INDITEX

Bisphenols Management Guidance

Index - Table of contents

1. Background 3

2. Objective 3

3. Scope and definitions 3
- 3.1. Bisphenol description and Uses in the retail sector 3
- 3.2 Bisphenol regulations 4
- 3.3 Bisphenol testing methodology 4

4. Measures to prevent bisphenol detections in textile and leather articles 5
- 4.1 Safer chemical product alternatives 5
- 4.2 Ensure proper chemical product management 6
- 4.3 Comunication across the supply chain 6
- 4.4 Testing verification 7

5. Recommendations for textile and leather manufacturing 7
- 5.1 Textile production with low amount of bisphenols 7
- 5.2 Low bisphenol alternatives for leather manufacturing 10

Annex I. Recommendations for leather manufacturing 12

1. Background

Bisphenols are molecules with endocrine disrupting potential. They are currently considered of concern for human health and they might also pose a threat to the environment. They have been used in a variety of applications for producing polymeric materials, such as plastics and resins. As a consequence, some bisphenols could be found in retail articles.

This document assesses the chemical processes that could entail a risk of bisphenol findings in textile and leather and offers alternatives for manufacturing them.

By applying a comprehensive approach, involving careful selection of materials, control of the chemical products, proper handling, and rigorous testing, manufacturers can lower the presence of BPA, BPS, and BPF, among other bisphenols of similar concern, thus producing safer and sustainable textiles and leather.

2. Objective

To avoid the indirect use of bisphenols in those textile and leather processes if there are alternative chemical products and recipes available. Additionally, recipes that entail low bisphenol content are proposed in those processes for which there are still no chemical product alternatives.

This guidance includes the following approaches:

1) Chemical product alternatives
2) Ensure proper chemical product management
3) Communication with the suppliers across the supply chain
4) Testing verification

Finally, the guide includes practical recommendations for textiles and leather.

This document is designed to educate and prepare suppliers for future regulatory restrictions on specific bisphenols. Suppliers are strongly advised to proactively minimize bisphenol concentrations to the lowest achievable levels, in accordance with emerging compliance standards and best practices in chemical management.

3. Scope and definitions

3.1. Bisphenol description and Uses in the retail sector

Bisphenols are synthetic molecules commonly used to produce polycarbonate plastics, epoxy resins and polymers. They are comprised of two phenolic rings that are connected through a carbon atom or other functional groups, thus there can be different configurations and congeners. Some of the most well-known ones are Bisphenol A (BPA), Bisphenol S (BPS) and Bisphenol F (BPF). Additionally, there is a wide variety of bisphenols that have similar chemical structures and uses, which are grouped together generally under the name of Bisphenols of Similar Concern (BoSC).

Presence of bisphenols in textile

Bisphenols might be found in some chemical products used to improve color fastness on polyamide textiles.

Particularly, Bisphenol F might be found as an impurity of the synthesis of the aforementioned fixing agents. The origin of Bisphenol S is from remnants of the monomer used for the synthesis of fixing agents. Both origins might involve further findings of BPS or BPF in textile fabrics. Additionally, some bisphenols i.e. Bisphenol A might be involved in the chemical processes for producing other synthetic fibers such as polyester.

Presence of bisphenols in leather

Bisphenols might be found in chemical products used for pretanning, tanning and retanning leather. Particularly, Bisphenol F could be found as an impurity of the synthesis of phenol-based synthetic tanning agents (syntan). The origin of Bisphenol S is from remnants of the monomers used for the synthesis of sulphones. Although much less frequently, Bisphenol A might have also been used as a monomer. All three origins might imply subsequent findings of either Bisphenol in the finished leather.

The risk of detecting bisphenols in leather is higher for articles whose production recipes use larger quantities of sulphones or phenolic syntans. Bisphenols can usually be found in wet white leather, however, there is a risk of high detections in all types of leather, even chrome tanned leather.

3.2 Bisphenol regulations

Bisphenols have been known to have hazardous properties, such as endocrine disruption, thus the use of some bisphenols has been limited and/or is being limited in the EU and other parts of the world to protect people's health and the environment. In Europe, Bisphenol A is regulated in thermal paper under the REACH and Bisphenol A, B and S are listed as a SVHC, indicating that its presence in a chemical product or article must be notified when the concentration is higher than 0.1%.

