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**ORGANIC
COTTON**

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 OEKO-TEX® STANDARD 100, also contains leather and skins (with or without hair) or chemicals (e.g. gel pouches), these materials are tested according to the conditions and criteria of OEKO-TEX® LEATHER STANDARD or 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
- OES - optical emission spectroscopy
- PCR - polymerase chain reaction
- UV/VIS - ultraviolet-visible

1 pH value

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

2 Formaldehyde

For the determination of free or releasable formaldehyde, 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 or LC-FLD.

3 Heavy metals

3.1 Extractable heavy metals

The heavy metals are extracted by use of artificial acidic sweat solution according to DIN EN 16711-2. The extract is analysed by means of ICP-OES, ICP-MS or AAS. Metallic accessories having a surface finish or coating are additionally subjected to a further test for extractable nickel after a pretreatment (wear and corrosion according to EN 12472:2020, used for its abrasion medium).

总论

若应通过 OEKO-TEX® STANDARD 100 认证的物品中还含有皮革和皮毛（带毛或不带毛）或化学品（如凝胶袋），则应分别根据 OEKO-TEX® LEATHER STANDARD 或 OEKO-TEX® ECO PASSPORT 的条件和标准以及使用的方法对这些材料进行测试（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
- OES - 发射光谱
- PCR - 聚合酶链反应
- 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

在测定游离或可释放甲醛时，根据日本法律 112 / JIS L 1041 - 2011 (使用乙酰丙酮，方法 B) 进行样品制备。使用 UV/VIS 或 LC-FLD 进行分析。

重金属

可萃取重金属

根据 DIN EN 16711-2 标准，使用人工酸性汗液提取重金属。提取物通过 ICP-OES、ICP-MS 或 AAS 进行分析。有表面处理或涂层的金属配件在经过预处理（根据 EN 12472:2020，磨损和腐蚀用于其磨损介质）后，还要进行可萃取镍的进一步检测。



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3.2 Heavy metal total content

The samples are chemically digested using acids to obtain a clear extract containing heavy metals, 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 DIN EN 16711-2. The content of chromium (VI) in the extract is determined with selective and sensitive methods. The detection can be carried by means of UV/VIS spectroscopy, AAS, ICP, IC or polarography.

4 Pesticides

4.1 Polar and apolar pesticide

Polar and apolar pesticides are extracted by ASE (or Soxhlet) using methanol or acetone. After clean-up, extracts are analysed for pesticides with GC-MS and LC-MS.

4.2 Glyphosate and salts

Glyphosate and its salts are extracted from samples by aqueous extraction, followed by derivatisation or without derivatisation. Extracts are then analysed 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 (cyclo)hexane. The extract is analysed by GC-MS.

重金属总含量

样品经酸化学消解后得到含有重金属的透明提取物，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。

六价铬的检测

根据 DIN EN 16711-2 标准，使用人工酸性汗液提取铬。提取物中的铬 (VI) 含量可通过选择性灵敏方法进行测定。检测方法包括 UV/VIS、AAS、ICP、IC 或极谱法。

杀虫剂

极性和非极性杀虫剂

极性和非极性农药通过 ASE（或索氏提取器）用甲醇或丙酮提取。净化后的提取物用 GC-MS 和 LC-MS 进行农药分析。

草甘膦和盐类

草甘膦及其盐类通过水萃取从样品中提取出来，然后进行衍生处理或不进行衍生处理。然后用 LC-MS 对提取物进行分析。

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

测试方法是用四氢呋喃萃取测试材料，然后用（环）己烷沉淀聚合物。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 (cyclo)hexane. The extract is analysed by GC-MS.

硅氧烷

测试方法是用四氢呋喃萃取测试材料，然后用（环）己烷沉淀聚合物。提取物通过 GC-MS 进行分析。

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化。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 a mix of dichloromethane/(cyclo)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 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石蜡的方法是用二氯甲烷/（环）己烷混合液对测试材料进行萃取，然后进行净化，再用 GC-MS 进行分析。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 模式用于鉴定和量化样品中的短链氯化石蜡和中链氯化石蜡同系物。

9 Per- and polyfluoroalkyl substances (PFAS)

PFAS are extracted from the samples using strongly alkaline methanol in an ultrasonic bath. This alkalinity allows for hydrolysis of, for instance, fluorinated polymers and esters and results in release of PFAS. After neutralization with acid, PFAS are analyzed using LC-MS.

