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Testing Methods

OEKO-TEX® STANDARD 100 & ORGANIC COTTON

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OEKO-TEX®
International Association for Research and Testing in
the Field of Textile and Leather Ecology.
国际环保纺织和皮革协会

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Testing procedures for authorization to use the
OEKO-TEX® STANDARD 100 mark

授权使用 OEKO-TEX® STANDARD 100 标识的测试
程序

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General remarks

In case an article, which shall be certified according to the OEKO-TEX® STANDARD 100, contains also leather and skins (with or without hair) or chemicals (e.g. gel pouches), these materials are tested according to the conditions and criteria of the OEKO-TEX® LEATHER STANDARD or the OEKO-TEX® ECO PASSPORT respectively and the methods used there (please refer to the corresponding documents).

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
- UV/VIS - ultraviolet-visible

1 pH value

The pH value is determined according to ISO 3071 (KCl solution).

2 Formaldehyde

2.1 Qualitative testing

If possible, qualitative tests can be done first through a colour change reaction with chromotrope acid to show whether the subsequent quantitative test is necessary or not.

2.2 Quantitative determination of the content of free and partially releasable formaldehyde

The sample preparation is performed according to Japanese Law 112 / JIS L 1041 - 2011 (using acetylacetone, method B). Analysis is performed either by using UV/VIS spectroscopy, LC-DAD or LC-FLD.

3 Heavy metals

3.1 Extraction with artificial acid sweat solution

The heavy metals are extracted by use of artificial acidic sweat solution according to ISO 105-E04.

总论

若根据 OEKO-TEX® STANDARD 100 认证的产品还包含皮革和毛皮（带或不带毛）或化学品（例如，凝胶袋），则这些材料应按照 OEKO-TEX® LEATHER STANDARD 或 OEKO-TEX® ECO PASSPORT 的条件和标准及其规定的方法进行测试（请参阅相应的文件）。

缩写

- AAS - 原子吸收光谱仪
- CI - 化学电离
- DAD - 二极管阵列检测器
- 电子轰击离子源
- FLD - 荧光检测器
- IC - 离子色谱法
- ICP - 电感耦合等离子体
- GC - 气相色谱法
- LC - 液相色谱法
- MS - 质谱分析法
- UV/VIS - 紫外-可见分光光度法

pH 值

按照 ISO 3071 (KCl 溶液) 测定 pH 值。

甲醛

定性测试

如果可能，首先通过与变色酸的变色反应进行定性测试，以显示是否有必要进行随后的定量测试。

定量测定游离的和可部分释放的甲醛的含量

按照日本法律 112 / JIS L 1041 - 2011 (使用乙酰-鲸蜡酮，方法 B) 进行。使用 UV/VIS、LC-DAD 或 LC-FLD 进行分析。

重金属

使用人造酸性汗液提取

按照 ISO 105-E04 使用人造酸性汗液提取重金属。



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Metallic accessories having a surface refinement or coating are subjected additional to a further test for extractable nickel after a pre-treatment (wear and corrosion according to EN 12472:2020, used for its abrasion medium).

3.2 Total digestion of the samples

The samples are chemically digested using acids to get a clear solution, which is afterwards analysed by means of ICP-OES, ICP-MS or AAS.

Different components of the sample, which can be differentiated macroscopically (base material, paints, etc.), are separately digested and analysed. The method is therefore suitable to check the samples for total lead content in reference to the requirement of the American legislation for children's articles (CPSIA, Consumer Product Safety Improvement Act).

3.3 Test for chromium(VI)

Chromium is extracted by use of artificial acidic sweat solution according to ISO 105-E04. The content of chromium (VI) in the extract is determined with selective and satisfactory sensitive methods. The detection can be carried by means of UV/VIS spectroscopy or IC.

4 Pesticides

The tests for the pesticides which are mentioned in STANDARD 100 by OEKO-TEX® are performed with cleaned-up extracts by GC-MS and LC-MS.

4.1 Glyphosate

The test for glyphosate is performed with cleaned-up extracts by LC-MS.

5 Chlorinated phenols and ortho-Phenylphenol (OPP)

The samples are extracted with a basic aqueous solution following DIN EN 17134-2. The extracted free phenols and possibly hydrolysed phenolesters are acetylated, transferred to an organic phase and analysed with GC-MS.

6 Phthalates

The test is performed by extraction of the testing material with tetrahydrofuran, followed by precipitation of the polymers with hexane. The extract is analysed by GC-MS.

