

# MATERIALISM EUROPEAN TOUR

## Materials exhibited



Culture

This project has been funded with support from the European Commission. This publication reflects the views only of the author, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

# ADVANCED MATERIALS

An advanced material is any material that, through the precise control of its composition and internal structure, features a series of exceptional properties (mechanical, electrical, optical, magnetic, etc.) or functionalities (self-repairing, shape change, decontamination, transformation of energy, etc.) that differentiates it from the rest of the universe of materials; or any that, when transformed through advanced manufacturing techniques, features such properties or functionalities.

All exhibited materials belong to the material families that are driving today's innovations:

**Advanced textiles and Fibres**

**High performance polymers**

**Advanced manufacturing**

**Advanced composites**

**Active materials**

**Gels and Foams**

**Nano materials**

**Light alloys**

**Coatings**

# ACTIVE MATERIALS

Active materials is a new generation of man made materials with astonishing properties that can resemble material wizardry. They can change colour, stiffness, conductivity, transparency, or shape in response to external stimuli such as changes in temperature, pressure, moisture level, PH level, light intensity, or when electrical or magnetic fields are applied. The properties allow the materials to play an active part in the way structures and devices work and this clearly sets this category of materials apart from the static materials humans have used for thousands of years.

Active materials have a plentitude of applications in smart sensors, actuators, dampers, switches, or energy harvesting devices where they change engineering, technology and design principles completely.

# Non-woven fabrics with micro-capsulated PCM

## Active materials

### WHAT

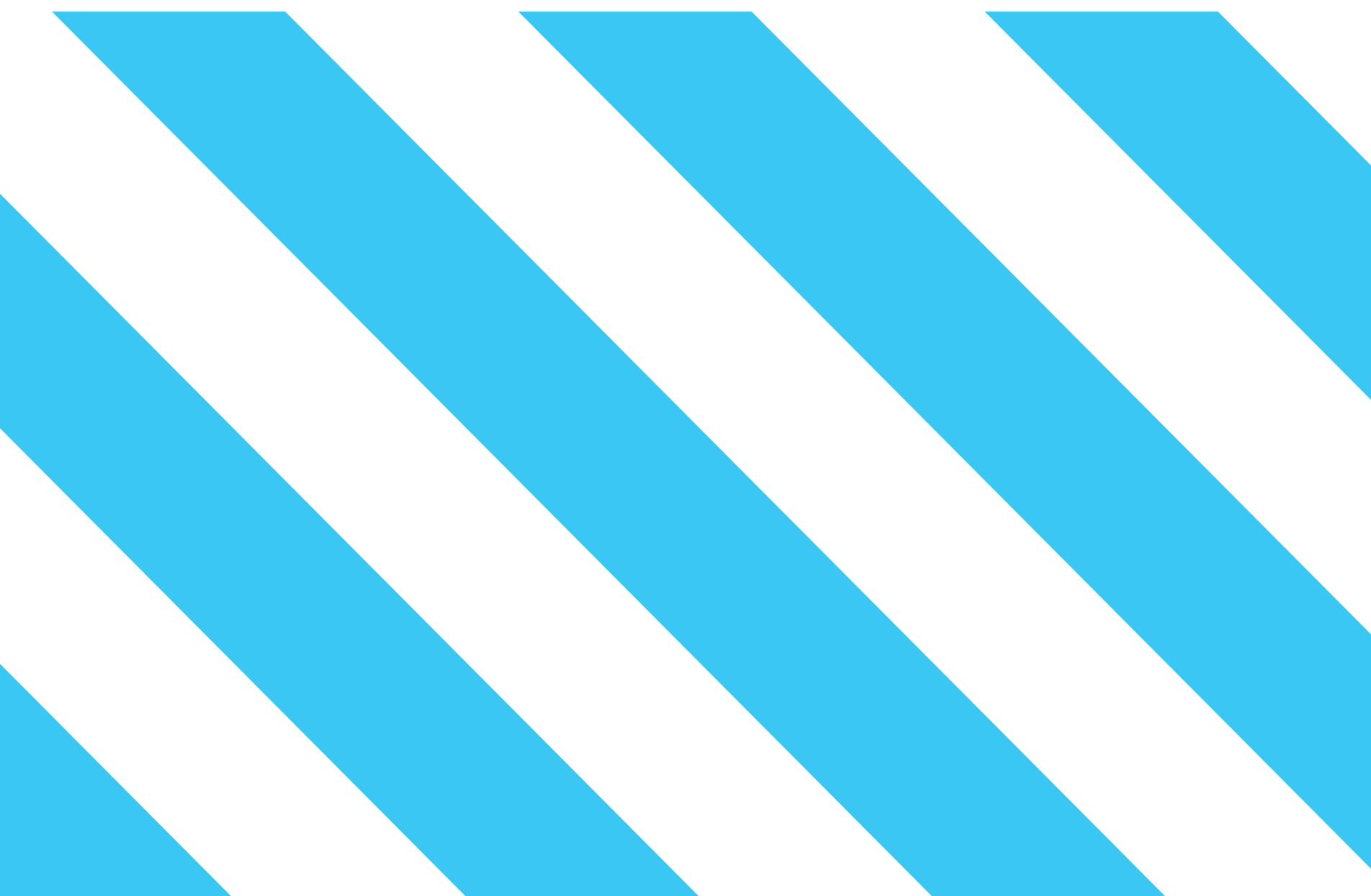
PCM (phase change materials) are substances with a high heat of fusion which, melting and solidifying at a certain temperature, are capable of absorbing, storing and releasing large amounts of energy. Heat is absorbed or released when the material changes from solid to liquid and vice versa, and occurs over a narrow temperature range, close to that of humans one. Thus, fabrics treated by PCM can actively thermo-regulate the human body and enhance thermal comfort.

### WHERE

Outdoor and sport apparel, protective clothing, bedding

### WHO

Comfortemp®  
[www.comfortemp.com](http://www.comfortemp.com)



# Flexible piezoelectric material

## Active materials

### WHAT

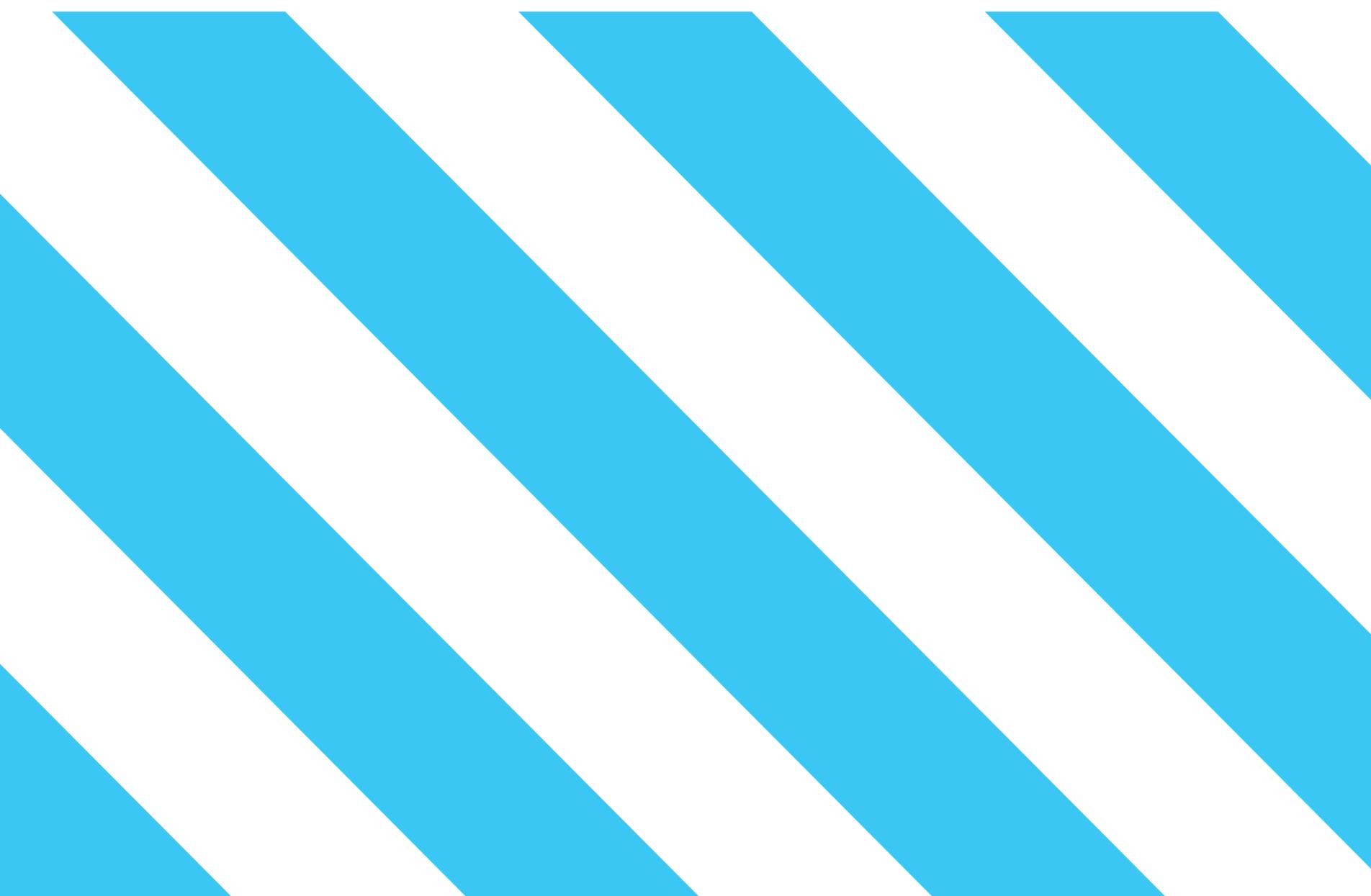
This flexible and robust piezoelectric transducer transforms changes in shape to electric current and vice versa. The transducer is very flexible compared with other piezoceramics, so it can be applied to even curved surfaces.

### WHERE

Active vibration dampening and energy harvesting in the milliwatt range- the harvested power can supply miniature electronics such as LEDs, sensors or transmitters for remote data

### WHO

DuraAct™  
[www.piceramic.de](http://www.piceramic.de)



# Micro-encapsulated phase-changing material

## Active materials

### WHAT

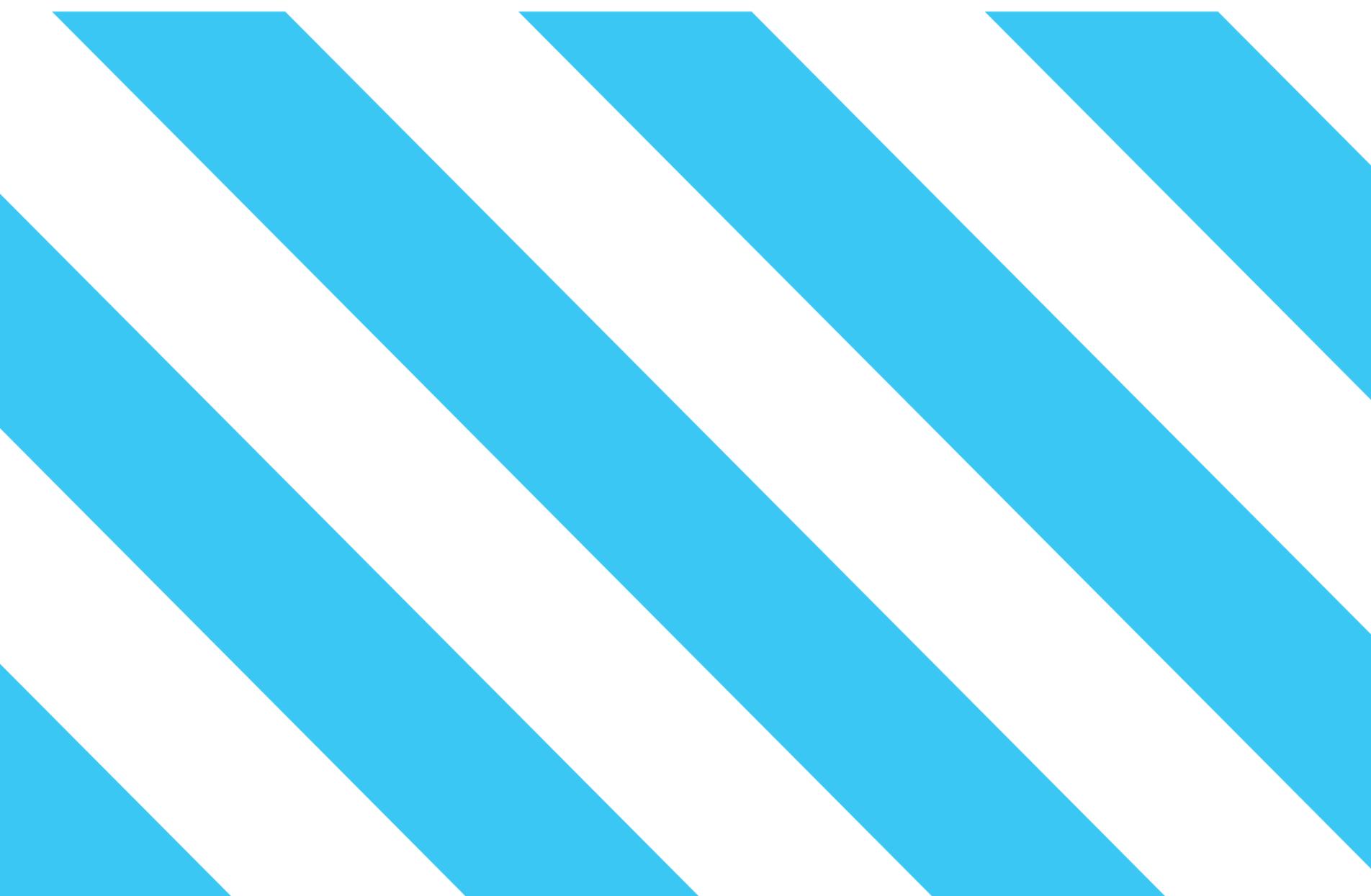
This micro-encapsulated phase-change material consists of small plastic spheres (~0.005 mm) containing a paraffin wax, which starts to melt when the spheres are heated. The wax is able to absorb a relatively large amount of heat during the phase change from solid to liquid. This heat is released when the temperature falls, as the wax will maintain the melting temperature until it has all solidified.

