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Testing methods

OEKO-TEX® ECO PASSPORT

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OEKO-TEX®

International Association for Research and Testing in the Field of Textile and Leather Ecology

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General remarks

This document informs about the analytical methodology applied for chemical safety testing in all laboratories of the OEKO-TEX® Association. The methods described below are applied to any article certified under the certification scheme OEKO-TEX® ECO PASSPORT. If an article shall be certified according to this standard and also contains textile and non-textile (e.g. metallic) components or leather components, these materials are tested according to the conditions and criteria of OEKO-TEX® STANDARD 100, OEKO-TEX® ORGANIC COTTON or OEKO-TEX® LEATHER STANDARD. For these methods, please refer to the corresponding testing method documents.

Please note that, as part of the OEKO-TEX® ECO PASSPORT certification, products with a diverse appearance and texture are analysed. In some methods, sample processing differs significantly between different sample types (solid, paste-like, liquid (miscible or immiscible with water)), so this document cannot show the entirety of the methods used.

Abbreviations

- AAS - atom absorption spectrometer
- CI - chemical ionisation
- DAD - diode array detector
- EI - electron impact
- FLD - fluorescence detector
- IC - ion chromatography
- ICP - inductively coupled plasma
- GC - gas chromatography
- LC - liquid chromatography
- MS - mass spectrometry
- OES - optical emission spectroscopy
- UV/VIS - ultraviolet-visible

Formaldehyde (M-EP-08)

The method is based on ISO 17226-1 and JIS L 1041-2011. Depending on the sample type, formaldehyde is either extracted with water and wetting agent solution or by liquid-liquid-extraction with n-hexane and wetting agent solution, derivatised with acetylacetone and determined by LC-FLD.

Total heavy metals (M-EP-21)

For the determination of the heavy metal content, samples are chemically digested using acids to obtain a clear extract containing heavy metals, which is afterwards analysed by AAS, ICP-MS or ICP-OES.

Permethrin (M-EP-06-D)

The method for permethrin is based on sample type dependent extraction. Either hexane extraction followed by liquid-liquid extraction is performed, or extraction with an acetonitrile/water mixture followed by QuEChERs. The subsequent analysis is carried out by GC-MS.

Chlorinated phenols and ortho-phenylphenol (M-EP-07)

The method for chlorinated phenols and ortho-phenylphenol (OPP) is based on an extraction with potassium hydroxide solution. After the sample extract has been purified if necessary, free chlorophenols and any hydrolysed chlorophenol esters are acetylated with acetic anhydride, transferred to an organic phase and analysed by means of GC-MS.

Phthalates & siloxanes (M-EP-18)

The extraction method for phthalates is dependent on the sample type but generally based on an extraction of the material with an organic solvent in an ultrasonication bath or Soxhlet apparatus and, if necessary, a subsequent clean-up of the extract. The subsequent analysis is carried out using GC- MS.

Organic tin compounds (M-EP-17)

The method for determination of organic tin compounds is based on an extraction with an ethanol / acetic acid mixture in an ultrasonication bath and followed by derivatisation with sodium tetraethyl borate. The subsequent analysis is carried out using GC-MS.

Bisphenols & related substances (M-EP-40)

The method is based on an extraction of the sample with THF in an ultrasonication bath. After a dilution step, the extract is analysed by LC-MS.

Azo dyes, arylamines and aniline (M-EP-03)

Azo dyes, which may be cleaved into carcinogenic arylamines, are analysed according to ISO 14362-1 and are combined with analysis of aniline (both as free chemical residue and cleavable form within colourants). Samples are treated with sodium dithionite and extracts are analysed with two chromatography methods, preferably LC-MS and GC-MS.

Allergenic, carcinogenic and other banned colourants & quinoline (M-EP-04)

The identification and quantification of dyestuff with allergenic or carcinogenic potential, other banned dyestuff and pigments and Michler's ketone and base is achieved by hot acetone extraction or, depending on the type of sample, by simple dissolution of testing material in methanol, and analysis by LC-DAD or LC-MS.

Chlorinated benzenes and toluenes (M-EP-02)

The determination of the content of chlorinated benzenes and toluenes is performed by extraction of the test material with sample type dependent extraction methods based on dichloromethane. The extract is further cleaned up, if needed, and analysed by GC-MS.