经过表面加工或涂层的金属辅料，在预处理（根据 EN 12472:2020 进行磨损和腐蚀，用作它的磨蚀介质）之后，须接受可萃取镍释放量的进一步检测。

样品消解后的总量

使用酸对样品进行化学消解，以得到透明的溶液，然后通过 ICP-OES，ICP-MS 或 AAS 进行分析。

可以宏观区分的样品不同组分（基材、油漆等），分开进行消解和分析。因此该方法适合用于按照美国儿童用品立法（CPSIA 消费品安全促进法）的要求检查总铅含量。

铬 (VI) 的检测

铬是使用符合 ISO 105-E04 标准的人工酸性汗液提取的。提取物中铬 (VI) 的含量是用选择性强和满意度高的敏感方法测定的。可通过 UV/VIS 或 IC 进行测定。

杀虫剂

OEKO-TEX® STANDARD 100 中提到的杀虫剂测试使用经净化的提取物通过 GC-MS 和 LC-MS 进行分析。

草甘膦

使用 LC-MS 对草甘膦进行提取测试

氯化苯酚和邻苯基苯酚 (OPP)

样品按照 DIN EN 17134-2 用碱性水溶液提取。提取的游离酚和可能的的水解酚酯被乙酰化，转移到有机相中并用 GC-MS 分析。

邻苯二甲酸酯

该测试是通过用四氢呋喃提取测试材料，然后用正己烷沉淀聚合物来进行的。提取物通过 GC-MS 进行分析。



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6.1 Siloxanes

The test is performed by extraction of the testing material with tetrahydrofuran, followed by precipitation of the polymers with hexane. The extract is analysed by GC-MS.

硅氧烷

该测试方法是使用四氢呋喃提取测试物进行测试，然后使用正己烷来沉淀聚合物，通过 GC-MS 分析提取物。

7 Organic tin compounds

The method is based on an extraction of the testing material with an ethanol/acetic acid solution and tropolone followed by derivatisation with sodium tetraethylborate. The extract is then analysed by GC-MS.

有机锡化合物

该方法基于用乙醇/乙酸溶液和托普隆提取测试材料，然后用四乙基硼酸钠衍生。然后通过 GC-MS 分析提取物。

8 Short and medium chained chlorinated paraffins (SCCP and MCCP)

The method for the determination of the short and medium chained chlorinated paraffins is based on an extraction of the testing material with dichloromethane/hexane, followed by a clean-up and subsequent analysis with GC-MS. For a total analysis (sum of short, medium and long chained chlorinated paraffins) the instrument is operated in the EI mode. CI mode is used for the identification and quantification of the SCCP and MCCP congeners present in the sample.

短链和中链氯化石蜡 (SCCP 和 MCCP)

测定短链和中链氯化对羟基苯甲酸的方法基于用二氯甲烷/正己烷提取测试材料，然后用 GC-MS 进行净化和随后的分析。对于总分析（短链、中链和长链氯化石蜡的总和），仪器在 EI 模式下运行。CI 模式用于鉴定和定量样品中存在的短链氯化石蜡和中链氯化石蜡同族元素。

9 Per- and polyfluorinated compounds (PFCs) / Per- and polyfluoroalkyl substances (PFAS)

The method for the determination of PFCs/PFAS is based on an extraction with methanol followed by determination of the PFCs/PFAS by means of LC-MS and GC-MS.

全氟和多氟化合物 (PFCs) / 全氟和多氟烷基物质 (PFAS)

PFCs/PFAS 的测定方法基于甲醇萃取，然后通过 LC-MS 和 GC-MS 进行测定。

10 Dimethylfumarate (DMFu)

The method bases on an extraction of the samples with acetone. After preconcentration the extracts are analysed with GC-MS.

富马酸二甲酯 (DMFu)

该方法基于用丙酮提取样品。预浓缩后，用 GC-MS 分析提取物。

11 Humanecologically critical colorants

与人类生态学密切相关的着色剂

11.1 Cleavable arylamines and aniline

可裂解芳香胺和苯胺

The tests for azo dyes, which may be cleaved into arylamines with cancerogenic properties are carried out following the official test methods accord-

这些染料可能被裂解成具有致癌特性的芳胺，按照符合 ISO 14362-1 和 14362-3 的官方测试方法进行。对芳胺和苯胺（可从着色剂中裂解以及以游离的化



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ing to ISO 14362-1 and 14362-3. The test for the aromatic amine aniline (cleavable from colorants as well as for the presence as chemical residue in free manner) is carried out together with the analyses of azo dyes.

11.2 Dyestuff and pigments with human ecologically critical properties (allergenic, carcinogenic)

The identification and quantification of dyestuff and pigments is made through a hot acetone extraction followed by detection with LC-DAD or LC-MS.

学残留物方式存在) 的测试与偶氮染料的分析一起进行。

与人类生态学密切相关的染料和颜料(致敏性、致癌性)

染料和着色剂的测定和定量通过热氯苯萃取进行, 然后使用 LC-DAD 或 LC-MS 进行检测。

12 Chlorinated benzenes and toluenes

The method is based on an ultrasonic bath extraction of the testing materials with dichloromethane. The extracts are analysed by means of GC-MS.