### WHERE

Embedded within walls and ceilings to level out daily temperature fluctuation

### WHO

Micronal® PCM  
[www.micronal.de](http://www.micronal.de)



# PCM panel

## Active materials

### WHAT

PCM (phase change materials) are substances with high fusion heat that, by melting and solidifying at a certain temperature, are capable of absorbing, storing and releasing large amounts of energy. Heat is absorbed or released when the material changes from solid to liquid and vice versa, and occurs over a narrow temperature range, close to ambient temperature. Thus, PCM helps to provide comfortable room temperatures and minimize temperature peaks during warm summer days at no extra energy cost, whilst on cooler days it can help to reduce heating energy. This aluminium laminated panel consists of paraffin wax trapped in a copolymer matrix.

### WHERE

Insulation for low inertia buildings

### WHO

DuPont™ ENERGAIN®  
energain.co.uk



# Nickel-titanium shape memory alloy

## Active materials

### WHAT

Shape memory alloys (SMAs) are a unique class of metal alloys that can recover their original cold-forged shape when they are heated above a certain temperature. The SMAs have two stable phases: the high-temperature phase, called austenite, and the low-temperature phase, called martensite. If the material is deformed in the martensite state, the deformation remains. But if it is then heated above the phase change temperature, it recovers the original shape and is capable of doing the work. Nickel-titanium alloy (NiTiNol) is the best known example of SMAs.

### WHERE

Aeronautics, automotive, consumer goods, biotechnology

### WHO

Nitinol

[www.euroflex.de](http://www.euroflex.de)



# Shape memory polymer and composite

## Active materials

### WHAT

Shape memory polymers (SMPs) are polymers whose qualities have been altered to give them dynamic shape “memory” properties. Using thermal stimuli, shape memory polymers can exhibit a radical change from a rigid polymer to a very elastic state, then back to a rigid state again. In its elastic state, it will recover its “memory” shape if left unrestrained. However, while pliable it can be stretched, folded or otherwise conformed into other shapes, tolerating up to 200% elongation. Dynamic polymer composites are like other high-performance composites, except that an SMP is used as the matrix.

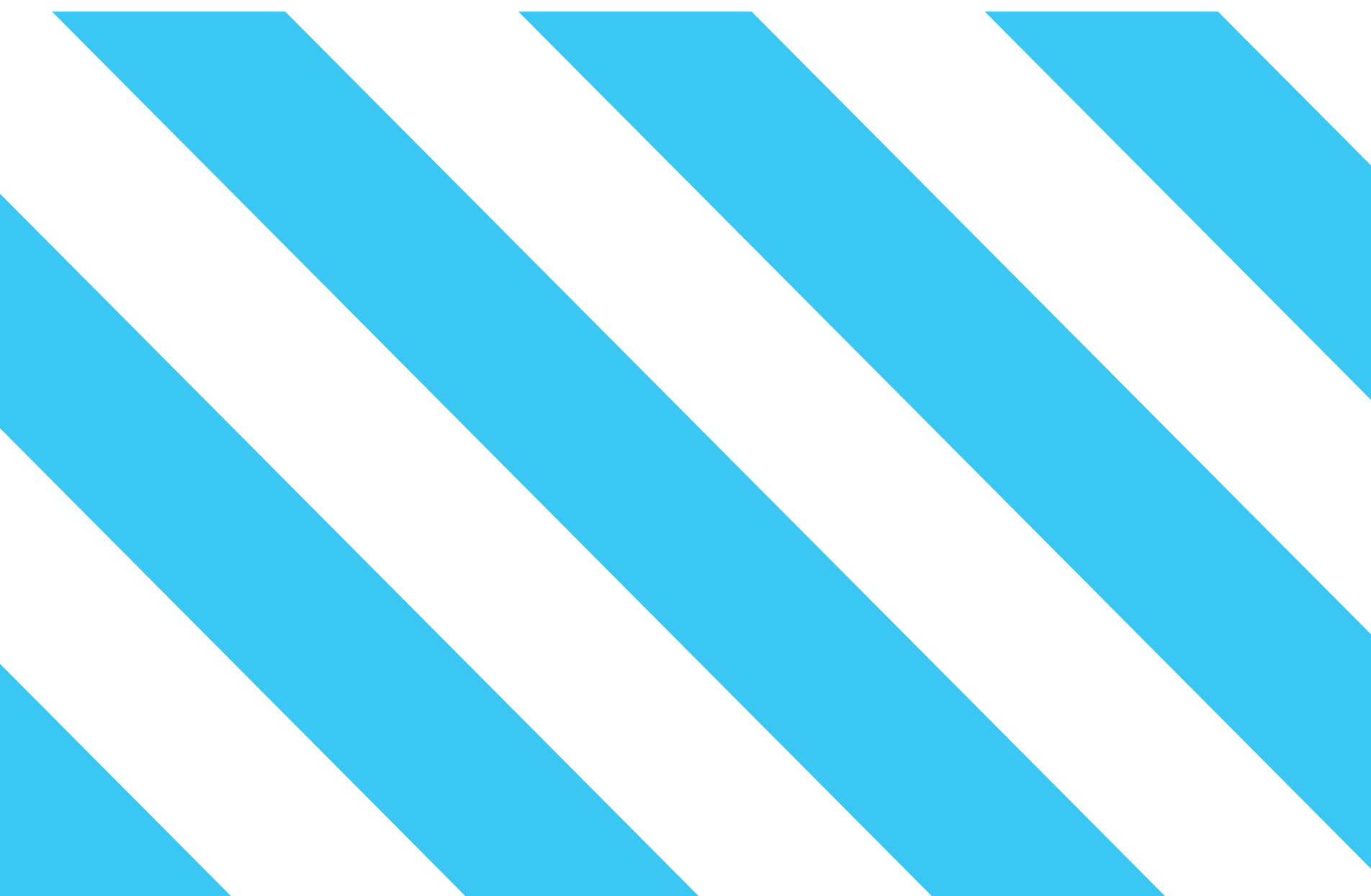
### WHERE

Biomedicine (orthodontics, needles, degradable implants), smart fixings, adjustable unions, automotive, packaging

### WHO

VERIFLEX® and VERITEX™

[www.crgrp.com](http://www.crgrp.com)



# Flexible luminescent panel

## Active materials

### WHAT

LEC (Light-emitting capacitor) lighting panels are approximately one millimeter thick, can be flexible, semi-rigid or rigid, are produced in stock sizes/shapes (from 53.45 cm<sup>2</sup> to 1.67 m<sup>2</sup>) through a screen-printing process that deposits layers of electrodes, phosphors and dielectrics.

The standard packaging of LEC lighting products can be configured in flexible, semi-rigid and rigid forms, depending on the application. To provide structural rigidity, it can be encapsulated in a co-polyester material that also protects against the elements for use in outdoor applications while maintaining high translucency.

### WHERE

Consumer goods, interior design, architecture

### WHO

**CEELITE**

[www.ceelite.com](http://www.ceelite.com), [www.lumigami.com](http://www.lumigami.com)



# Photoluminescent pigments

## Active materials

### WHAT

Luminescence is the process of spontaneous emission of light initiated by certain materials. Luminescence is caused by the movement of electrons within a substance from more energetic states to less energetic states. Photoluminescence is a type of luminescence in which electrons are excited by visible or ultraviolet radiation.

These glass panels made by the technology of fusing have incorporated photo luminescent pigments in the mass during the hot process.

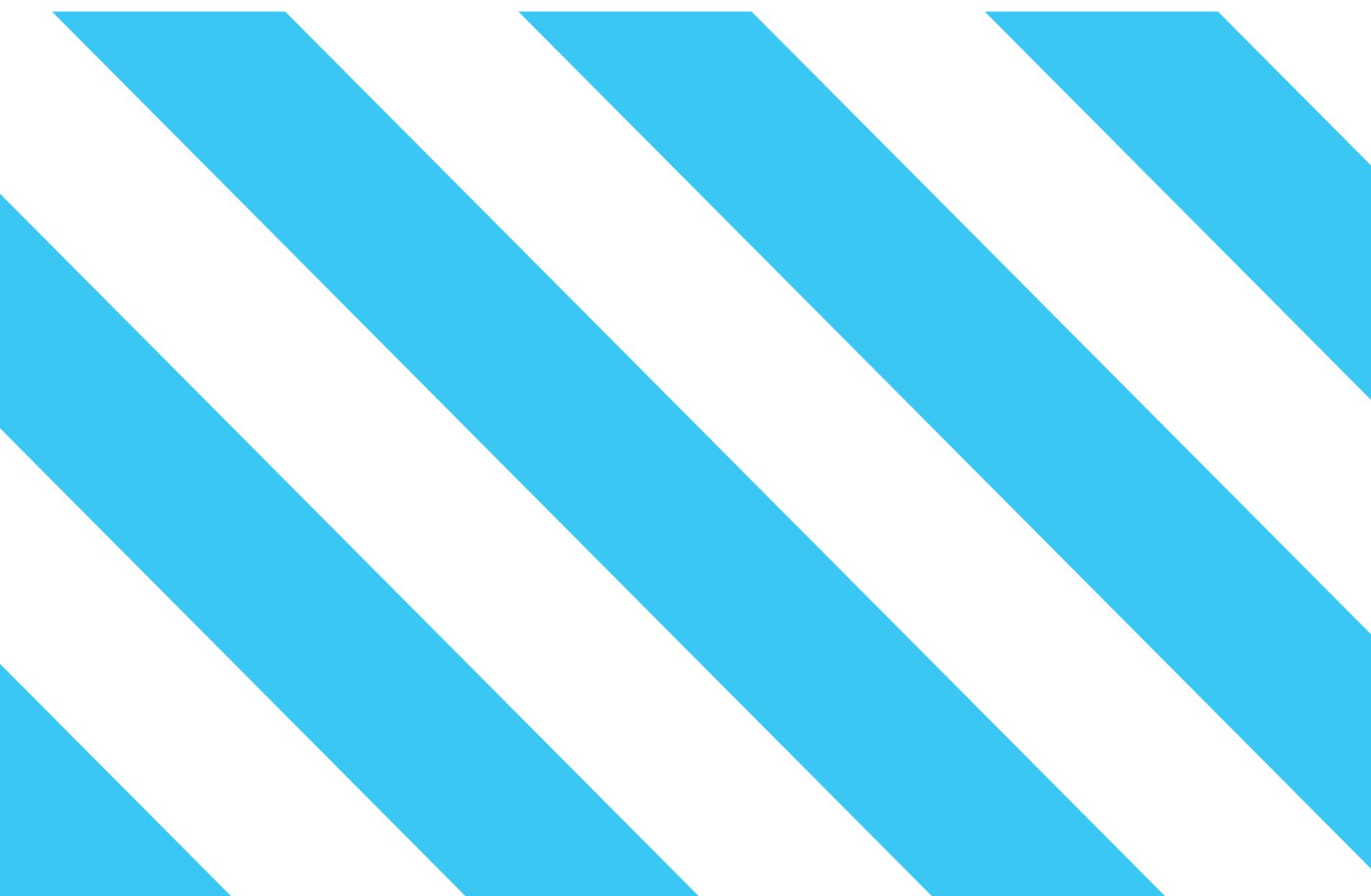
### WHERE

Architecture, interior design, product design

### WHO

VitruCell

[www.lhotsky.com](http://www.lhotsky.com)



# Thermochromic pigment

## Active materials

### WHAT

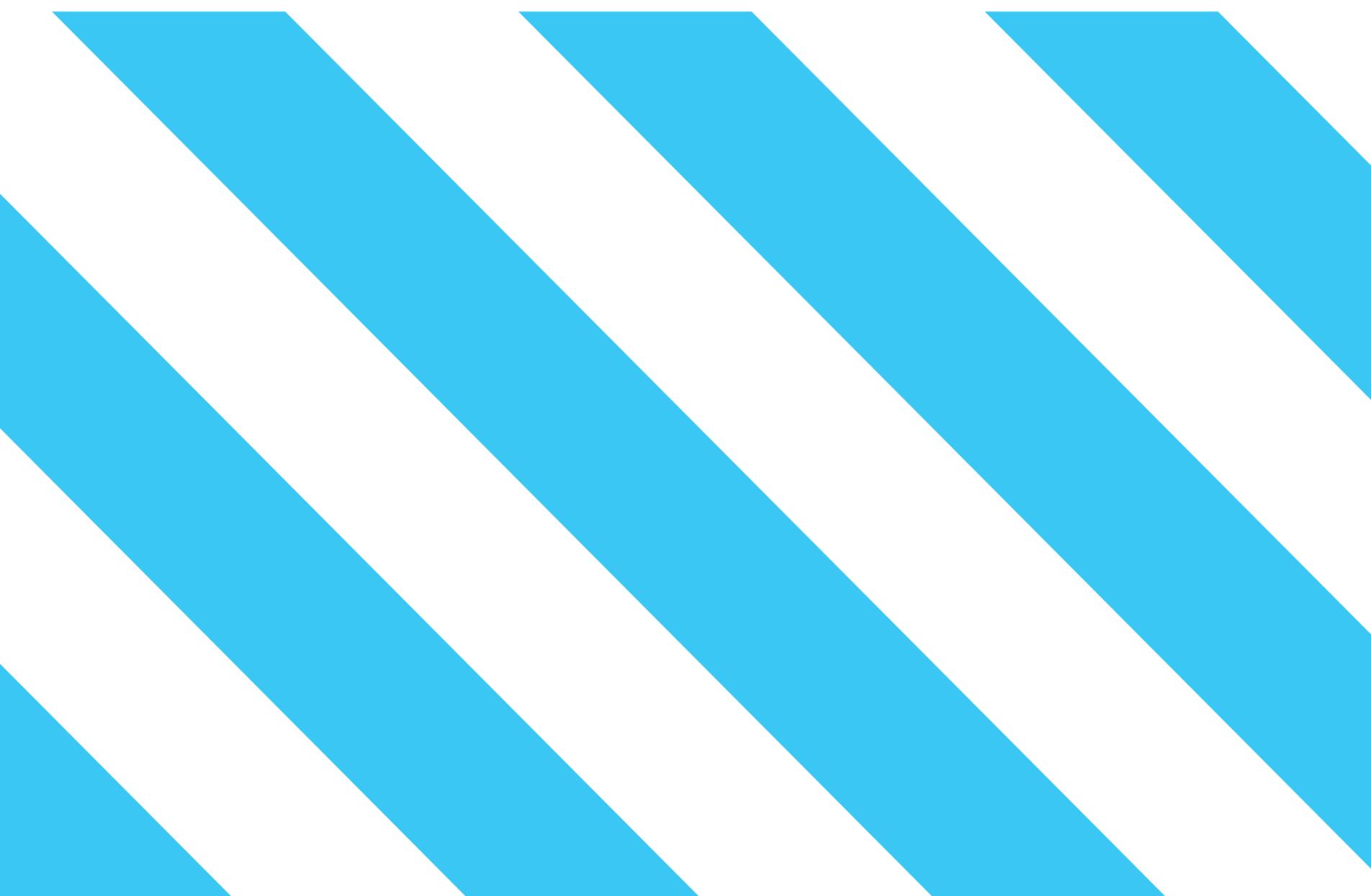
This pigment becomes almost transparent when heated above its activation temperature; it returns to its original colour when cooled down. The pigment comes in colours such as black, red, blue, green, orange and magenta, and with activation temperatures ranging from  $-10^{\circ}\text{C}$  to  $65^{\circ}\text{C}$ . It is possible to mix colours, and custom pigments outside the standard range can also be created. The pigments are damaged by UV light and should therefore be kept out of the sun. The pigment will slowly lose colour intensity if consistently heated to above  $50^{\circ}\text{C}$ .