These are the compounds that are currently restricted, however, ECHA is currently assessing the need of restricting all bisphenols as a group with one universal restriction, under the term “Bisphenol A and other Bisphenol of similar Concern“. This would include a restriction for a group of molecules. The limit would be expressed as the maximum concentration of free bisphenol allowed in articles and it would also take migration into account. However, this regulation is not yet published nor in-force.

Additionally, Proposition 65 in California (USA) also includes a notification requirement on articles containing Bisphenol A and/or Bisphenol S, although there is no defined notification limit.

3.3 Bisphenol testing methodology

International technical committees have developed official standards for determining the presence of bisphenols in several substrates:

- Determination of bisphenols in leather

ISO 11936:2023 Leather — Determination of total content of certain bisphenols

This method is applicable to every type of leather and every leather part of an article, even if it is used in footwear. This includes finished leather and also all types of semi-manufactured leathers, tanned by any tanning system, i.e. wet blue leather, wet white leather and vegetable tanned leather, among others.

The method is based on an ultrasonic extraction at 60°C for one hour and the subsequent determination and quantification via LC-MS, LC-MS/MS or LC-DAD. Limit of Quantification (LoQ) for mass spectrometry detection is 10 mg/kg and for DAD is 100 mg/kg.

Some studies confirm a homogeneous distribution in bisphenol content in different parts of the leather (butt, bend, shoulder, and flanks). Therefore, testing location within the same leather is not critical for compliance verification testing.

- Determination of bisphenols in chemical products used for leather manufacturing

ISO 21135:2024 Chemicals for the leather tanning industry - Determination of the total content of certain bisphenols

The method is based on an ultrasonic extraction at 60°C for one hour and the subsequent determination and quantification via LC-MS, LC-MS/MS or LC-DAD. Limit of Quantification (LoQ) for mass spectrometry detection is 10 mg/kg and for DAD is 100 mg/kg.

- Determination of bisphenols in textile

As per January 2025, for textile substrates specifically, there is no published ISO standard. However, the CEN Committee 248, Working Group 26, focused on the creation of standards for restricted substances on textile, will begin developing a method specific for textiles. It will be based on a similar methodology currently also in progress proposed by the International Technical Committee for Footwear test methods (ISO TC 216):

ISO-WD 23377 Footwear — Critical substances potentially present in footwear and footwear components — Test method to quantitatively determine certain bisphenols in footwear materials.

This test method is based on a solvent extraction in an ultrasonic bath and the subsequent determination and quantification via LC-MS/MS. Limit of Quantification (LoQ) is 5 mg/kg.

Another viable analytical pathway could be to follow the recommendations of the AFIRM Group for testing for bisphenols (See AFIRM RSL 2025 or the latest version).

- Determination of bisphenols in chemical product used for textiles

Currently there is no published ISO standard. It is recommended to test chemical products for textile treatment based on:

ISO 21135:2024 Chemicals for the leather tanning industry - Determination of the total content of certain bisphenols, could be also used for textile chemical products.

4. Measures to prevent bisphenol detections in textile and leather articles

Inditex recommends assessing the following chapter with the goal of minimising the content of remaining bisphenol in the final product as an interim procedure until the chemical industry finds new safer chemical alternatives not based in bisphenol chemistry. The section includes helpful measures to reduce bisphenol content while ensuring the same quality in the final articles.

Inditex encourages to work with trusted suppliers of chemical products to minimize residual concentrations in the final article. It is convenient and important to study formulas and replace conventional chemical products with better alternatives where technically feasible. When in doubt, testing for bisphenols in the chemical product is a good verification tool to ensure proper chemical selection.

Different options might be suitable for leather and textile manufacturing; hence this section includes recommendation for the suppliers of both materials.

4.1 Safer chemical product alternatives

It is recommended that you contact your chemical product suppliers for up-to-date information of the composition/ formulation of the chemical products they supply. To reduce risk of bisphenol findings in textile and/or leather, search and evaluate safer alternatives, making sure the change effectively reduces bisphenol content and does not result in regrettable substitutions.

