

Irritation Studies

Irritation from textile clothing products leading to wearer discomfort and sometimes physical effects such as skin dermatitis may be due to a number of factors including the garment's physical construction or chemical residues associated with its manufacturing processes. The wearers own personal preference may also influence a garment's perceived comfort.

At Shirley Technologies we can carry out a comprehensive investigation to determine the cause of an irritation complaint, using a range of analytical techniques and panel assessment depending on the nature of the problem.

Physical Causes of Discomfort may include :
Handle
Seam Construction
Fibrillation
Thickness
Hairiness (woollen fabrics) – itchiness
Garment Construction



Chemical Causes of Discomfort may include :
Sensitisation from disperse dyes
Metal Content (Nickel)
Surfactant Residues
pH
Formaldehyde Residues
Loose Dye

Testing for Organotin Compounds

Since the 1970s, organotin compounds, commonly **TBT** (tri-butyl tin) and **DBT** (di-butyl tin) have been used worldwide as active biocidal substances for the protection of materials. These compounds have been traditionally used in antifouling paints to stop marine organisms adhering to the bottom surfaces of ships. TBT is also used as a disinfectant in industrial cooling plants, as a slime-inhibiting agent in paper manufacture, as a mildew-proofing agent in wood and as a stabiliser in PVC. Organotin species could therefore be deposited on textiles from a number of textile treatments where they might be present in water or as stabilisers/inhibitors in finishing and coating formulations. In synthetic fibres, TBT has also been used to produce an antibacterial effect in sports garments to reduce body odour.

Why Are Organotins of Concern ?

TBT is known to effect the hormone balance in marine organisms such as water snails resulting in masculinisation of the females and infertility in males. Over a hundred snail species throughout the world are thought to be in danger of extinction as a result of the use of these chemicals. The toxicological effects on humans are suspected of being similar and at high concentration severe effects such as muscular weakness, breathing problems and skin irritation are known to occur.



Use Restrictions

For inshore boats the use of TBT in antifouling paints is now banned in EU waters and a complete worldwide ban is expected by 2008.

Testing procedures

Shirley Technologies Ltd have an in-house procedure used for the detection of Organotin compounds based on ISO/WD 17353.

Toxic Heavy Metals Screening

Toxic metals, often referred to as *Heavy Metals* and their compounds can be introduced into textile products at a number of stages during manufacture; for example as impurities from catalytic material in polymeric synthetic fibre production and can also be present in natural fibres such as cotton as a result of soil contamination. Compounds may also have been specifically introduced for their desired effects.

The toxicological effects of heavy metals as shown below, has been well documented over a number of years and there are consequently many legislative requirements concerning their use.

Heavy Metal	Examples of *toxic effects	May be Used or Found in
Arsenic	Skin irritation, breathing problems	Cotton – (pre-processing)
Lead	Allergies, muscle weakness, birth defects	Viscose & Printed Fabrics
Antimony	Irritates mucus membranes	Polyester –polymer processing
Cadmium	Interferes with breathing, vomiting, nausea etc	Printed Fabrics
Chromium/ Cr VI	Dizziness, vomiting and shock	After chromed dyes- for improving colourfastness
Copper	Hair loss, reproductive problems, reduced viral infection resistance	Dye Stuffs
Cobalt	Carcinogenic, birth defects	Dye Stuffs
Nickel	Skin irritation including dermatitis, asthma etc	Zips, rivets & Accessories
Mercury	Breathing problems, vomiting, affects nervous system	Cotton – (pre-processing)

* Information is non specific and intended for general interest only. Information includes known acute effects and those established from animal testing.

Testing Procedures

Shirley Technologies Ltd is able to screen your textile products for these substances and our testing protocols include the following recognised testing standards:

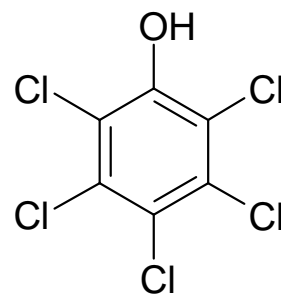
Wet and Dry Ash
BS6810: 1987 (1996)
BS EN71 Part 3 : 1995
ISO 105 E04 (1994)
DIN 53314 : 1996

Synthetic Perspiration Extraction
TOTAL METALS
Toy Testing Protocol-toxic metals
Total Metals Extraction (artificial perspiration)
Chromium VI

PCPS - Pentachlorophenol

Pentachlorophenol (PCP) and its derivatives are used as preservatives to prevent rot and mildew.

It is used in the textile industry as a transportation and storage preservative and may typically be used within sizing agents for cotton and wool.



PCP has been shown to have toxic, teratogenic and carcinogenic properties. Many countries currently have their own regulations for acceptable levels of PCP impurities e.g. Germany allows up to 5ppm.

Testing procedures

Testing to the standard DIN 53313 is available which involves a quantitative technique to measure the extractable content of PCP and its salts and esters.

Allergenic Disperse Dyes

What Are Disperse Dyes?

These are typically low water soluble dye stuffs used for colouring hydrophobic fibres including polyester and nylon at high temperatures.

Sensitisation Effects of Disperse Dyes

Certain dyestuffs of this type, approximating about 20 are known to cause skin sensitisation in the form of allergic effects such as contact dermatitis and hence their concern to manufacturers, retailer and consumers.