氯化苯和氯化甲苯

该方法基于用二氯甲烷对测试材料进行超声波溶化提取。通过 GC-MS 分析提取物。

13 Polycyclic aromatic hydrocarbons (PAH)

The method is based on extraction of the test samples with toluene. The extracts are analysed with GC-MS.

多环芳香烃 (PAH)

该方法基于用甲苯对测试样品进行提取。然后用 GC-MS 分析提取物。

14 Solvent residues

The method is based on extraction of the test samples with methanol. The extracts are analysed with GC-MS.

溶剂残留物

该方法基于用甲醇对测试样品进行提取。然后用 GC-MS 分析提取物。

15 UV stabilizers

The method bases on an extraction of the test samples with tetrahydrofuran. The extracts are then analysed with LC-DAD, LC-MS or GC-MS.

紫外线稳定剂

该方法基于用四氢呋喃对测试样品进行提取。然后用 LC-DAD、LC-MS 或 GC-MS 分析提取物。

16 Banned flame retardants

The determination of the banned flame retardants is performed by extraction of the test material with organic solvents. The extract is analysed then by LC-MS and GC-MS.

禁用阻燃剂

禁用阻燃剂的测定是通过用甲苯对测试材料进行提取来进行的。然后通过 LC-MS 和 GC-MS 分析提取物。



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17 Volatile organic compounds (VOC), glycols cresols and chlorinated solvents

The sample that is to be analysed for organic volatile compounds, glycols and cresols is baked out by thermodesorption technique. The released substances are enriched on suitable trapping material and afterwards analysed by GC-MS.

18 Quinoline

The extraction of the samples is done with hot extraction. The measurement of the of the extracted quinoline is performed in by LC-MS or GC-MS.

19 N-nitrosamines and N-nitrosatable substances

The N-nitrosamines and N-nitrosatable substances migrate into a saliva test solution. The N-nitrosatable substances react to N-nitrosamines by acidification.

The analysis of the N-nitrosamines and N-nitrosatable substances is done by LC-MS.

20 Surfactants and wetting agent residues (Alkylphenols, Alkylphenol ethoxylates)

The method is based on extraction of the test samples with methanol. The extracts are then analysed with LC-MS and/or GC-MS.

21 Azodicarboxamide (ADCA)

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

22 Genetically modified organisms (GMO)

22.1 Qualitative analysis

The detection of genetic modification is carried out according to the International Workshop Agreement (IWA) 32:2019, in which DNA is isolated from chemically untreated cotton and analyzed for various markers that indicate genetic modification of the cotton. The test allows the screening of all currently known genetically modified cotton events and is designed to optimize the probability of also

挥发性有机化合物 (VOC)、二醇类和甲酚

通过热吸附方式进行 VOC、乙二醇和甲酚含量的测定。将释放的物质富集于合适的材料上，然后采用 GC/MS 进行分析。

喹啉

通过热牵引对测试样品进行提取。然后由 LC-MS 或 GC-MS 进行提取喹啉的测量。

亚硝胺和亚硝基物质

亚硝胺和亚硝基物质迁移至唾液测试溶液中。亚硝基物质通过酸化反应生成亚硝胺。

使用 LC-MS 对亚硝胺和亚硝基物质进行分析。

表面活性剂和润湿剂残留物(烷基酚，烷基酚聚氧乙烯醚)

该方法使用甲醇提取测试物。然后使用 LC-MS 和或 GC-MS 分析提取物。

偶氮二甲酰胺

样品使用乙酸乙酯/DMSO 提取，然后使用 LC-DAD 分析样品

转基因生物 (GMO)

定性分析

转基因检测是根据国际研讨会协议(IWA) 32:2019 进行的，其中 DNA 被从化学处理的棉花中分离并被用作分析表明棉花转基因的各种标记。该测试允许筛选所有目前已知的转基因棉花，并旨在优化检测未知转基因棉花的概率。



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detecting unknown genetically modified cotton events.

22.2 Quantitative analysis

The procedure is carried out following the qualitative analysis. The isolated DNA is further analyzed by real-time PCR and in the first step the fundamental cotton lines are determined. These lines are quantified in the second step by realtime PCR. The quantification is done in relation to taxonomic target gene control (SAH7).

23 Emission

For the determination of emitted chemicals an emission chamber is used. The methods used are based on ISO 16000-3, 16000-6 and 16000-9.

24 Phenol

The determination of phenol is performed by extraction of the test material with methanol. The extract is analysed then by LC-FLD.

25 Bisphenols

The determination of bisphenols is performed by extraction of the test material with THF followed by a precipitation. The extract is analysed then by LC-MS.