### WHERE

Cold- and heat-reactive labels for beverages and food products and colour-changing coffee mugs

### WHO

Chameleon<sup>®</sup> Ink  
[www.lcrhallcrest.com](http://www.lcrhallcrest.com)



# Thermochromic liquid crystal sheet

## Active materials

### WHAT

This transparent polymer sheet is coated with a liquid crystal-based material that changes colour to first green and then blue when heated. The sheet turns black when it cools down again. This sample changes colour at 25°C to 30°C, but there are variants for other temperature ranges available (-20 °C to 100°C). The sheet will degrade with time and the degradation is faster if it is exposed to sunlight or if it used in hot water baths.

### WHERE

Thermometers, science experiments and thermal mapping in R&D

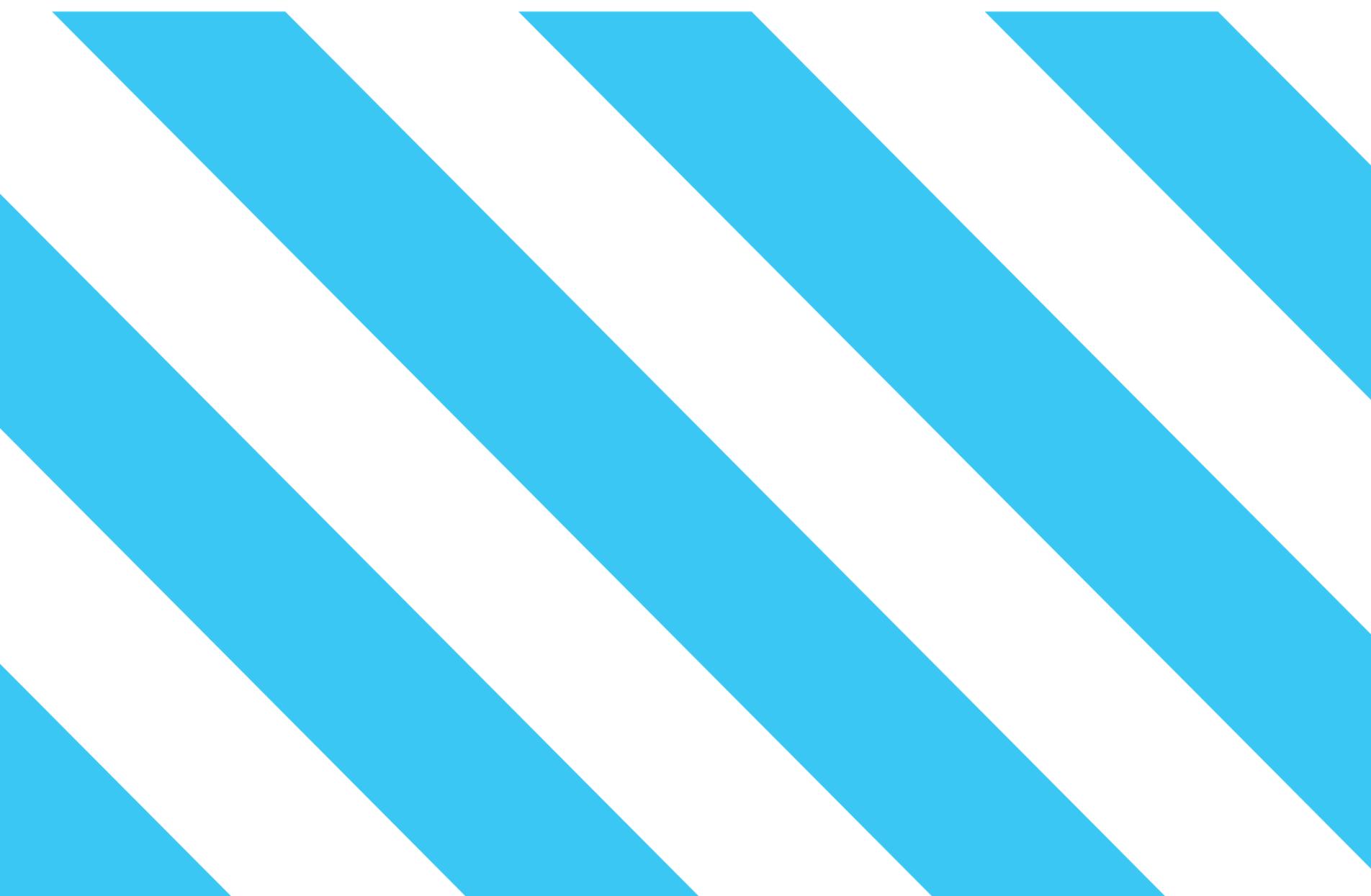
### TRY IT

Put your hand on the sheet to see it change colour

### WHO

Chameleon® Ink - Liquid Crystal Ink

[www.tmchallcrest.com](http://www.tmchallcrest.com)



# Printed rewritable memory

## Active materials

### WHAT

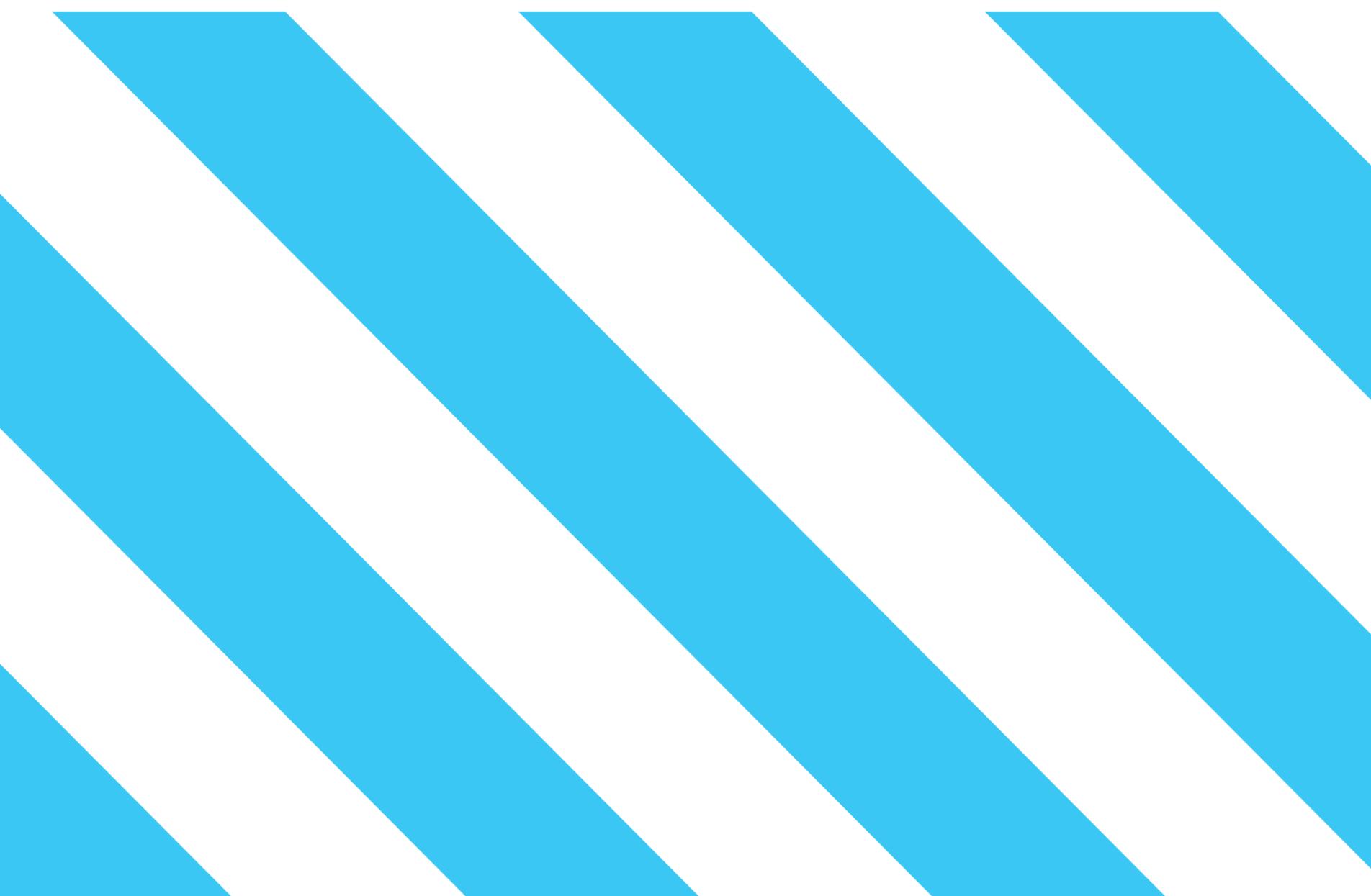
This flexible sticker is printed with ferroelectric polymer ink, in which data is stored. The memory is rewritable and can be written and read by a standalone device or by a module integrated in another product. The first-generation printed memory holds 20 bits of data, but capacity is expected to rise as the technology is improved.

### WHERE

Interactive games, personalized toys, loyalty cards, collectible card games, and interactive board games

### WHO

Thinfilm  
[www.thinfilm.no](http://www.thinfilm.no)



# Light-emitting, touch-sensitive fabric

## Active materials

### WHAT

This thin light-emitting textile is highly flexible while maintaining its luminescent qualities. It is made using electroluminescent film, sandwiched between two laminar electrodes. This material is ideal for covering large surfaces, but it can also be applied to 3D objects and inserted into injection-moulded products combined with a variety of different materials.

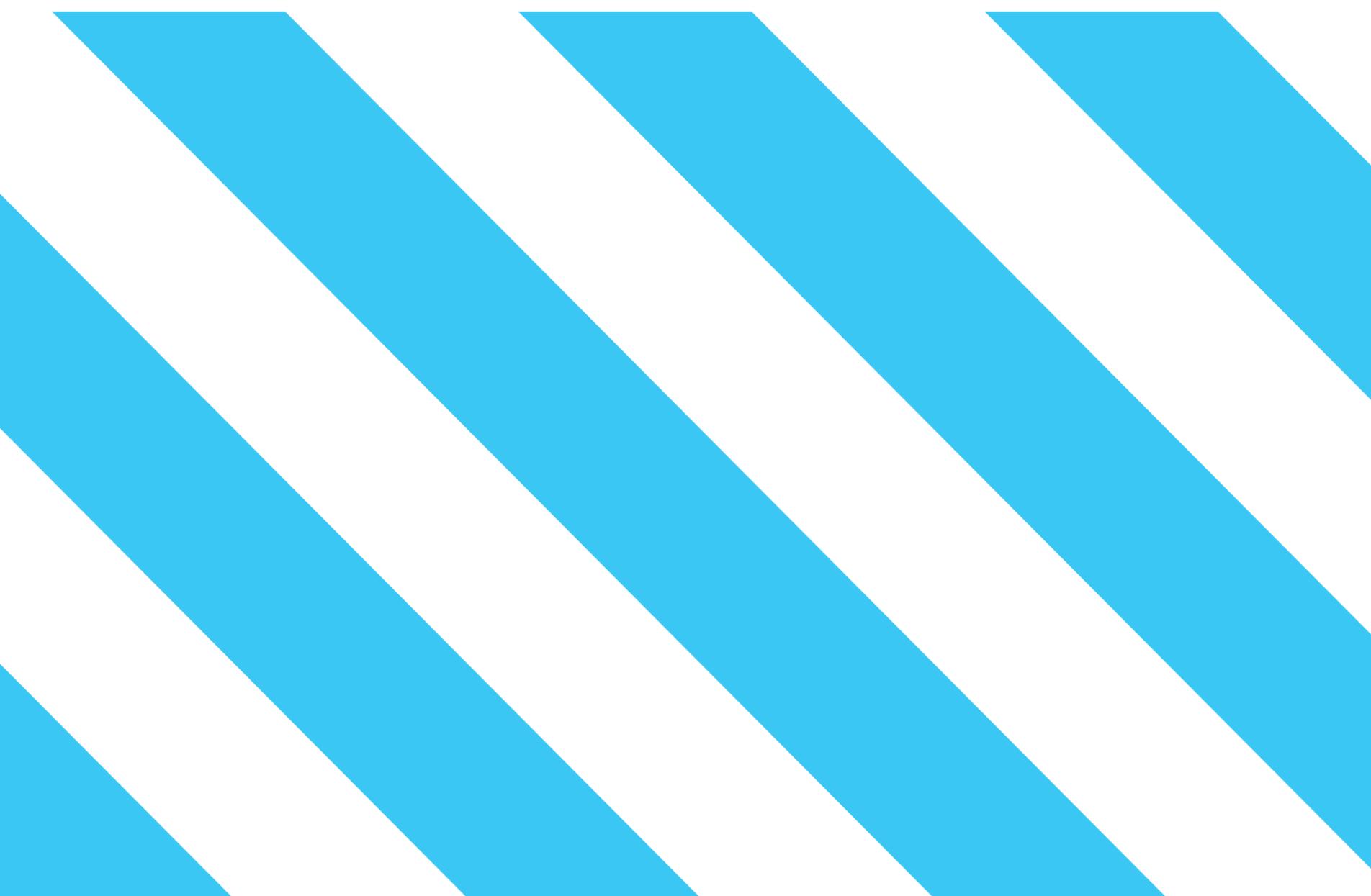
### WHERE

Automotive interiors, solar cells integrated in building façades and touch screens

### WHO

Sefar Electroluminescent Textile

[www.sefar.com](http://www.sefar.com)