The List by Inditex and ZDHC are currently working on the risk assessment to establish a safe limit for bisphenols. Based on the conclusions available and the regulatory status, some of these substances may be added to newer versions of MRSL ZDHC and be contemplated in The List by Inditex. Please make sure you and your supply chain are aware of these resources.

4.2 Ensure proper chemical product management

For textile

BPS and BPF can be found in fixing agents for improving color fastness of polyamide textiles, and traces of BPA could come from polyester manufacturing. Taking this into account, it is recommended to identify all the chemical products that could entail a risk of bisphenol findings, and to store and/or label them accordingly for preventing contaminations. Please keep the information related to each chemical product, for example (SDS), Technical Data Sheet (TDS), Test report (TR), properly stored and up to date. In case of not having all the information about bisphenol presence in chemical product, it is recommended to ensure bisphenols absence by testing. Please refer to Section 3.3 to find the suitable methods.

For leather

BPS, BPF and much less frequently BPA might be found in phenolic syntans and/or sulphones used in the production of wet-white leathers, but also in chromium-tanned leathers and in some cases, also in vegetable leathers. To assess your risk when tanning and retanning leathers, it is a good practise to request Test reports (TR) of bisphenols from suppliers of the following chemical products:

- Sulphones (sulphone-based synthetic tanning agents)
- Phenolic syntans (phenol-based synthetic tanning agents)

The SDS of a chemical product should also be a source of information for bisphenol content, since contents greater than 1000 mg/kg for some bisphenols should be dully notified. However, there are SDSs on the market that are not updated and do not contain this information. In case of lacking certain information about bisphenol presence in the chemical, this chemical product should be analysed to estimate the concentration of bisphenol in the final leather. Please refer to Section 3.3 to find the suitable methods.

4.3 Comunication across the supply chain

It is important to share information and spread knowledge throughout the production chain. To that extent, attention should be paid to textile and leather materials and chemical products associated with risk of further bisphenol findings, such as polyamide fixing agents or synthetic tanning agents, among others. See previous sections, particularly Section 3.1, for further details.

- If you are a dyeing or printing mill, or a tanner, your chemical product supplier should verify bisphenol content in their chemical products according to the aforementioned risk assessment on chapter 3.1, and provide corresponding documentation, such as the latest version of Safety Data Sheet, Technical Data sheet and/or Test report (TR).
- If you source and trade materials and/or garments that could have risk of bisphenol findings according to the Section 3.1 of this document, such as yarn, thread, fabric, wet blue, wet white or crust leathers, among others, your supplier should have verified that such material does not contain bisphenols or in case of technologies with no available alternatives, the bisphenol content is as low as possible and technically achievable.
- However, in case your supplier of any kind does not offer guarantees related to the amount of bisphenols, verify bisphenol content by testing.

To this effect:

1) It is extremely convenient to ask the chemical product supplier for the latest versions of Safety Data Sheets (SDS) and Technical Data Sheets (TDS) of the chemical products that have bisphenol risk and are used in the tannery's formulations. Note that Bisphenol S should be clearly listed in *Section 3_ Composition/information on ingredients* of the SDS. Consult with your chemical distributor or chemical manufacturer to obtain the most updated version of SDS.

2) It is convenient to ask all supply chain to monitor, control and identify stock of different batches of raw materials (textiles, leathers, raw materials, chemical products and other supplies) to avoid unintentional use of materials containing bisphenols.

4.4 Testing verification

In case of not having certain information about bisphenol presence in a raw material, testing for bisphenols in the substrate is a good tool to gather information. This applies to chemical products and raw materials, such as: yarns, threads, fabric, or leather, among others. Bisphenol content can be measured on the chemical product prior to starting any production, allowing to ensure compliance in the full production. Please refer to Section 3.3 of this guidelines for more information about availability of testing methods.

In the case of leather, if the analysis of the risk chemicals (sulphones and phenolic syntans) reveals any content of bisphenols, you can get an approximate idea of the content in the produced leather treated with this chemical product by calculation, according to the percentage applied, and estimating that all of them remain bonded in leather (considering maximum pick-up in the leather, as this would be the worst scenario).