Polycyclic aromatic hydrocarbons (PAH; M-EP-23)

The method for determination of polycyclic aromatic hydrocarbons (PAH) is based on an extraction of the material with toluene. And, if necessary, a subsequent clean-up of the extract. Subsequent analysis is carried out using GC-MS.

Flame retardants (M-EP-30)

The determination of banned flame retardants (brominated, organophosphorus and others) is based on sample extraction with a mixture of methanol and toluene, followed by GC-MS and LC-MS analysis, respectively.

Solvent residues (M-EP-26)

The method for the determination of solvent residues is based on an extraction of the sample with methanol and subsequent analyses by GC-MS.

Alkylphenols & alkylphenol ethoxylates (AP & APEO; M-EP-25)

The method for analysis of alkylphenols and alkylphenol ethoxylates is initiated by sample type dependent extraction. Either methanol extraction in an ultrasonication bath is applied or liquid-liquid extraction with either water and dichloromethane or water, methanol and hexane. After optional extract clean up, analysis is carried out by LC-MS.

Per- and polyfluoroalkyl substances (PFAS; M-EP-22)

For the determination of PFAS, the test sample is extracted with organic solvent in the presence of sodium hydroxide for alkaline hydrolysis, using an ultrasonication bath. The following analysis is performed with LC-MS and GC-MS.

Total fluorine (M-EP-42)

The method is based on direct sample combustion with oxygen. The resulting HF is collected in an absorber solution and can then be analysed for the fluorine content using IC.

UV stabilisers (M-EP-28)

The extraction method for UV stabilisers is highly dependent on the sample type, but generally based on an extraction of the material with an organic solvent in an ultrasonication bath or Soxhlet apparatus and, if necessary, a subsequent clean-up of the extract. The subsequent analysis is carried out using LC-MS.

Short & medium chain chlorinated paraffins (SCCP&MCCP; M-EP-24)

The method for the determination of short and medium chain chlorinated paraffines is based on an extraction of the testing material with a mixture of dichloromethane and (cyclo)hexane, followed by a clean-up and subsequent analysis with GC-MS. For analysis of the sum of all short and medium chlorinated paraffins the instrument is operated in the EI (electron impact) mode. For the definite identification and quantification of the SCCP and MCCP congeners present in the sample, the instrument must be operated in CI (chemical ionisation) mode.

Process preservative agents (M-EP-29)

For the determination of process preservative agents, triclosan and 2-MBT, a sample type dependent extraction using water, acetonitrile, and hexane is performed and is concluded by phase separation. Analysis is performed by LC-DAD.

VOCs, glycols, cresols, & chlorinated solvents (M-EP-31)

The method for the determination of VOCs, glycols, cresols, and chlorinated solvents is based on an extraction of the sample with methanol and subsequent analyses by GC-MS.

Vinylchloride (M-EP-50)

The analysis method for vinylchloride follows DIN EN ISO 6401. Monomeric vinylchloride is extracted from samples using DMAc, followed by headspace GC-MS.

Azodicarbonamide (ADCA; M-EP-35)

The sample is extracted with DMSO. After extraction, the sample is analysed by LC-DAD.

Dimethylfumarate (DMFu; M-EP-27)

The method for the determination of dimethylfumarate is based on an extraction of the sample with an organic solvent and subsequent analyses by GC-MS.

Glutaraldehyde (M-EP-41)

Glutaraldehyde is extracted from samples in an ultrasonication bath with an aqueous solution (and organic solvents) and derivatised with DNPH, followed by LC-DAD analysis.

Melamine (M-EP-44)

The extraction method for melamine is highly dependent on the sample type, but generally utilises wetting agent solution followed by an n-hexane clean-up or liquid-liquid extraction with wetting agent solution and n-hexane for extraction. The extract is analysed by LC-MS.

N-(hydroxymethyl)acrylamide (M-EP-43)

The method is based on sample extraction with hot water in an ultrasonication bath. The extract is analysed by LC-DAD.

Phenol & related substances (M-EP-39)

For the determination of phenol and related substances, a strongly sample type dependent extraction method which is based on the solvents water, acetonitrile and hexane and is concluded by phase separation is performed. Analysis is performed by LC-DAD or LC-MS.