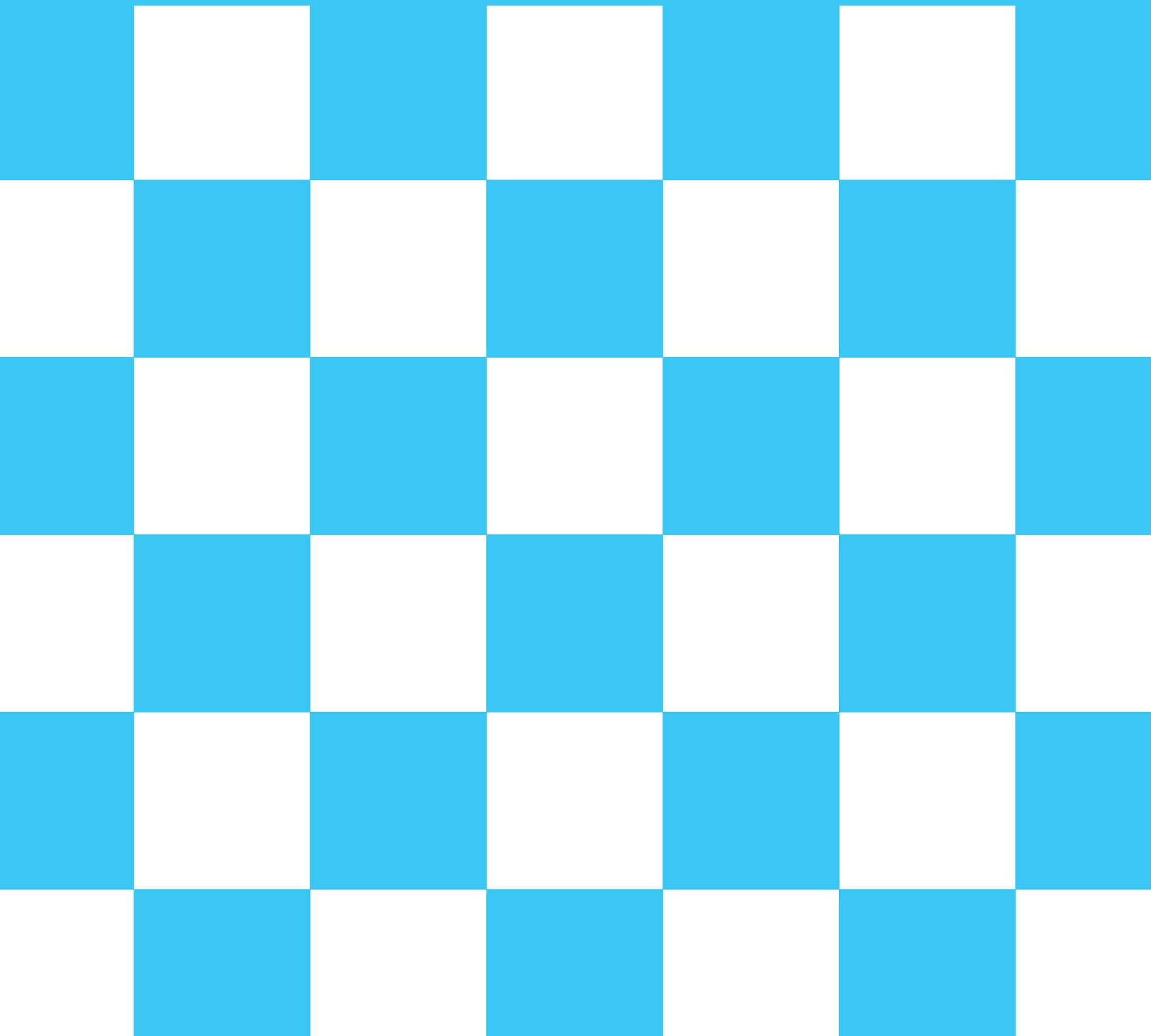


# NANO MATERIALS

Three to five atoms fit in a nanometer. Steel, plastic, viruses, fungi and ourselves are made of the same thing: atoms.

Nanotechnology could be defined as the attempt by man to tame these atoms and molecules. Moving from the micro- to the nano-scale, not only the size is diminished, but also the system of forces that are acting. If we speak of nanometers, the force of gravity does not exist, the mass is almost nonexistent, so the behavior of individual atoms is governed by laws other than those applied hitherto: the laws of quantum mechanics.

Nanomaterials are formed from particles or structures of nanometric size in at least one dimension, and have physical properties that are distinct from the same macroscopic-sized material.



# Water-repellent nano-composition

## Nano materials

### WHAT

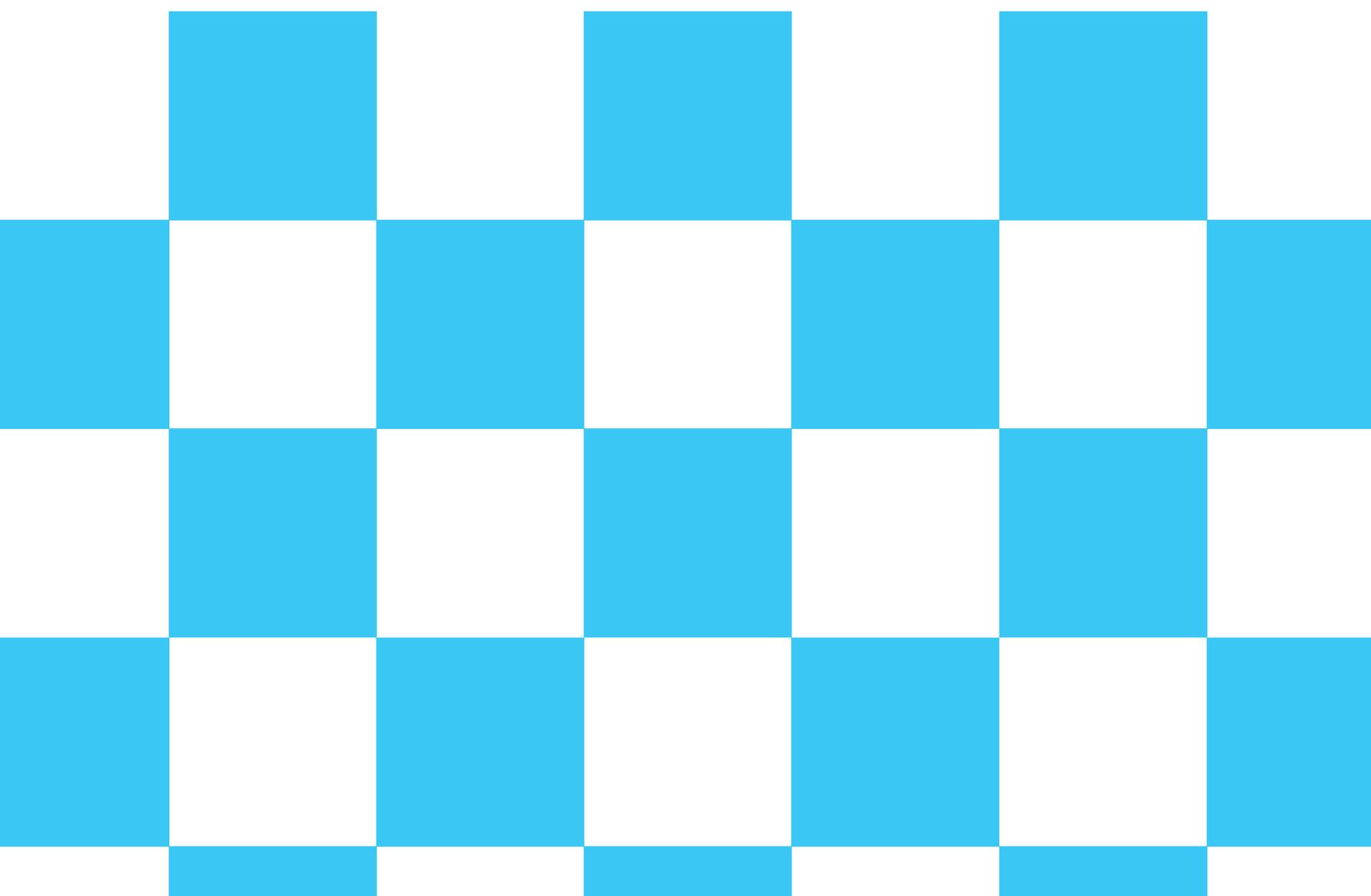
Tecnadis is a hydrophobizing composition based on nanoparticles with high water repellence that can be applied on porous substrates such as natural stone, brick, roof tiles, concrete, wood, etc. Tecnadis PRS® is a dispersion of nanoparticles (with an average size of 15 nm) treated with active agents and other additives in a basic solvent without VOC (volatile organic compounds). The treated surfaces become hydrophobic, so they allow water and even oil to slide over them without leaving any residue and they can even trap any surface contamination (self-cleaning properties).

### WHERE

Façade painting and other vertical or inclined surfaces, anti-stain floors

### WHO

Tecnadis Range  
[www.tecnan-nanomat.com](http://www.tecnan-nanomat.com)



# Carbon nanofibers

## Nano materials

### WHAT

Carbon nanofibers are submicron vapour-grown carbon fibers (s-VGCF) with a graphitic structure. That gives them excellent mechanical properties and thermal and electric conductivity as a great surface finish in pieces. Nanofibers are used as reinforcement in composite materials with polymeric matrix in order to enhance the properties of the final piece and to allow their recyclability. The material can be found in powder form, masterbatch in thermoplastics, pre-impregnate “nanopreg” and in temporary stable dispersions in solvents and resins.

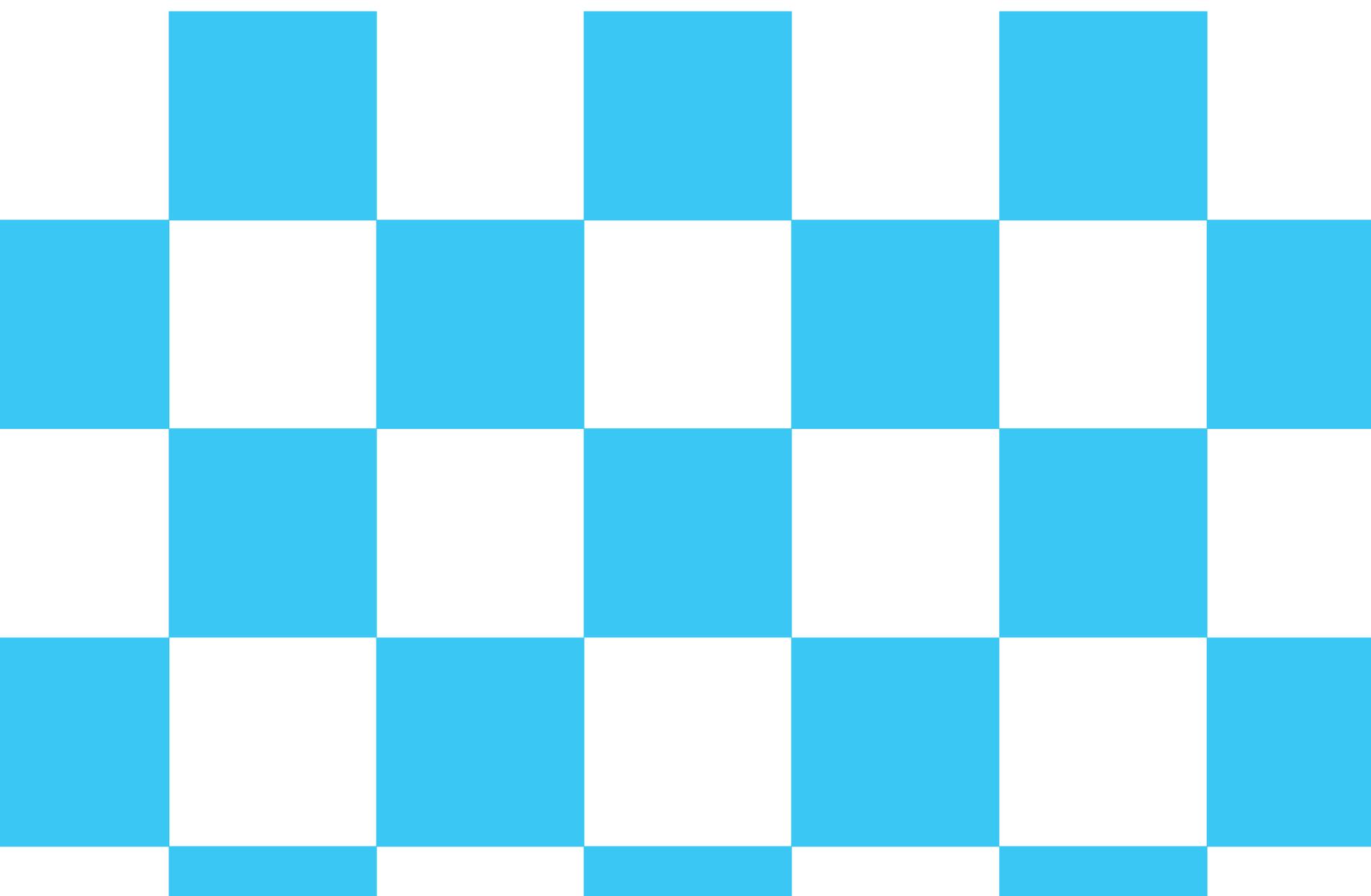
### WHERE

Aeronautics and space, automotive, consumer goods, energy, fabrics

### WHO

GANF carbon nanofibers

[www.grupoantolin.com](http://www.grupoantolin.com)



