

4 RESEARCH 2021 LIST

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Ø ZDHC

ZERO DISCHARGE
OF HAZARDOUS
CHEMICALS PROGRAMME

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Research List

Zero Discharge of Hazardous Chemicals Programme

Applying the Zero Discharge of Hazardous Chemicals (ZDHC) Framework for the Prioritisation of Hazardous Chemicals,¹ the ZDHC Group identified a list of substances for the research and phase out actions of our framework. Two lists were developed by the ZDHC Group for action as a result of this prioritisation activity – a Manufacturing Restricted Substances List (MRSL) and a Research List. The MRSL addresses hazardous substances potentially used and discharged into the environment during manufacturing and related processes, not just those substances that could be present in finished products. The list includes chemical substances subject to a usage ban in facilities that process textile materials and trim parts for use in apparel and footwear.

The Research List focuses the ZDHC Group's efforts on research and development for prioritised substances that do not have safer alternatives for all uses in the market today. By encouraging key stakeholders to develop alternatives for chemicals on the Research List, the ZDHC Group hopes to move these chemicals more rapidly to the MRSL for supply chain phase out.

Both the Research List and the MRSL will be updated regularly as data become available.

Chemical Substance Resource Links

The following chemical substance resource links provide information about chemical substances on the ZDHC Research List, including information about regulations and toxicological data.

- California Environmental Protection Agency (<http://www.calepa.ca.gov/>)
- European Union (EU) Classification – Classification and Labelling and Packaging Annex VI (<http://echa.europa.eu/addressing-chemicals-of-concern/harmonised-classification-and-labelling/annex-vi-to-clp>)
- German Commission for the Investigation of Health Hazards of Chemical Compounds in the Work Area (MAK Commission) (http://www.dfg.de/en/dfg_profile/publications/senate_commissions/index.html)
- GreenScreen® List Translator (<http://www.greenscreenchemicals.org/method/greenscreen-list-translator>)
- Japan Ministry of Economy, Trade and Industry/Ministry of the Environment – Global Harmonizing System classifications (<http://www.meti.go.jp/english/>; <http://www.env.go.jp/en>)
- REACH (<http://echa.europa.eu/en/regulations>)
- TEDX (<http://endocrinedisruption.org/>)
- Toxicology Data Network (TOXNET) – Hazardous Substances Database (<http://toxnet.nlm.nih.gov/cgi-bin/sis/htmlgen?HSDB>)
- United States National Institutes of Environmental Health Sciences (<http://www.niehs.nih.gov>)
- United States Environmental Protection Agency (<http://www2.epa.gov/>)

¹ Zero Discharge of Hazardous Chemicals Group. 2014. Framework for the Prioritisation of Hazardous Chemicals, Revision 1. <http://www.roadmaptozero.com/programme-documents.php>.

CAS Number	Name	Additional Remarks and Details on Use in the Supply Chain
100-41-4	Ethylbenzene Chemical intermediate	<p>Ethylbenzene is an intermediate in the production of styrene, which is a precursor to polystyrene and other co-polymers. Ethylbenzene is a solvent in inks, adhesives, rubber adhesives, varnishes and paints.</p> <p>It is also a common solvent used in carrier formulations for polyester dyeing, in the scouring of natural and synthetic fibres and fabrics and for cleaning and preventing trimer formation in dye machines.</p> <p>Finally, it is used in production of synthetic rubber.</p> <p>ZDHC is looking for a safe limit for ethylbenzene as a <i>contaminant</i> in textile chemical formulations.</p>
127-19-5	N,N-dimethylacetamide (DMAC) Solvent	<p>DMAC is used as the main solvent for elastane fibres and sometimes in wet spinning of polyacrylonitrile fibres.</p> <p>DMACs may be used as a solvent for adhesives or coatings.</p> <p>ZDHC is looking for safer alternatives to the use of DMAC especially as a solvent for polyurethane (PU) coatings.</p>
68-12-2	Dimethyl formamide; N,N-dimethylformamide (DMF) Solvent	<p>DMF may be used in the formulation of surfactants, liquid dyes and fluorescent whitening agents.</p> <p>It is also the solvent used during the manufacture of acrylic fibres and some plastics, as well as the main part of the solvent mixture or exclusively the solvent for PU coatings.</p> <p>Due its polarity, it is used to clean dyeing equipment after processing disperse dyes.</p> <p>DMF may be present in synthetic leather (processed by PU coatings) and adhesives.</p> <p>ZDHC is looking for safer alternatives to dimethyl formamide as a solvent for PU coatings, during the processing of artificial leather, and the manufacture of sustainable alternatives and alternative techniques without DMF. Research should focus on all preconditions to substitute DMF.</p> <p>In addition, ZDHC is looking for a safe alternative for DMF to clean dyeing equipment.</p>
67-56-1	Methanol Solvent	<p>Methanol can be toxic at certain doses and the main concern in the textile industry is occupational exposure. It is used widely in everyday consumer products such as windscreen wash, camping fuels and even dietary products.</p> <p>Methanol may be used as a solvent in all types of textile chemicals.</p> <p>It may be present as a component in solvents that are used to clean components prior to bonding. However, it is unlikely to exist in a finished product.</p> <p>Methanol is proposed by some EU member states as a reproductive toxin like ethanol.</p> <p>ZDHC is looking for safe limits for methanol as a contaminant in textile chemical formulations.</p>