Nevertheless, the best option will be always to check it with the analysis of the material to be sure of the final content, once done the application in a pilot trial.

5. Recommendations for textile and leather manufacturing

5.1 Textile production with low amount of bisphenols

Some textile fabrics might be at risk of bisphenol findings due to their origin. For example, polyester fabrics might contain traces of Bisphenol A. In these cases, the safe approach is to test the raw material to ensure that no bisphenols will be found in the final textile.

Other textile fabrics are at a risk of bisphenol finding due to the process of fixing the dye/ink to the fiber. The following recommendations have been found suitable for reducing and, in some cases, completely eliminating the risk of bisphenol detections.

Note that the common, conventional dyeing process of polyamide is usually done with acid dyes, which are well-suited for polyamide due to their ability to form ionic bonds with the amine groups from polyamide. The dyeing process typically involves pre-treatment, dye application, and fixation steps to ensure color fastness and uniformity. Once the desired shade has been achieved after the dye application, the fibers undergo a rinsing process to remove any unfixed dye, followed by the fixation step that often involves a pH adjustment and the addition of a fixing agent to enhance dye fastness, particularly wet fastness. This fixing agent was conventionally based on bisphenol chemistry and thus its use shall be reduced and/or restricted.

If the application of color to the polyamide is done via conventional or digital printing with soluble colors (dyes/inks) instead of via exhausting dyeing, even though the process might slightly vary, the risk of bisphenols will remain if conventional fixing agents are used.

5.1.1 Alternative processes to produce polyamide fabrics with no or low bisphenol content

To prevent bisphenol findings in textiles, search and evaluate safer procedures for improving color fastness in polyamide textiles. The following alternative processes have been found suitable for polyamide without entailing any addition of bisphenol in the final textile and at the same time, providing excellent fixation of the dye, achieving desired fastness values without compromising final quality of the fabric.

- After dyeing polyamide, using an anionic fixing agent based on polyphenols has been found effective and its performance has been confirmed over time.
- When the fixing agent based on polyphenols is not enough to obtain excellent color fastness, applying a cationic fixing agent afterwards as a second fixing treatment can be a good solution.

- Assess if all your production requires a fixing treatment. In some cases, light or medium shades have enough color fastness without extra fixing agents.
- Finally, note that adjusting some parameters of the process can also improve color fastness. For example, it is suggested to only use the required amount of dye.

All these recommendations also apply for printing process for textiles made of polyamide. If you are an installation that performs printing processes, please contact your trusted chemical supplier of anionic fixing agents to adapt the technical recommendations for this application.

Verify the performance of the treatment applied by testing for color fastness according to the latest update of Physical Testing Requirements (PTR).

5.1.2 Additional recommendations to reduce bisphenol findings when dyeing polyamide

Additionally, the following are recommendations to improve the inherent fixation of the dye to the polyamide substrate. Please note, any change in the production processes needs to be adjusted so that the required final quality, function and performance are achieved.

1) Dye choice

Selecting the dye is also a relevant parameter that will contribute to achieving good fastness. Whenever possible it is recommended to use the following type of dyes, so that the color fastness will be enhanced. This will allow for reducing the amount of fixing agent required, or even to skip the fixation step.

- Use dyes with different chemical nature. See the following table for general recommendations for dyeing and printing processes. Please verify suitability of the treatments and changes implemented to ensure that the quality of the final article is maintained, and the physical and chemical requirements listed in PTR or CTW are achieved.:

Substrate	Suggested dye	Posterior fixation step
Light shades	Disperse dyes	A fixation treatment might not be required
	Acid dyes	Fixation step based on polyphenols, if needed
Intense, bright shades	Reactive dyes	Another fixating process, without risk of bisphenols (cationic agents)
	Acid dyes	Fixation step based on polyphenols, if needed
Dark, intense, dull shades	Metal-complex dyes*	Fixation step based on polyphenols
	Other acid dyes	Fixation step based on polyphenols, if needed

Table 1

*Note: Please be mindful of metal complex risk related to heavy metal detections in the final textile. Mill should ensure Clear to Wear compliance after making any changes in the formulations.