# Antibacterial surface

## Nano materials

### WHAT

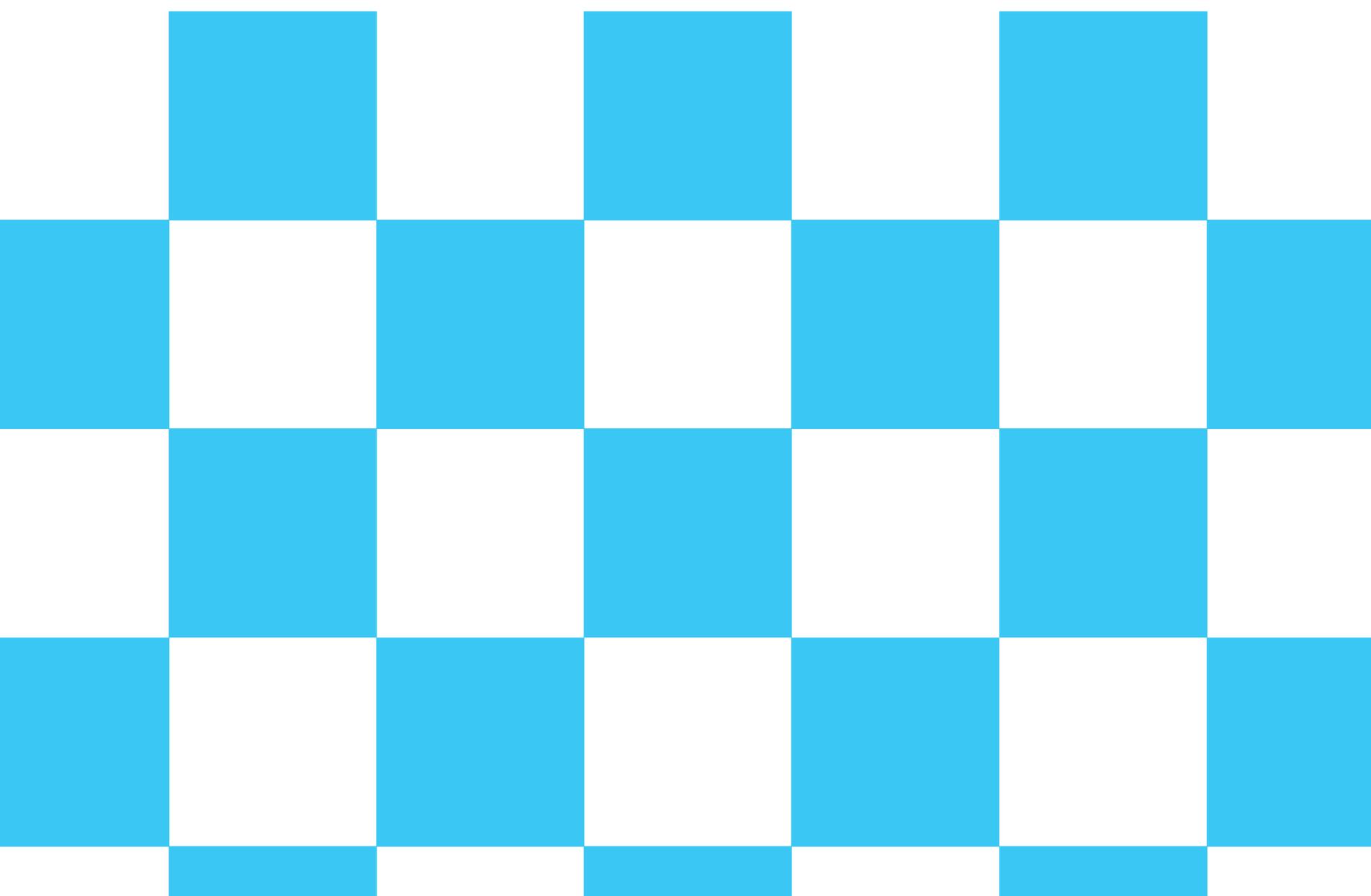
This plastic film has a unique micro-pattern embedded into its surface that inhibits bacteria's ability to aggregate, survive, migrate and transfer from the surface. This is achieved through the micro-pattern alone without any use of chemicals or toxins. As a result, there is little chance that bacteria will develop resistance, a problem with some other biocidal and antimicrobial technologies.

### WHERE

Health care for high-touch areas such as push panels on doors, bed rails and patient tray tables

### WHO

**Sharklet™**  
[www.sharklet.com](http://www.sharklet.com)



# Graphene

## Nano materials

### WHAT

Graphene is a new two-dimensional nanometric material, obtained from graphite in 2004 by scientists Andre Geim and Konstantin Novoselov. Graphene is composed of a layer of carbon atoms arranged in a regular hexagonal pattern, with a thickness of one atom (0.1 nm). Some of the amazing properties of this material are its high mechanical strength, transparency and very high electrical conductivity. Graphene is called to lead the next great revolution of materials, with endless potential applications as a component in electronics, flexible screens or solar cells.

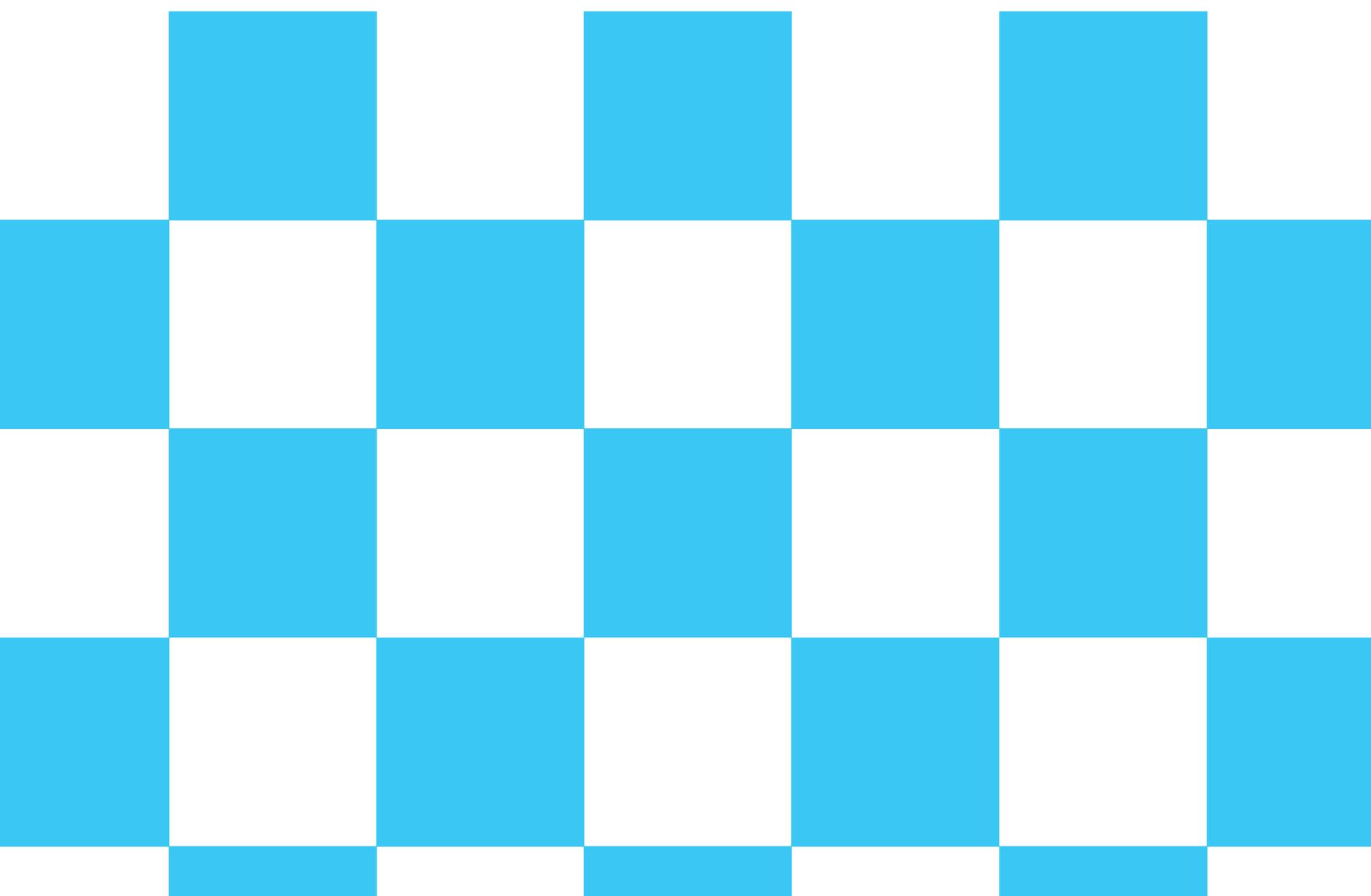
### WHERE

Electronics, energy, biomedicine, consumer goods, chemistry, optics

### WHO

**GRAnPH® Nanotech (Grupo Antolín)**

[www.granphnanotech.com](http://www.granphnanotech.com)



# ADVANCED MANUFACTURING

Advanced manufacturing processes allow both advanced and more basic materials to be shaped, joined and modified to form useful products, and the manufacturing process can also drastically change the properties of the raw material thereby allowing for new applications.

In recent years automation, digital simulation and computer-controlled production have made entirely new manufacturing processes possible. One example is the rapid maturing of 3D printing processes that are not only used for prototyping but also for custom and low-volume manufacturing. It is now possible to 3D-print functional parts in good quality in a wide range of different plastics and metals, as well as engineering ceramics.



# Vacuum forming technology for metals

## Advanced manufacturing

### WHAT

Superforming offers an alternative to press forming for the production of large scale, complex, premium metal components including car body panels for brands such as Lamborghini and Ferrari. The main advantage of this technology is that it does not distort or deform the surface of the metal as with press forming due to the uniform pressure applied across the sheet, that also enhances strength. The process is compatible with the aluminium alloys 5082 and 2004, which offer excellent superplastic forming properties.

Superformed parts can be further formed and finished after processing with anodic films, chromate conversion coatings and conventional paint systems.

### WHERE

Aerospace industry, car body panels, architectural cladding, acoustic panels

### WHO

Superforming  
[www.superform-aluminium.com](http://www.superform-aluminium.com)



# 3D-printed optics

## Advanced manufacturing

### WHAT

3D-printed transparent, matte, textured or coloured plastic elements with complex geometries and small features. The printing process utilizes inkjet technology to build structures from thin layers of a UV-curable photopolymer; they are deposited in a 2D geometry and then cured by UV light. The process allows for on-demand manufacturing of optical elements directly from a CAD model, with no need for expensive moulds or tooling.

### WHERE

Used by lighting developers and optical systems designers for prototyping, custom projects, and low- to medium volume manufacturing

### WHO

Print Optical Technology

[www.luxexcel.com](http://www.luxexcel.com)



# Metal 3D printing with inkjet technology

## Advanced manufacturing

### WHAT

A liquid bonding agent is selectively deposited with inkjet technology to a thin layer of metal powder, after which new layers are applied on top and bonded. The bonded metal powder forms a 3D printed component, which is subsequently sintered in an oven to fuse the powder into a solid component.

### WHERE

Industrial components and medical devices, suited also for low volume manufacturing of geometrically complex components

### WHO

Digital Metal  
[www.hoganas.com](http://www.hoganas.com)



# Selective laser sintering

## Advanced manufacturing

### WHAT

Selective laser sintering (SLS) is an additive manufacturing process used to “grow” objects from powder by fusing it with a laser, repeating this layer by layer. There are different kinds of fine powder for sintering: metallic pre-alloys (direct metal laser sintering – DMLS), polymers, ceramics, composites, etc. Compared with other additive manufacturing processes, SLS can produce parts from a relatively wide range of commercially available powder materials. The resulting pieces offer good mechanical properties.

### WHERE

Automotive, aeronautics and space, consumer goods, biotechnology, metallurgy, technology, systems and displays

### WHO

MARAGINGSTEEL MS1, PRIMECAST 101<sup>®</sup>, PA2200, ALUMIDE<sup>®</sup>,  
TITANIUM Ti64, DIRECTMETAL 20

[www.eos.info](http://www.eos.info)



# Precise electroforming

## Advanced manufacturing

### WHAT

Electroforming is a metal forming process that forms parts up to 200  $\mu\text{m}$  thickness through electro-deposition. The part is produced by depositing a metal skin onto a base form, known as a mandrel, which is removed after forming. This technology can replicate a mandrel surface precisely atom-by-atom with practically no loss of fidelity.

### WHERE

Fabrication of micro and nano scale metallic devices, precision injection moulds with micro- and nano- scale feature for production of non-metallic micro-moulded objects

### WHO

Precision Electroforming

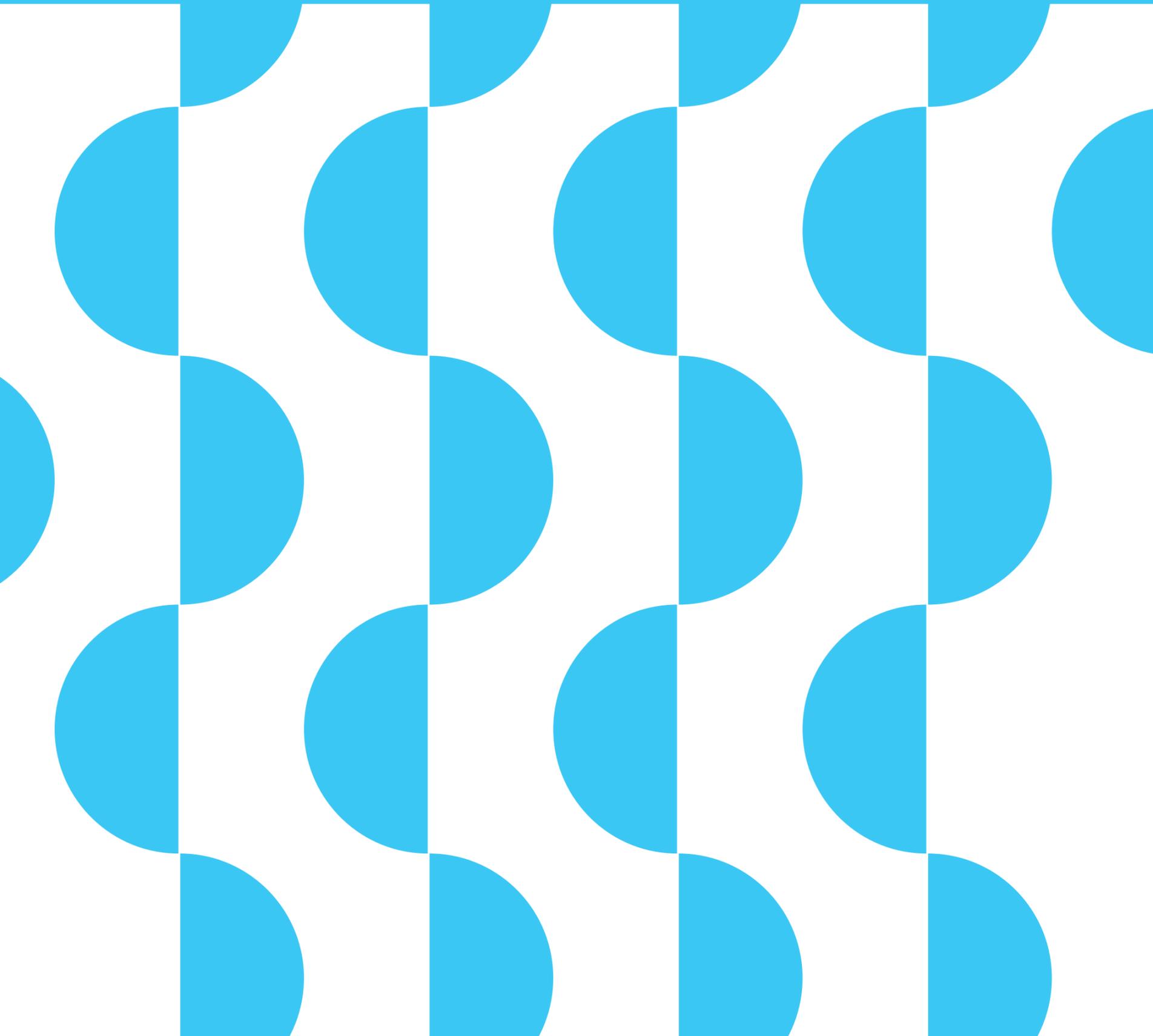
[www.trw.ch](http://www.trw.ch)



# HIGH-PERFORMANCE POLYMERS

It is a large group of plastics, elastomers and composites with properties of mechanical strength, thermal resistance, environmental stability, gas barrier, solvent resistance etc. that far exceed conventional polymers.