Legislation is yet to be established concerning these materials which continue to be used in manufacture and certain countries such as Germany are campaigning via their Food and Commodity Goods Law (LMBG) to get this put into place.



Dyes containing sensitising dye stuffs
C.I. Disperse Blue 1
C.I. Disperse Blue 35
C.I. Disperse Blue 106
C.I. Disperse Blue 124
C.I. Disperse Yellow 3
C.I. Disperse Orange 3
C.I. Disperse Orange 37/76
C.I. Disperse Red 1

Testing procedures

A Shirley Technologies in-house procedure is used for this analysis which involves extraction of the dyestuffs and identification using TLC.

Azo Dyes (Banned Azo colourants)

Azo dyes are one of the most commonly used chemical classes of dyestuff. Certain types pose a recognised toxicological risk as they produce harmful by-products known as MAK (aromatic) amines during use which are known to possess carcinogenic properties.

23 aromatic amines have been listed in an 'amendment document' for the European Council Directive 76/769/EEC '*relating to restrictions on the marketing and use of certain dangerous substances and preparations*'.

Use of AZO Dyes associated with these aromatic amines is banned within the EU for textiles and leather articles which may come into direct or prolonged skin contact. The draft European document states a limit of 30 mg/kg (minimum detectable limit) for the aromatic amines included in this legislation.

The EU amendment has been raised in order to harmonise legislation across Europe and several EU countries (e.g. Germany and The Netherlands) as well as many retailers have already placed restrictions on Aromatic Amines.

Testing procedures

Our test procedures follow the recognised standard method LMBG (German Food and Commodity Goods Law) 82.02 as stipulated in the legislation and involve the detection and measurement of specific aromatic amines and includes :

- Part 2 : Natural Fibres
- Part 3 : Leather
- Part 4 : Polyester



Phthalates

When and why Phthalates are of concern?

Phthalates have been commonly used as plasticisers or softeners in PVC plastics over a number of years and are commonly found in everyday products such as shower curtains, flooring, cosmetics, medical devices and also soft “chewable” toys such as teethers and baby toys.

Over the last few years they have been of toxicological concern since studies showed that certain classes of phthalates known as DINP (diisononyl phthalate) can adversely affect kidney and liver function and interfere with sexual development when tested on rats.

It is considered that phthalates, as well as entering the body via inhalation and skin contact are most likely to enter the body via ingestion.



EC EMERGENCY BAN

In 1999, an amendment was made to the GPSD (General Products Safety Directive) 92/59/EEC when EC put in place an emergency ban on the use of certain phthalates in toys intended for children under 3 years because of the risks associated with mouthing or chewing these articles.

The issue of toxicological risks associated with phthalates is still under debate.

Testing procedures

Standard and In-house screening tests are available.

LGC Stringent	BTTG In-house
Perspiration Extraction	Solvent Extraction

Nickel Testing and The Nickel Directive

Hypersensitivity to Nickel

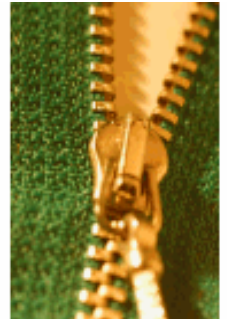
Hypersensitivity to Nickel is surprisingly common - It has been estimated that about 10% of the population are affected to some degree.

Contact with products containing Nickel can cause allergic contact dermatitis, asthma and even conjunctivitis.

The effect on humans has been well documented over many years and yet no legislation protected the consumer until the the introduction of the 'Nickel Directive' (Dangerous Substances and Preparations Regulations 2000).

The European Directive (94/27/EEC) from which these regulations are derived, effectively makes it illegal to sell a any product which comes into prolonged contact with the skin and releases more than 0.5 $\mu\text{g}/\text{cm}^2/\text{week}$ of Nickel.

Nickel is commonly used to impart a range of properties, including durability, in preference to more expensive alternatives into a range of product types including:



Jewellery

Watches

Straps

Rivets

Tighteners

Zips

Testing procedures

Uncoated items are tested to the standard BS EN 1811 for Nickel release.

Coated items must undergo a simulation of wear and corrosion test to BS EN 12472 before BS EN 1811 is used to calculate Nickel release.

Formaldehyde Testing Services

Where is Formaldehyde Used ?

Formaldehyde, primarily used as a preservative in many consumable products, is also widely used within textile finishing procedures to impart a range of properties to treated fabric including permanent press, anti-cling, anti-static, anti-wrinkle finishes. It is used in chlorine resistant, water and perspiration proof finishes and for moth proofing and mildew resistant finishes.

Why does it pose a problem ?

Formaldehyde is a sensitiser and irritant, affecting the skin, eyes and breathing function as well as causing head aches. Prolonged exposure to formaldehyde can lead to allergic contact dermatitis and it is leached by perspiration or sebum in its free state causing irritation and discomfort.

Formaldehyde Testing

Shirley Technologies provides a range of testing to determine the levels of both free and released formaldehyde to a range of recognised testing standards specific to either skin or respiratory irritation and will also routinely screen for formaldehyde when carrying out an irritation investigation study.

Type of Irritation	Standard Test	Measures..
Respiratory Irritation	BS EN ISO 14184-2 (1998) AATCC 112 : 1998	Released formaldehyde
Skin Irritation	BS EN ISO 14184-1(1999) Japanese Law Method 112 (1973)	Free formaldehyde

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