2) Substrate composition

There are several types of polyamides in the market. The color fastness of different types of polyamide (i.e. Polyamide 6, Polyamide 6.6, among others) might differ.

Additionally, the amount of elastane present in the polyamide might interfere with dye fixation, leading to an increased need for larger amounts of fixing agent.

Adjust the raw material within possibility so that color fastness can be improved.

Please note, the saturation of the fiber should be taken into consideration and studied before escalating the production process. It is recommended to pretreat the fabric properly before the dyeing and printing process, such as proper fiber cleaning to remove impurities that might block chemical sites where the dye will bond.

3) Fixing treatment

Making sure that the final quality, function, and performance are maintained is necessary if adjustments are made in the finishing treatment.

If fixing agents based on polyphenols are implemented, adapt the fixation process to ensure that quality and performance is maintained. A second fixing agent with cationic chemistry might be required to ensure excellent color fastness, so the amounts to be incorporated in the recipe shall be studied.

As stated in Section 3.1, conventional fixing agents might contain traces of bisphenols. The best solution is to avoid this chemistry, otherwise, make duly adjustments to the recipe so that the final textile has low bisphenol content.

All these recommendations also apply for printing process with soluble colors for textiles made of polyamide or textiles made with mixture.

Please note, ensure the required quality of the articles by properly adjusting the process before the industrial production to obtain the same quality as per INDITEX's quality standards agreed with the commercial department and/or listed in the latest update Physical Testing Requirements (PTR).

In case of doubt, please consult with your trusted chemical product supplier.

5.1.3 Coloring textiles made with PA and another fiber

In some cases, the substrate to be coloured is a mixture of polyamide with another fiber. If the secondary fiber is wool, the same dyestuff as in polyamide can be used, due to the chemical structure. If the secondary fiber is elastane (i.e. Lycra ® or other polyurethanes), please be mindful that this fiber does not bond to the dye. Proceed with care.
The following table includes a general recommendation for different PA mixtures. It also includes recommendations for printing processes (conventional or digital).

Substrate	Dyeing	Conventional printing	Digital printing
100% PA or textiles with a small % of elastomer fibers	Reference to Table 1	Acid dyes – fixed with an anionic fixing agent such as one based in polyphenols	Acid dyes – fixed with an anionic fixing agent such as one based in polyphenols
			Reactive dyes – fixed with a cationic fixing agent
Mixture of PA + cellulosic fibers	Acid dyes + Direct/reactive dyes	PA is ≥ 50%	Reactive dyes for the whole textile, regardless of the composition – fixed with a cationic fixing agent
		If the percentage of PA in the mixture is equal or greater than 50%, acid dyes are used in conventional printing or in dyeing.	
		PA is < 50%	
		If the percentage of PA in the mixture is less than 50%, the dye to be used will depend on the other fiber. In the case of cellulosic fibers, reactive or direct dyes, fixed with a cationic fixing agent are recommended.	
Other mixtures	Please contact your trusted chemical supplier		

Table 2. General recommendations for dyeing textiles made with multifiber.

5.2 Low bisphenol alternatives for leather manufacturing

Wet-white leather was conventionally tanned with chemical products based on sulphones. But this is not the only process that has risk of bisphenol findings. In some cases, bisphenols can be found not only in wet-white tanning but also in the pre-tanning and/or re-tanning of chromium-tanned leather, and/or as a combined tanning method together with vegetable-leather tanning.

Please note, Annex I contains a comprehensive guideline for alternatives according to different leather manufacturing systems.

Chemical products with high bisphenol content should not be used in leather production. Instead, it is recommended to look for and use chemical product alternatives that are free of bisphenols or, in case of technologies with no available alternatives, the bisphenol content is as low as possible and technically achievable.

At the moment, it is not possible to produce pure sulphone-based synthetic tanning agents that meet this requirement. Fortunately, there is a new generation of phenolic synthetic tanning agents that have very low content in bisphenols.

Those will give the leather similar properties to those provided by sulphones for leathers intended to apparel, footwear and accessories. Please contact your trusted supplier of chemical products for pre-tanning, tanning, and retanning - depending on your particular case - to discuss the alternative chemicals with very low content in bisphenols that better suits the characteristics of your article.