They are used in almost every aspect of our lives... from fairly obvious areas like automotive, aerospace, defence and many parts of the energy industry, through to areas not automatically thought of like electronics, medical, sport and even food-related applications.



# PEI

## High performance polymers

### WHAT

PEI (polyetherimide) is an amorphous amber-to-transparent thermoplastic which is characterized by unique combination of properties. PEI has extremely high flame resistance and has a very high stiffness, tensile strength and hardness over a broad temperature range. In case of fire PEI develops very low smoke.

It is used for production of parts that must satisfy special requirements with regard to fire properties and mechanical strength.

### WHERE

Electrical and electronic industry, medical technology, aircraft construction

### WHO

SUSTAPEI

[www.roechling-plastics.cz](http://www.roechling-plastics.cz)



# Self-healing polymer

## High performance polymers

### WHAT

Self-healing rubber based on the concept of supra-molecular chemistry, composed of at least 60% fatty-acid oligomers derived from vegetable oils. This rubber features so-called „reversible” (non-permanent) intermolecular bonds, in contrast with polymers derived from traditional chemistry, which are based on so-called „irreversible” (permanent) bonds. This reversibility feature imparts a capacity to self-heal: cracks or breaks can be repaired simply by putting the fractured surfaces back together and applying light pressure; the materials recover nearly all their initial strength without the need for bonding or heating.

### WHERE

Biotechnology, building industry, energy

### WHO

**REVERLINK®**

[www.arkema.com](http://www.arkema.com)



# Bendable, optimized low-energy fiber optic lighting

## High performance polymers

### WHAT

Side emitting fiber cable, unlike conventional fiber optic cables, reflects light along its side as well as the ends for maximum light output. It consists of multiple polymer fibers twisted around a highly reflective PVC internal core, which offers flexible stability, making it virtually unbreakable, and is extremely energy efficient, due to the fact that a single light source can be used at the end of the cable.

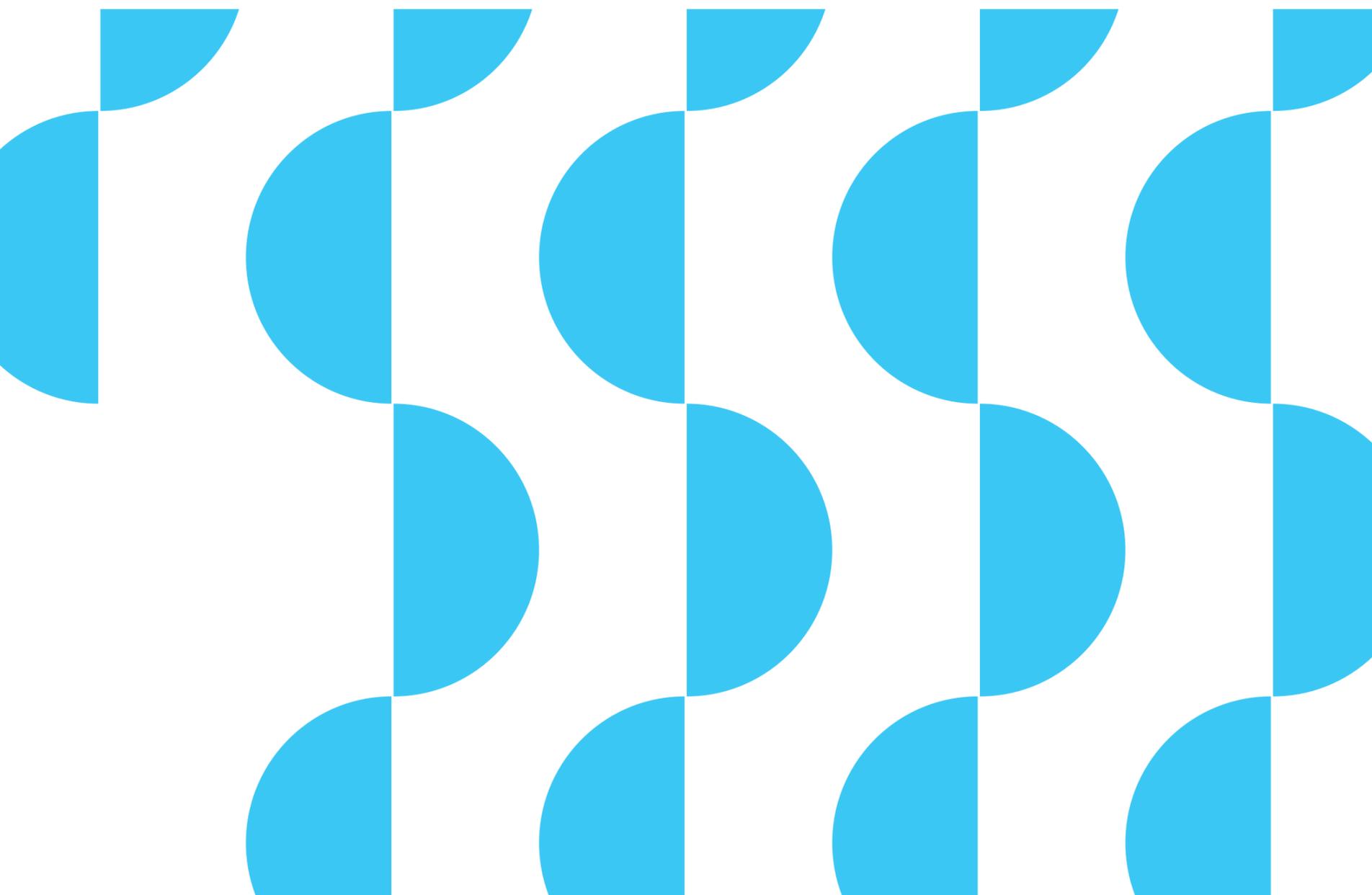
### WHERE

Interior and exterior building lightings, car dashboards, screen displays or even door handles

### WHO

**Schott Glass Fiber**

[www.schott.com/lightingimaging](http://www.schott.com/lightingimaging)



# PEEK

## High performance polymers

### WHAT

PEEK (Polyetheretherketone) is the strongest and stiffest thermoplastic. This semi-crystalline polymer is characterized by the combination of properties such as: good hydrolysis resistance, biocompatibility, serializability, outstanding chemical resistance, high wear resistance and excellent high-temperature performance. In medical applications its design and manufacturing flexibility makes it ideal across highly diverse applications required in the implantation of blood, bone and tissue requiring contact of more than 30 days, and is an ideal replacement for stainless steel and titanium.

### WHERE

Aeronautics and space, automotive, biotechnology

### WHO

**CRANIAL LOOP™**

[www.neosurgery.com](http://www.neosurgery.com)

**SUSTAPEEK**

[www.roechling-plastics.cz](http://www.roechling-plastics.cz)



# LIGHT ALLOYS

Light alloys are materials characterized by low density and high strength-to-weight ratios. They are also corrosion-resistant (especially titanium) and non-toxic.

Although these alloys were originally developed for aerospace applications, they are now used in a wide range of engineering applications - shipbuilding, transportation and automotive engineering, instrument-making, electrical engineering, civil construction, and nuclear power engineering, as well as in the production of consumer goods.

# Metal sheets lighter than solid aluminium

## Light alloys

### WHAT

Hybrix<sup>®</sup> is a lightweight, strong and thin sandwich stainless steel sheet material with a core that consists of 90-95% air. It weighs half as much as conventional stainless steel or aluminium sheets, but its properties are fully comparable and it can be used with most standard sheet metal processes. This material began life as a decorative crafts material, but its reassuring strength and light weight lends itself well to a range of safety-related applications.

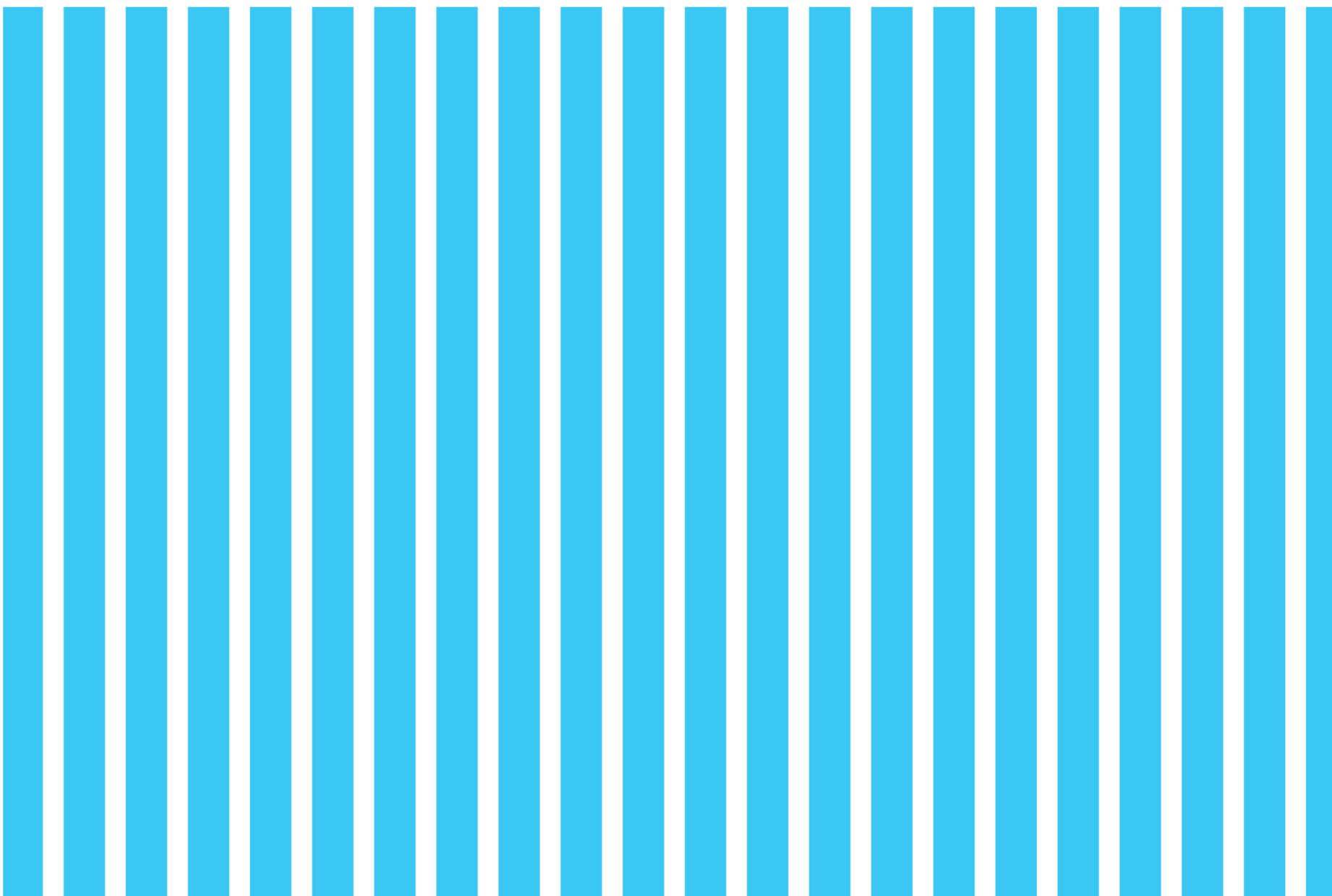
### WHERE

Automotive, electronics, aircraft interiors, consumer goods

### WHO

Hybrix

[www.lamera.se](http://www.lamera.se)



# Magnesium alloys

## Light alloys

### WHAT

Magnesium is the lightest structural metal in existence: its weight is equivalent to two-thirds of the weight of aluminium and a quarter of steel. The fabrication process of magnesium components through high-pressure die-casting, HPDC, offers better injection fluidity than aluminium while allowing for a reduction in the components and stages. The properties of the alloy enable it to manufacture light, thin and complex pieces that absorb vibration, resist impact, reduce noise and are easily recyclable.