26 Extractable organic fluorine

The method is based on an ultrasonic bath extraction of samples with methanol. The extracts obtained are burned with oxygen in a combustion unit. The resulting HF is collected in an absorber solution and can then be analysed for the fluorine content using IC.

27 N-(Hydroxymethyl)acrylamide

The method is based on an extraction of samples with water. The extract is analysed by LC-DAD.

28 Colour fastness

In all the colour fastness tests cited below only the fastness grades with respect to staining of the adjacent fabrics are determined.

The basic methods for the performing and evaluating the test are ISO 105-A01 and ISO 105-A03. More specifically, following tests are performed:

定量分析

该过程是在定性分析之后进行的。分离出的 DNA 将通过实时 PCR 进行进一步分析，第一步是确定基本的棉花品系。第二步通过实时 PCR 对这些品系进行定量。定量与分类目标基因控制 (SAH7) 有关。

释放量

使用释放舱测定释放的化学物质。测定方法基于 ISO 16000-3、16000-6 和 16000-9。

苯酚

苯酚的测定是通过用甲醇提取测试物来进行的。然后通过 LC-FLD 分析提取物。

双酚

双酚的测定是通过四氢呋喃提取测试材料，然后进行沉淀。然后用 HPLC-MS 对提取物进行分析。

可萃取有机氟

该方法基于用甲醇对样品进行超声波浴提取。萃取液在燃烧装置中与氧气一起燃烧。产生的氢氟酸被收集到吸收液中，然后使用 IC 分析氟含量。

N-(羟甲基)丙烯酰胺

该方法以水提取样品为基础。提取物通过 LC-DAD 进行分析。

色牢度

在下面引用的所有色牢度测试中，只测定贴衬织物的沾色牢度等级。

执行和评估测试的基本方法为 ISO 105-A01 和 ISO 105-A03。更具体地说，执行以下测试：



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- Determination of colour fastness to water according to ISO 105-E01
 - Determination of colour fastness to acidic and alkaline perspiration according to ISO 105-E04
 - Determination of colour fastness to rubbing dry according to ISO 105-X12
 - Determination of colour fastness to saliva and perspiration. The test is performed with reference to § 64 LFGB (German law regarding food, commodities, and animal feed), BVL B 82.92-3 (DIN 53160-1) and B 82.02-13 (DIN 53160-2)
- 按照 ISO 105-E01 进行的耐水色牢度测定
 - 按照 ISO 105-E04 进行的耐酸性和碱性汗液色牢度测定
 - 按照 ISO 105-X12 进行的耐干摩擦色牢度测定
 - 唾液和汗液色牢度的测定。参照§64 LFGB (德国食品、日用品和动物饲料的法律)、BVL B 82.92-3 (DIN 53160-1) 和 B 82.02-13 (DIN 53160-2)

29 Odour

A sample of defined area is conditioned in a desiccator of set humidity and the odour formed is evaluated sensory by a set of test persons.

29.1 Odour test on textile floor coverings, mattresses, foams and large coated articles not being used for clothing

After being fitted, textile floor coverings may emit a perceptible odour. This is an inherent initial odour typical of the new products and normally vanishes after some weeks.

The odour test is performed with reference to SNV 195 651. The test specimen is tested for the development of odour in a closed system, considering time, temperature and humidity.

29.2 Odour test on other articles

All articles are subjected to a preliminary odour test, which, if failed, stops the certification procedure. The odour from mould, high boiling fractions of petrol (from colour printing), fish (from permanent finishing) or aromatic hydrocarbons will induce a test failure. Moreover, odorants (perfumes) used for removing or covering the smell of a textile material originating from its production (oil, fats, dyestuffs) must not be detected during sensory odour testing.

30 Asbestos fibres

The identification of asbestos fibres is performed using a polarizing microscope using at least a 250-fold magnification.

气味

将确定范围内的样品放入湿度已设定的干燥器中进行调节，所形成的气味由一组测试人员通过感官进行评估。

针对纺织地毯、床垫、泡绵和不用于服装的大型涂层产品的气味检测

在铺设后，覆盖地板之纺织品可能会释放出或多或少的可感觉到的气味。这是新产品固有原始气味，并且通常在几星期后会消失。

按照 SNV 195 651 进行气味测试。在交付时状态和储存之后两种情况下，注意时间、温度和湿度，在密封系统中测试试样气味产生情况。

其他物品的气味测试

所有产品都要经过初步气味测试，如果测试失败，认证程序就会终止。霉菌、高沸点汽油馏分(来自彩色印刷)、鱼腥(来自永久整理)或芳香烃的气味会导致测试失败。此外，在感官气味测试过程中，用于去除或掩盖纺织材料(油、脂肪、染料)气味的气味剂(香水)不得有缺陷。

石棉纤维

使用至少 250 倍放大率的偏光显微镜进行石棉纤维的识别。