It is important to achieve the suitable tanning degree as well as performance and quality requirements of the leathers. Please perform internal trials prior launching industrial productions to ensure that the substitutions or updates of the processes are suitable.

Studies carried out in collaboration with tanneries have shown that is perfectly possible to obtain leathers with less than 500 mg/kg of total bisphenols without technical production complications or loss of performance, even in wet-white leather. Refer to Annex I for a simple guideline on alternative options depending on the leather manufacturing processes.

Alternatives for tanning/pre-tanning

Reduce sulphone input in the production to the essential minimum by adjusting the recipes. The total or partial substitution by products of a different chemical nature, such as biopolymers, polysilicates or modified aldehydes implies a substantial change that can alter the properties of the article and will require to adjust other parameters in later processes of the wet-end.

The replacement of the sulphones/outdated syntans with a generally equivalent amount of new generation syntan low in bisphenols is an alternative that involves smaller changes in the recipe and therefore will be much easier to implement. It is essential to ensure that the new alternative chemical product has effective tanning power (which can be verified by the value of shrinkage temperature of the leather), and that the whiteness, softness and other properties are comparable to those manufactured with conventional chemical products. However, for some particular articles it is possible that the use of sulphones cannot currently be completely eliminated and a small fraction may be necessary in the production.

Ask your chemical supplier for the most appropriate new generation synthetic tanning agents that better fit the characteristics of your specific article.

Please note, ensure the required quality of the articles by properly adjusting the process before the industrial production.

Alternatives for retanning

There are many alternative agents. Tanning power is not a requirement as essential as in chemical products for pre-tanning and tanning. In addition to the new generation syntans low in bisphenols, it is possible to use acrylic resins, fatty polymers, aluminium salts, biopolymers (e.g. protein-based tanning/retanning agents), modified aldehydes that have been verified that do not release formaldehyde, polysilicates, zeolites, and vegetable tanning extracts, among others.

Annex I. Recommendations for leather manufacturing

The table below is intended to be used as a reference for selecting and applying alternative processes and chemical products in leather tanning.

Process	Type of Leather	Chemical products with risk	Possible alternatives. Note: they might depend a lot on the type of article and the recipes might need to be studied and adjusted
Pre-tanning	Wet White	Sulphones and syntans	Syntans of new generation low in bisphenols, aldehydes that do not release formaldehyde. For some particular articles it is possible that the use of sulphones cannot currently be completely avoided. If this is the case, reduce sulphone input in the recipe to the essential minimum.
	Vegetable	Sulphones and syntans	Syntans of new generation low in bisphenols, aldehydes that do not release formaldehyde.
	Chromium	Sulphones and syntans	Syntans of new generation low in bisphenols, aldehydes that do not release formaldehyde.
Tanning	Wet White	Sulphones and syntans	Syntans of new generation low in bisphenols, aldehydes that do not release formaldehyde, zeolites, polysilicates. For some particular articles it is possible that the use of sulphones cannot currently be completely avoided. If this is the case, reduce sulphone input in the recipe to the essential minimum.
	Vegetable	Sulphones and syntans	Syntans of new generation low in bisphenols
Re-tanning	Wet White	Sulphones and syntans	Syntans of new generation low in bisphenols, acrylic resins, fatty polymers, aluminium salts, biopolymers (lignosulfonates, proteinic retanning agents, among others), modified aldehydes that do not release formaldehyde, and vegetable tanning extracts.
	Vegetable	Sulphones and syntans	Syntans of new generation low in bisphenols, acrylic resins, fatty polymers, aluminium salts, biopolymers (lignosulfonates, proteinic retanning agents, among others), and vegetable extracts.
	Chromium	Sulphones and syntans	Syntans of new generation low in bisphenols, acrylic resins, fatty polymers, aluminium salts, biopolymers, modified aldehydes that do not release formaldehyde, polysilicates, zeolites, and vegetable tanning extracts.

Consult your trusted chemical supplier which of these alternatives are most suitable for the characteristics of your final article and how to tailor the formulas.

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