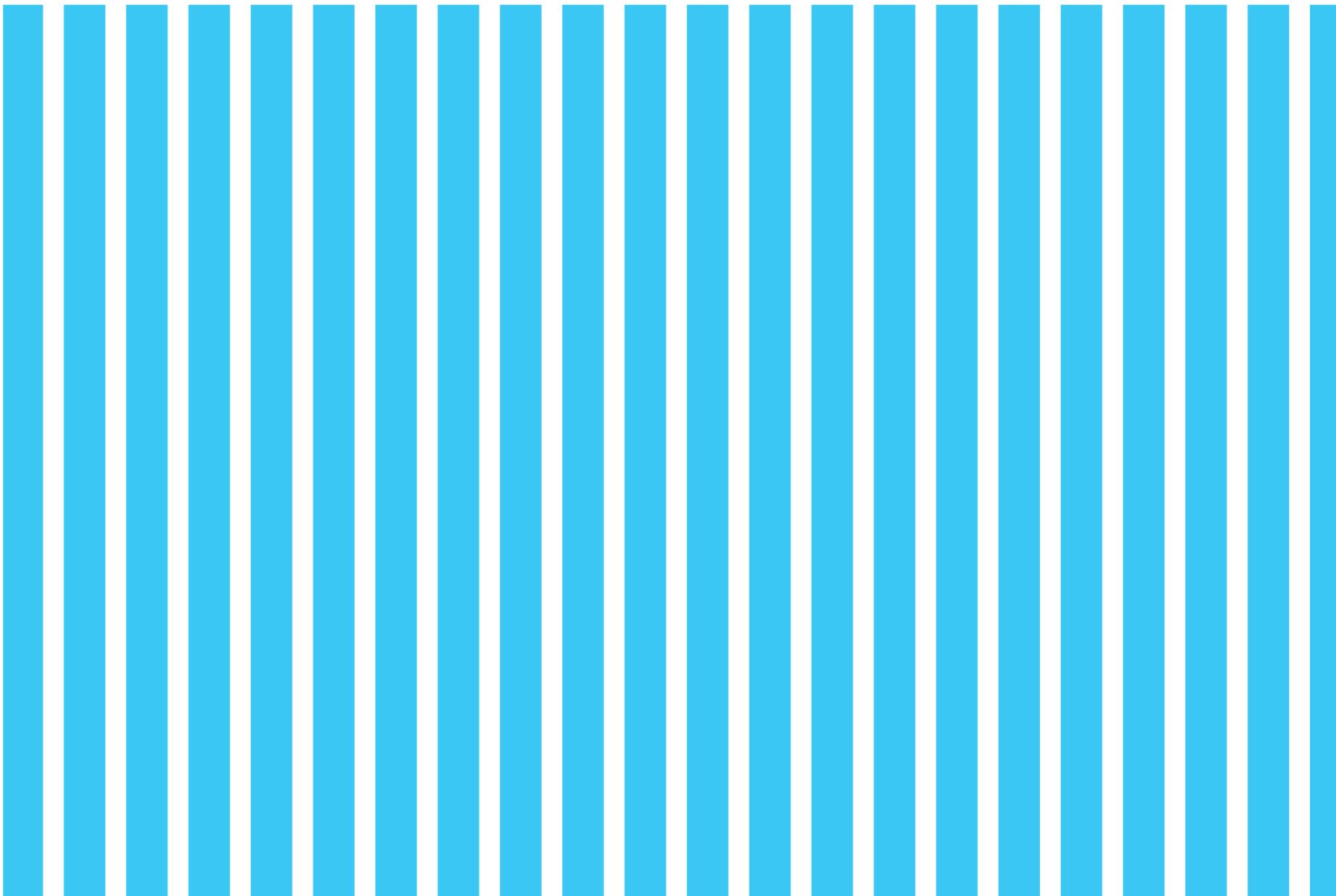
### WHERE

Automotive

### WHO

Magnesium Alloys

[www.grupoantolin.com](http://www.grupoantolin.com)

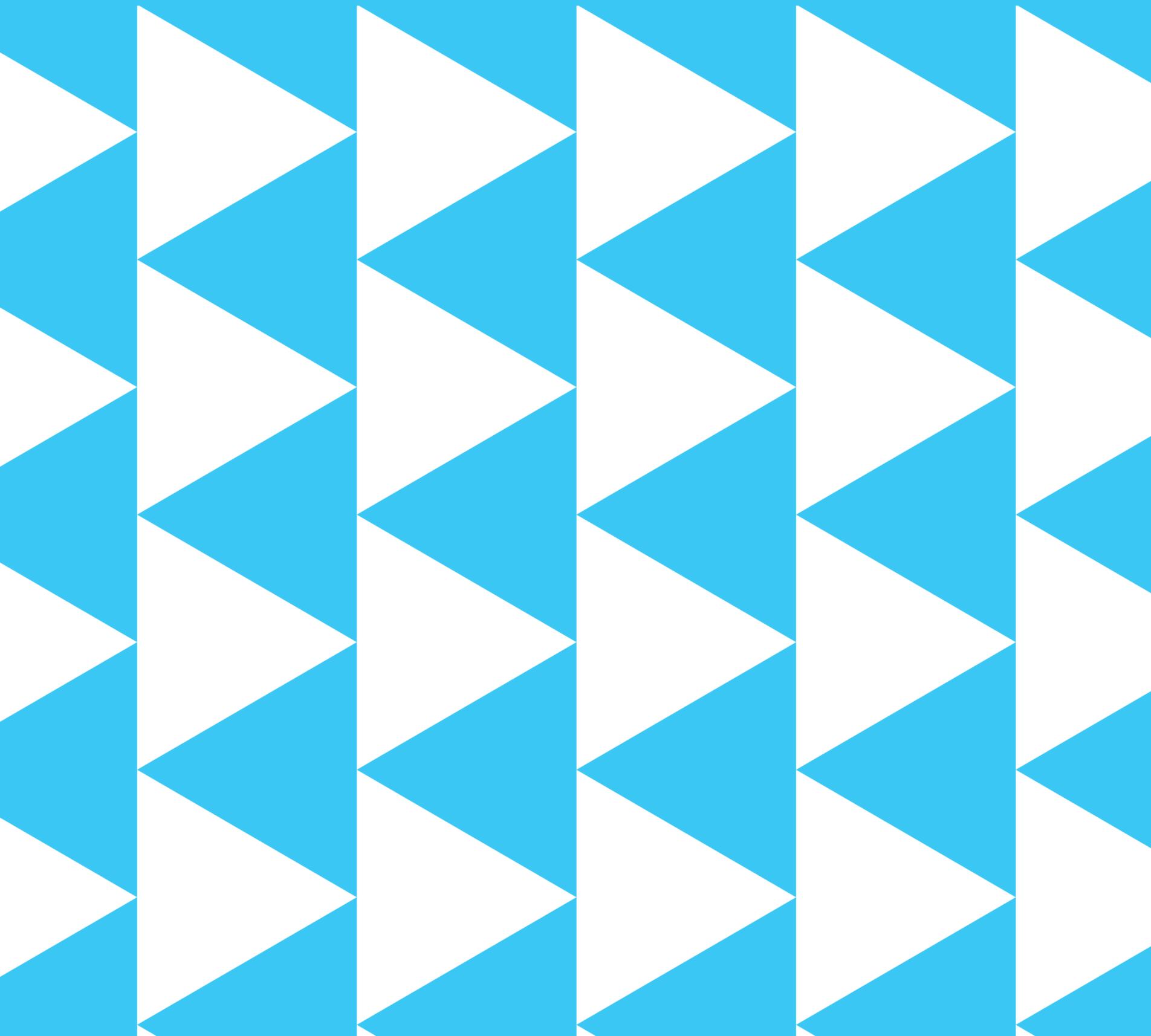


# COATINGS

The surface of a material is the interface with the environment that surrounds it, and it is therefore a critical point for the material's behavior. A coating can improve the properties of the substrate, such as its appearance, corrosion or wear resistance, among others. In many other cases, the functionality falls directly to the coating, while the substrate becomes a support.

Paints and inks are common coatings. There are different types of

coatings based on electrolytic or chemical processes in order to give the surface of the piece a variety of properties such as resistance to corrosion or a surface finish. Other processes such as Chemical Vapor Deposition (CVD) and Physical Vapor Deposition (PVD) are used in order to obtain high-performance coatings.



# Spray-on chrome paint

## Coatings

### WHAT

Advanced “spray-on” chrome paint technology allows to apply a brilliant, durable, mirror like flexible chrome finish over virtually any surface and material. Comparing to galvanization, this new method of chrome coating enables application of chrome paint to any material, including polymers or wood. Custom processing, variety of colors and finishes.

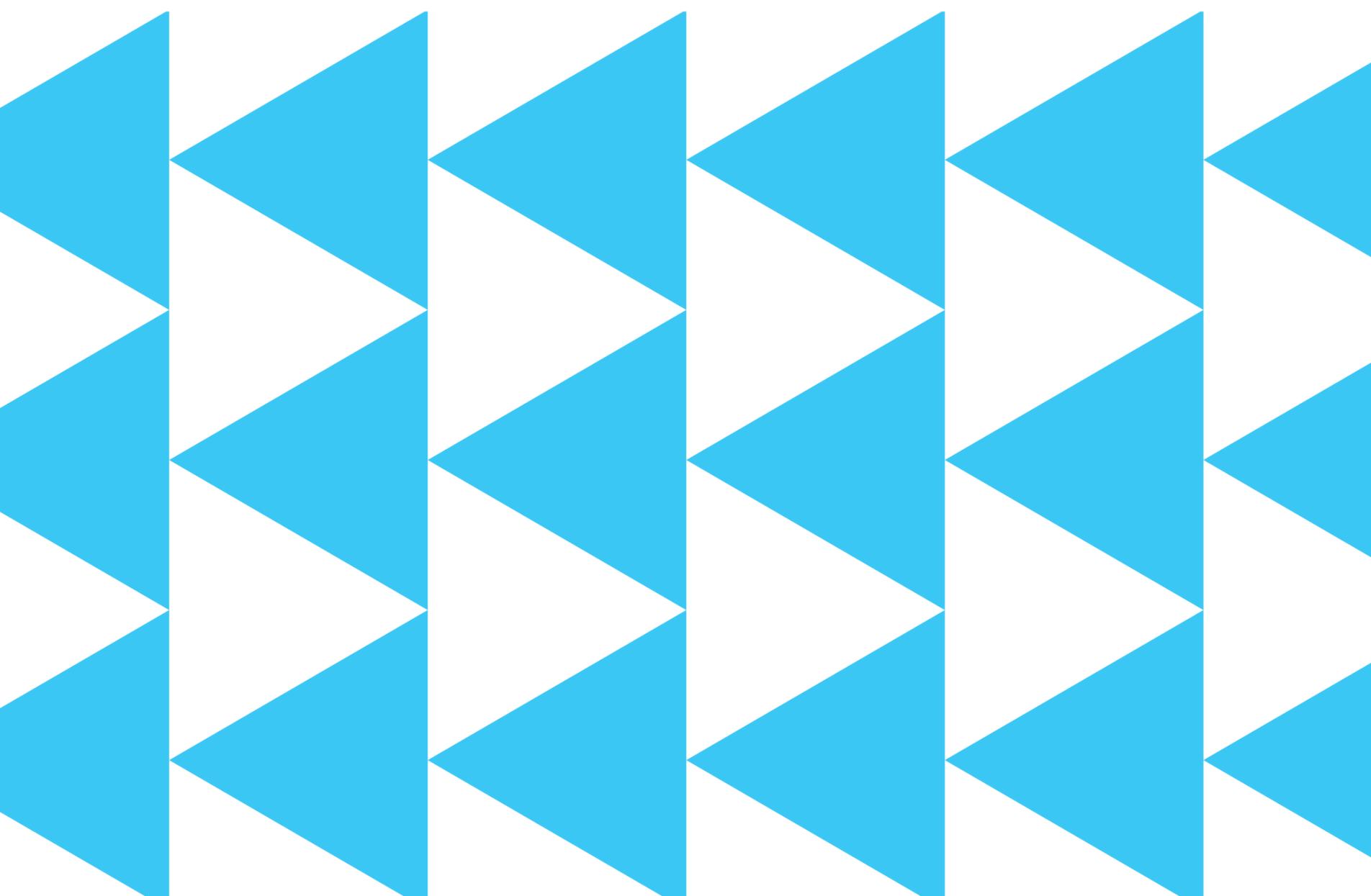
### WHERE

Decoration, automotive industry

### WHO

Carsofa

[www.chromovani-nastrikem.cz](http://www.chromovani-nastrikem.cz)



# Strong and coloured coatings for titanium

## Coatings

### WHAT

When titanium is in contact with air, it spontaneously creates a protective layer on its surface that increases its properties, such as the biocompatibility. Alti Color has developed a technology to increase the thickness of the oxide layer, creating coloured films. By increasing the film thickness, in fact, optical interference phenomena arise and different colours are experienced. There are no restrictions in shapes or dimensions for this technology and it is possible to oxidize the entire component as well as a part of it.

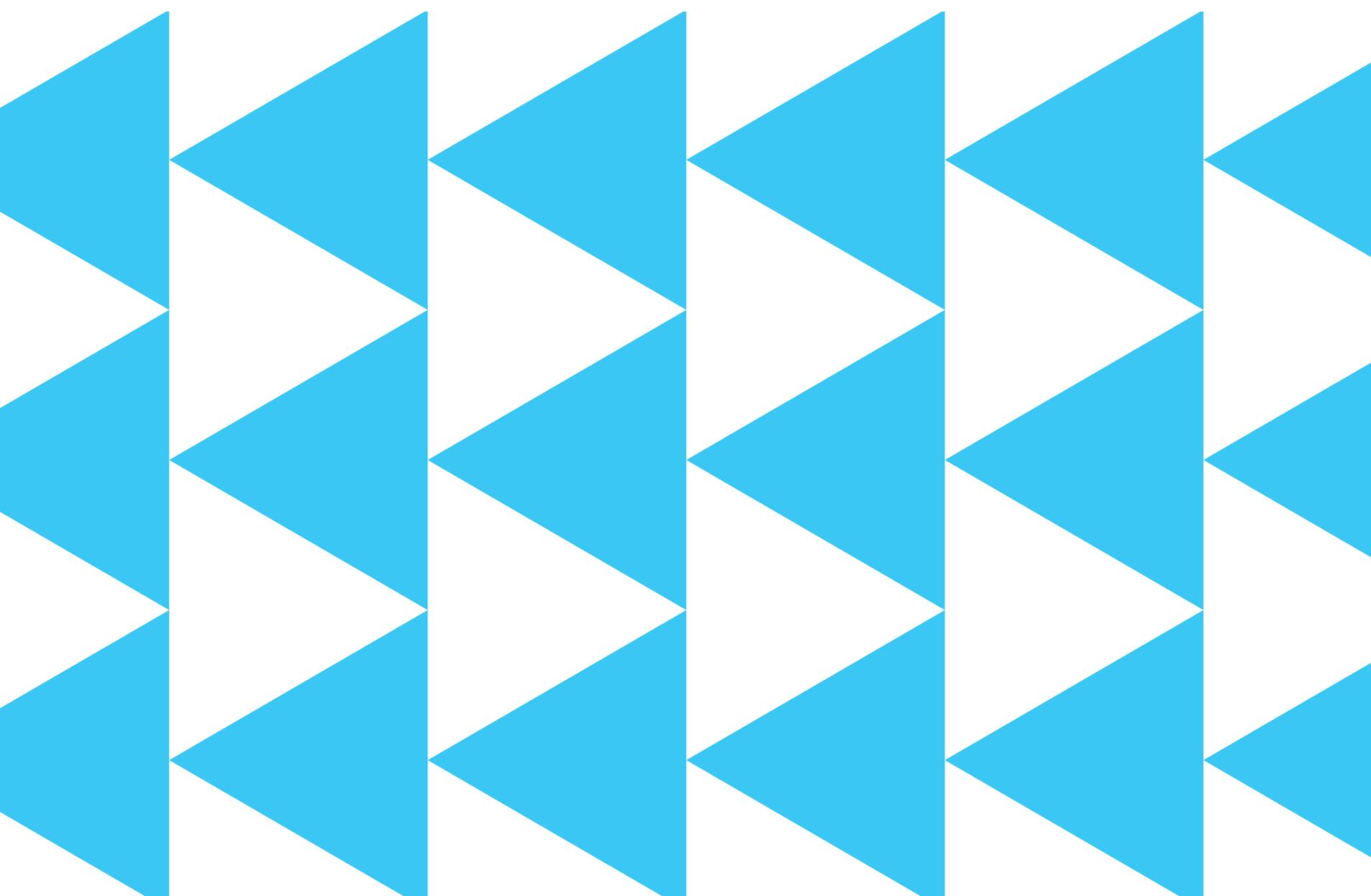
### WHERE

Biomedical implants, horse bits, jewellery, automotive and nautical components

### WHO

Alti color

[www.alticolor.com](http://www.alticolor.com), [www.lorenzinititanio.com](http://www.lorenzinititanio.com)