全氟和多氟烷基物质 (PFAS)

在超声波仪中使用强碱性甲醇从样品中提取 PFAS。这种碱性可使含氟聚合物和酯等水解，从而释放出 PFAS。用酸中和后，使用 LC-MS 对 PFAS 进行分析。

10 Dimethylfumarate (DMFu)

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

富马酸二甲酯 (DMFu)

该方法以丙酮提取样品为基础。提取物经过预浓缩后，用 GC-MS 进行分析。

11 Colourants

11.1 Azo dyes, arylamines and aniline

The tests for azo dyes, which may be cleaved into arylamines with cancerogenic properties, are carried out following the official test methods according to ISO 14362-1 and 14362-3, i.e. treating samples with the reductant sodium dithionite and ana-

着色剂

偶氮染料、芳香胺和苯胺

偶氮染料可裂解成致癌性芳香胺，其检测按照 ISO 14362-1 和 14362-3 的官方检测方法进行，即用还原剂亚硫酸钠处理样品，并用两种色谱法（最好是 LC-DAD 和 GC-MS）分析提取物。芳香胺苯胺（可



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lysing the extracts with two chromatography methods, preferably LC-DAD and GC-MS. 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 Allergenic, carcinogenic and other banned colourants

The identification and quantification of dyestuff with allergenic or carcinogenic potential, other banned dyestuff and pigments and Michler's ketone and base is achieved through a hot acetone extraction followed by detection with LC-DAD or LC-MS.

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.

13 Polycyclic aromatic hydrocarbons (PAH)

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

14 Solvent residues

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

15 UV stabilisers

The method is based on extraction of samples with tetrahydrofuran (THF) or with a dichloromethane-(cyclo)hexane mixture. The extracts are then analysed with LC-DAD, LC-MS or GC-MS.

16 Banned flame retardants

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

从着色剂中分解，也可作为化学残留物以游离方式存在)的检测与偶氮染料的分析一起进行。

致敏、致癌和其他禁用着色剂

通过热丙酮萃取，然后使用 LC-DAD 或 LC-MS 进行检测，可对具有过敏性或致癌性的染料、其他禁用染料和颜料以及 Michler 酮和碱进行鉴定和定量。

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。

多环芳香烃 (PAH)

该方法以甲苯萃取测试样品为基础。提取物用 GC-MS 进行分析。

溶剂残留

该方法以甲醇萃取测试样品为基础。提取物用 GC-MS 进行分析。

紫外线稳定剂

该方法采用四氢呋喃 (THF) 或二氯甲烷- (环) 己烷混合物提取样品。然后用 LC-DAD、LC-MS 或 GC-MS 对提取物进行分析。

禁用阻燃剂

检测禁用阻燃剂的方法是用丙酮或甲苯萃取测试材料。然后用 LC-MS 和 GC-MS 对提取物进行分析。



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

The sample to be analysed for volatile organic compounds, glycols, cresols and chlorinated solvents 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 achieved by hot extraction with acetone. 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 freely available as well as produced N-nitrosamines is done by LC-MS.

20 Alkylphenols, Alkylphenol ethoxylates

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

21 Azodicarbonamide (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 analysed for various markers that indicate genetic modification of the cotton. The test allows to screen for all currently known genetically modified cotton events and is designed to optimize the probability of also detecting unknown genetically modified cotton events.

挥发性有机化合物 (VOC)、乙二醇、甲酚和氯化溶剂

通过热解吸附技术烘焙出要分析挥发性有机化合物、二醇、甲酚和氯化溶剂的样品。释放的物质在合适的捕获材料上富集，然后通过 GC-MS 进行分析。

喹啉

样品通过丙酮热萃取法提取。提取的喹啉通过 LC-MS 或 GC-MS 进行测量。

亚硝胺和亚硝基物质

N-亚硝胺和 N-亚硝基物质会迁移到唾液测试溶液中。N-亚硝基物质通过酸化反应生成 N-亚硝胺。通过 LC-MS 检测游离态和反应生成的 N-亚硝胺。

烷基酚、烷基酚聚氧乙烯醚

该方法是在超声波浴中用甲醇萃取测试样品。然后用 LC-MS 和/或 GC-MS 对提取物进行分析。

偶氮二甲酰胺 (ADCA)

