additional Information

Continued list of CAS Numbers and substance names from first page:

CAS Number	Substance
569-64-2/ 2437-29-8/ 10309-95-2	C.I. Basic Green 4
632-99-5	C.I. Basic Violet 14
2580-56-5	C.I. Basic Blue 26 (with Michler's Ketone > 0.1%)
1937-37-7	C.I. Direct Black 38
2602-46-2	C.I. Direct Blue 6
573-58-0	C.I. Direct Red 28
16071-86-6	C.I. Direct Brown 95
60-11-7	4-Dimethylaminoazobenzene (C.I. Solvent Yellow 2)
6786-83-0	C.I. Solvent Blue 4

561-41-1

4,4'-bis(dimethylamino)-4''-(methylamino) trityl alcohol (C.I. Solvent Violet 8)

118685-33-9/ No CAS #

Navy Blue Dye complex: Component 1: C₃₉H₂₃ClCrN₇O₁₂S₂.2Na/ Component 2: C₄₆H₃₀CrN₁₀O₂₀S₂.3Na (Index #611-070-00-2)

References

- 1 Vigo, T.L. Textile Processing and Properties: Preparation, Dyeing, Finishing and Performance, Elsevier Science, BV, 2013.
- 2 European Union Commission Directive 2003/3/EC, 01/06/2003. Substance added to Annex I to Directive 76/769/EEC.
- 3 Apparel and Footwear International RSL Management Group (Ed.). (2018, January 31). Restricted Substances List (Rep.). Retrieved <http://afirm-group.com/afirm-rsl/>.

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