CAS Number	Name	Additional Remarks and Details on Use in the Supply Chain
108-88-3	Toluene Solvent	<p>Toluene is used as a feedstock in the chemical industry (e.g., as raw material used to make toluene diisocyanate which is used to make PUs and in the manufacture of rubber, in adhesives and as a cleaning agent).</p> <p>Toluene is an excellent solvent and deliberately used as solvent for PU coatings. There are less harmful alternatives for use in adhesives and cleaning solvents but in the rubber industry (especially high gloss applications) no safer alternatives exist.</p> <p>ZDHC is looking for safe limits for toluene as component/contaminant in rubber products for textiles.</p> <p>ZDHC is also looking for safer alternatives for toluene as a solvent for PU coatings. ZDHC believes that toluene cannot be considered a sustainable substitute for DMF in PU coatings.</p>
108-95-2	Phenol	<p>Phenol is not deliberately used in textiles or footwear but trace amounts of phenol can be found in many chemical formulations.</p> <p>ZDHC is looking for safe limits for phenol as a contaminant in textile chemical formulations.</p>
111-77-3	2-(2-methoxyethoxy)-ethanol	<p>2-(2-methoxyethoxy)-ethanol is a glycol and used as an industrial solvent with wide uses in industry.</p> <p>Glycols have many uses in the apparel and footwear supply chain, including as solvents for finishing/cleaning, printing agents, and dissolving and diluting fats, oils and adhesives (e.g., in degreasing or cleaning operations).</p> <p>ZDHC is looking for a safe limit for 2-(2-methoxyethoxy)-ethanol as a contaminant in textile chemical formulations.</p>
1589-47-5	2-methoxypropanol	<p>2-methoxypropanol is a glycol and a solvent.</p> <p>Glycols have a wide range of uses in the apparel and footwear supply chain, including as solvents for finishing/cleaning, printing agents, and dissolving and diluting fats, oils and adhesives (e.g., in degreasing or cleaning operations).</p> <p>ZDHC is looking for a safe limit for 2-methoxypropanol in textile chemical formulations.</p>

PERFLUORINATED CHEMICALS			
CAS Number	Name	General Remarks	Details on Use in the Supply Chain
Various	Short-chain fluorinated polymers and related substances	<p>Note, a distinction is made between long-chain and short-chain compounds according to the OECD – definition (http://www.oecd.org/ehs/pfc/):</p> <p>Long-chain perfluorocarboxylic acids: C8 and higher</p> <p>Long chain perfluoroalkyl sulfonates: C6 and higher</p> <p>ZDHC members acknowledge that short-chain perfluorinated chemicals (PFCs) are, until safer alternatives are found, a substitute for long-chain PFCs.</p> <p>ZDHC has already started research on alternatives for short-chain PFCs because there is little data available on these technologies. There is, according to some authorities, a potential risk that short-chain PFCs may have comparable risks to long chain PFCs.</p> <p>Placing short chain PFCs on our Research List demonstrates that we are working with stakeholders to find replacements for short-chain PFCs. We fully acknowledge that this may take many years.</p> <p>As long as no safer alternative for durable water, oil and stain repellency and soil release with satisfactory performance level is found, some brands will continue using short-chain PFCs on their consumer products.</p> <p>In a few cases, due to the end use of the textile (e. g., medical field, personal protective equipment, military), performance requirements must be considered more important than potential environmental risks.</p> <p>In these few cases, we acknowledge that there may never be suitable alternatives.</p>	<p>PFCs are typically persistent substances that must not be released into wastewater.</p> <p>Fluorinated polymers (fluoro carbon resins) based on C-6 telomer chemistry and fluorinated polymers based on C-4 electro-fluorination chemistry are used for water, oil and stain repellency and soil release finishes for textiles.</p> <p>ZDHC is looking for PFC-free durable water repellent alternatives and substitutions that can provide oil and stain repellency.</p>

ZDHC members have agreed to eliminate the use of long-chain PFCs by January 2015, which is in line with the voluntary US EPA stewardship program. For this reason perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA) have been placed on our MRSL (<http://www.epa.gov/oppt/existingchemicals/pubs/actionplans/pfcs.html>).