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 IWA 32:2019 国际研讨会协议 (International Workshop Agreement IWA 32:2019) 进行的，即从未经化学处理的棉花中分离 DNA，并对表明棉花转基因的各种标记进行分析。该检测可筛查目前已知的所有转基因棉花事件，其目的是最大限度地提高检测未知转基因棉花事件的概率。



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22.2 Quantitative analysis

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

23 Emission of volatile chemicals

For the determination of emitted volatile chemicals, the methods are based on ISO 16000-3 (formaldehyde) and ISO 16000-6 (VOCs), using an emission chamber according to ISO 16000-9. Formaldehyde is adsorbed on DNPH cartridges, eluted with acetonitrile and analysed using LC-DAD or LC-FLD. For VOCs, different adsorbents are used and analysis is performed by thermal desorption and GC-MS.

24 Phenol

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

25 Bisphenols

The determination of bisphenols is performed by extraction of the test material with THF in an ultrasonic bath followed by a polymer precipitation with methanol or (cyclo)hexane. The extract is then analysed by LC-MS.

26 Total fluorine

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.

27 N-(Hydroxymethyl)acrylamide

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

定量分析

该过程是在定性分析之后进行的。分离出的 DNA 将通过实时定量 PCR 进行进一步分析，第一步是确定棉花的基本品系。第二步通过实时定量 PCR 对这些品系进行量化。定量与分类目标基因对照 (SAH7) 有关。

挥发性化学品的排放

对于挥发性化学物质的检测，其方法基于 ISO 16000-3 (甲醛) 和 ISO 16000-6 (挥发性有机化合物)，使用符合 ISO 16000-9 标准的排放室。甲醛吸附在 DNPH 试剂盒上，用乙腈洗脱，然后使用 LC-DAD 或 LC-FLD 进行分析。对于挥发性有机化合物，则使用不同的吸附剂，并通过热解吸附和 GC-MS 进行分析。

苯酚

苯酚的测定方法是在超声波浴中用甲醇萃取测试材料。然后用 LC-FLD 对提取物进行分析。

双酚

该方法以甲苯萃取测试样品为基础。提取物用 GC-MS 进行分析。

总氟

该方法基于样品与氧气的直接燃烧。产生的氢氟酸被收集到吸收溶液中，然后使用 IC 分析氟含量。

N-(羟甲基)丙烯酰胺

该方法是在超声波浴中用热水提取样品。提取物通过 LC-DAD 进行分析。



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28 Melamine

The samples are extracted with water in a shaking bath (acc. to Japanese Law 112 / JIS L 1041 - 2011) and then analyzed on LC-DAD.

29 Colour fastness

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

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

- 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 for food, commodities and animal feed), DIN 53160, ISO 105-A03 and ISO105-E04

30 Odour

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

30.1 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 lead to 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.

30.2 Odour test on clothing and accessories

After being fitted, textile floor coverings may emit a perceptible odour. This is an inherent initial odour typical of the 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.

三聚氰胺

样品在振荡槽中用水提取（根据日本法律 112 / JIS L 1041 - 2011），然后在 LC-DAD 上进行分析。

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是 ISO 105-A01 和 ISO 105-A03。具体来说，要进行以下测试：

- 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
- 唾液和汗渍色牢度测定。测试参照 § 64 LFGB（德国食品、商品和动物饲料法）、DIN 53160、ISO 105-A03 和 ISO105-E04 进行。

气味

在设定湿度的干燥器中对确定区域的样本进行调节，并由一组测试人员对形成的气味进行感官评估。

其他物品的气味测试

所有物品都要进行初步气味测试，如果不合格，则停止认证程序。霉菌、高沸点汽油（来自彩色印花）、鱼腥味（来自永久整理）或芳香烃的气味会导致测试失败。此外，在感官气味测试中，不得检测到用于去除或掩盖纺织品生产过程中产生的气味（油、脂肪、染料）的气味剂（香水）。

服装和配饰气味测试

纺织楼板面层在安装后可能会散发出明显的气味。这是产品固有的典型初始气味，通常会在几周后消失。

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的气味产生情况。



STANDARD
100



ORGANIC
COTTON

31 Asbestos fibres

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

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。