# Strong decoration that does not wear off

## Coatings

### WHAT

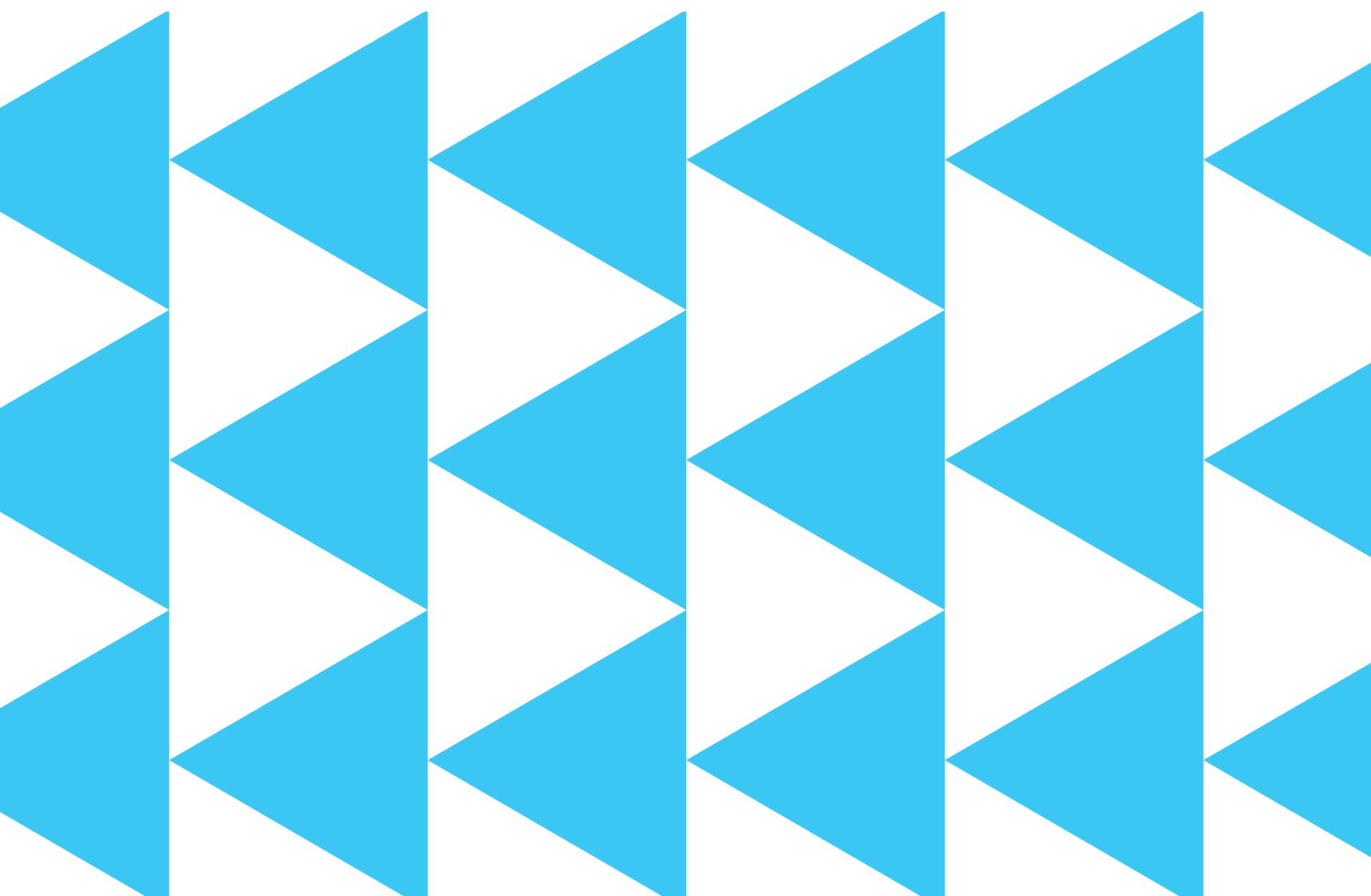
Idt Systems is a decorative process for 2D and 3D parts that penetrates the surface to provide a decoration that appears to be part of the material itself. The process, initially developed for plastic, is now a solution for most materials across all industries, aiming to decorate and authenticate consumer products at a cost 20% lower than alternative methods.

### WHERE

Consumer electronics industry and the decoration of ceramic products. Potential applications within automotive industry both for interiors and exterior metal body, household appliances and sport equipment

### WHO

**IDT Systems**  
[www.idt-systems.com](http://www.idt-systems.com)



# Electrically- conductive ink

## Coatings

### WHAT

Non-toxic, water-soluble, water-based and electrically-conductive ink. Composed of natural resins, water, conductive carbon and additives, this ink is capable of adhering itself to surfaces such as wood, paper, cork or some plastics and metals. It can be used in low-voltage circuits and is ideal for small devices, using it like electric tracks and weld points of the components.

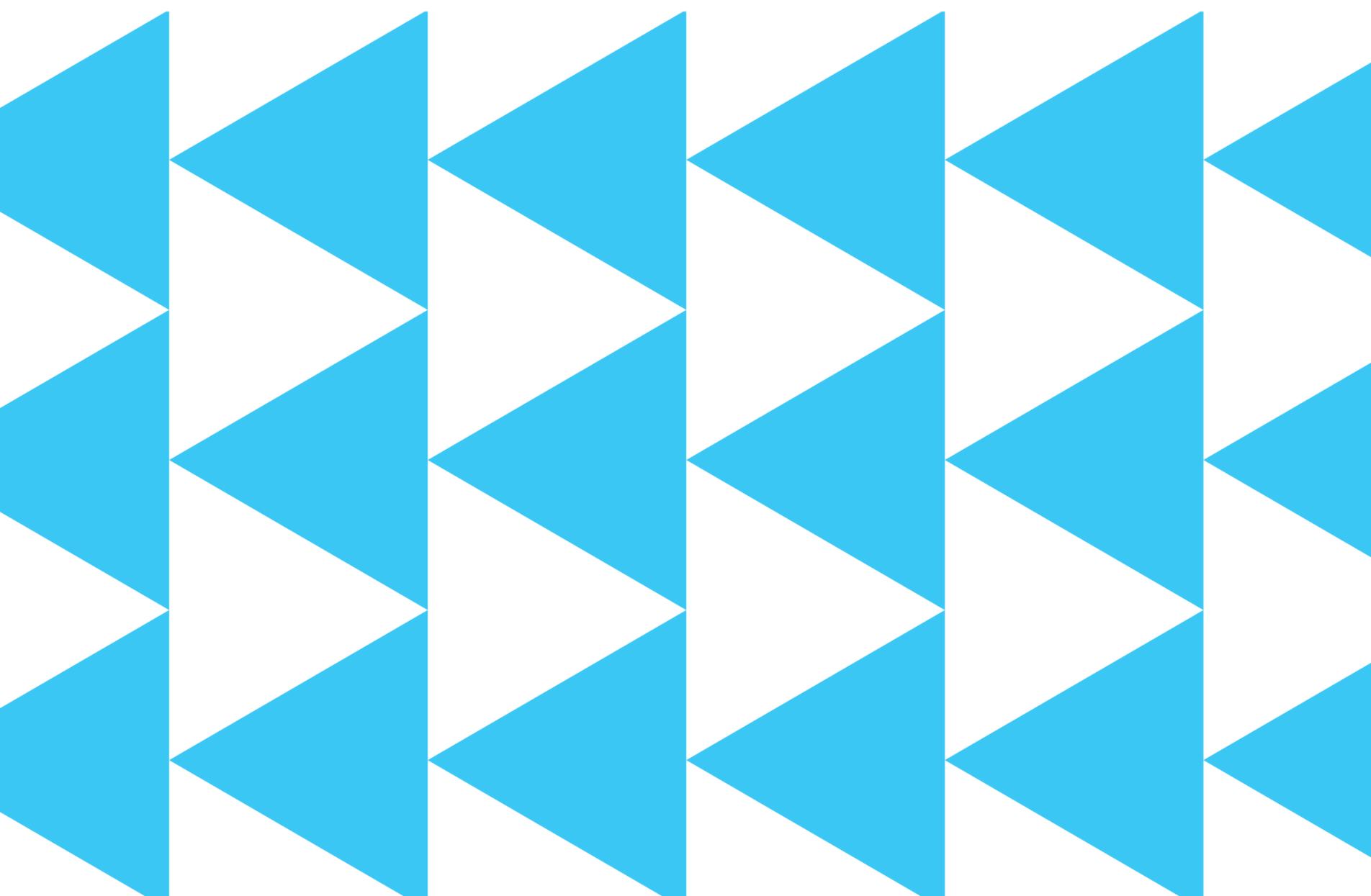
### WHERE

Print systems and electronic circuits

### WHO

**BARE CONDUCTIVE®**

[www.bareconductive.com](http://www.bareconductive.com)



# Security pigments

## Coatings

### WHAT

These print colors and plastics pigments offer security on many different levels: from interference effects visible to the naked eye to complex color transition effects, as well as invisible and/or forensic security features. Securalic® safety solutions are difficult to reproduce with the “usual” counterfeiting tools and methods. They can be easily integrated into an existing product design and cost-efficiently incorporated into existing manufacturing processes in printing and plastics processing.

Thanks to the variety of combination possibilities, the company can come up with an individual safety solution for every trademark protection program.

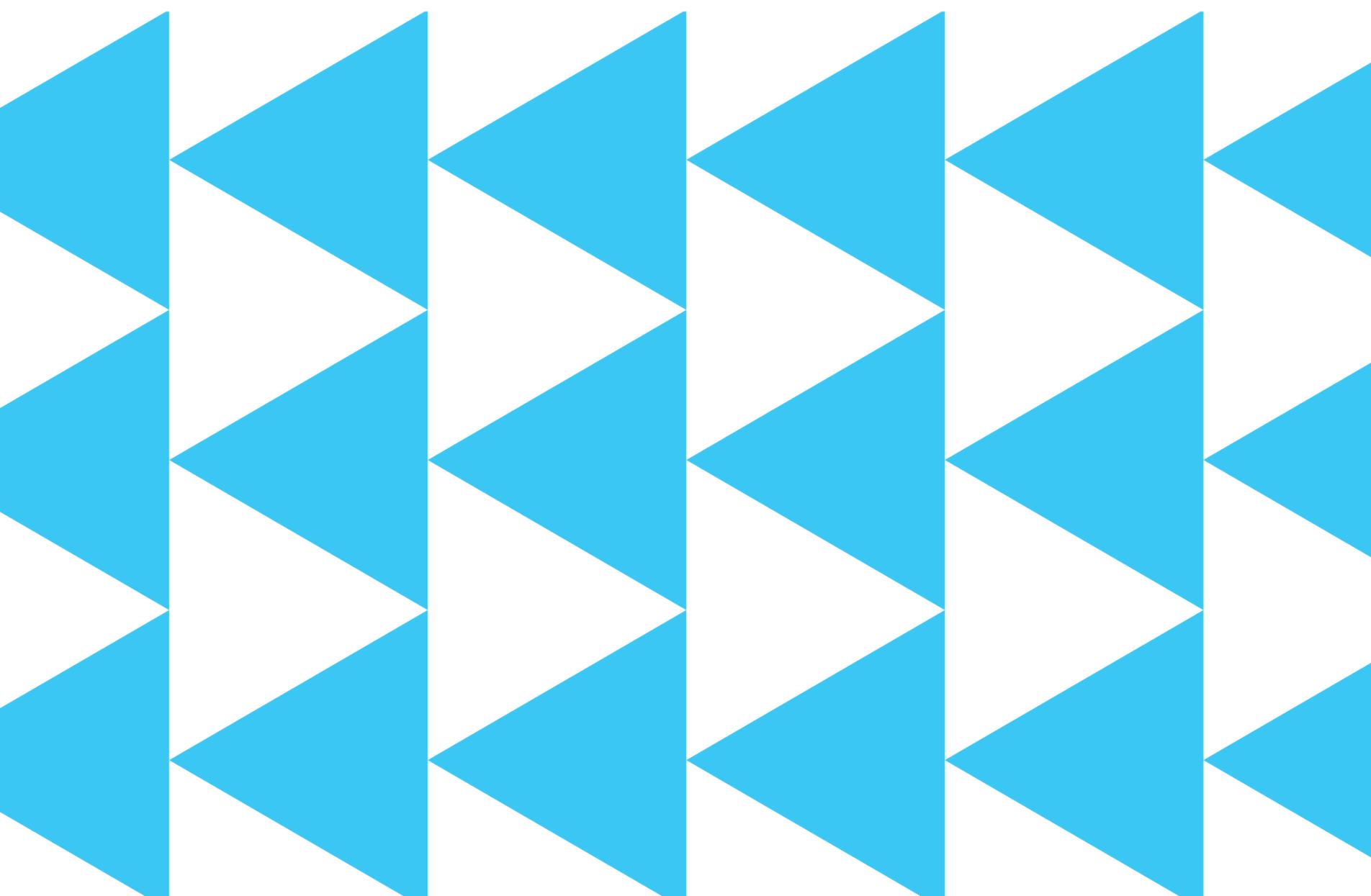
### WHERE

Consumer goods, medicines, high-value packaging

### WHO

**SECURALIC**

[www.merck.de](http://www.merck.de)



# High temperature-resistant PEEK coatings

## Coatings

### WHAT

The main ingredient of VICOTE® Coatings is VICTREX® PEEK™ polymer, widely regarded as one of the highest performing thermoplastic materials in the world. VICOTE® Coatings provide numerous benefits over most conventional coatings including: improved wear performance, extended application life, food contact approval and reduced systems cost.

Consider VICOTE® Coatings for all those applications that require exposure to extreme conditions such as high temperature, chemicals and abrasion.

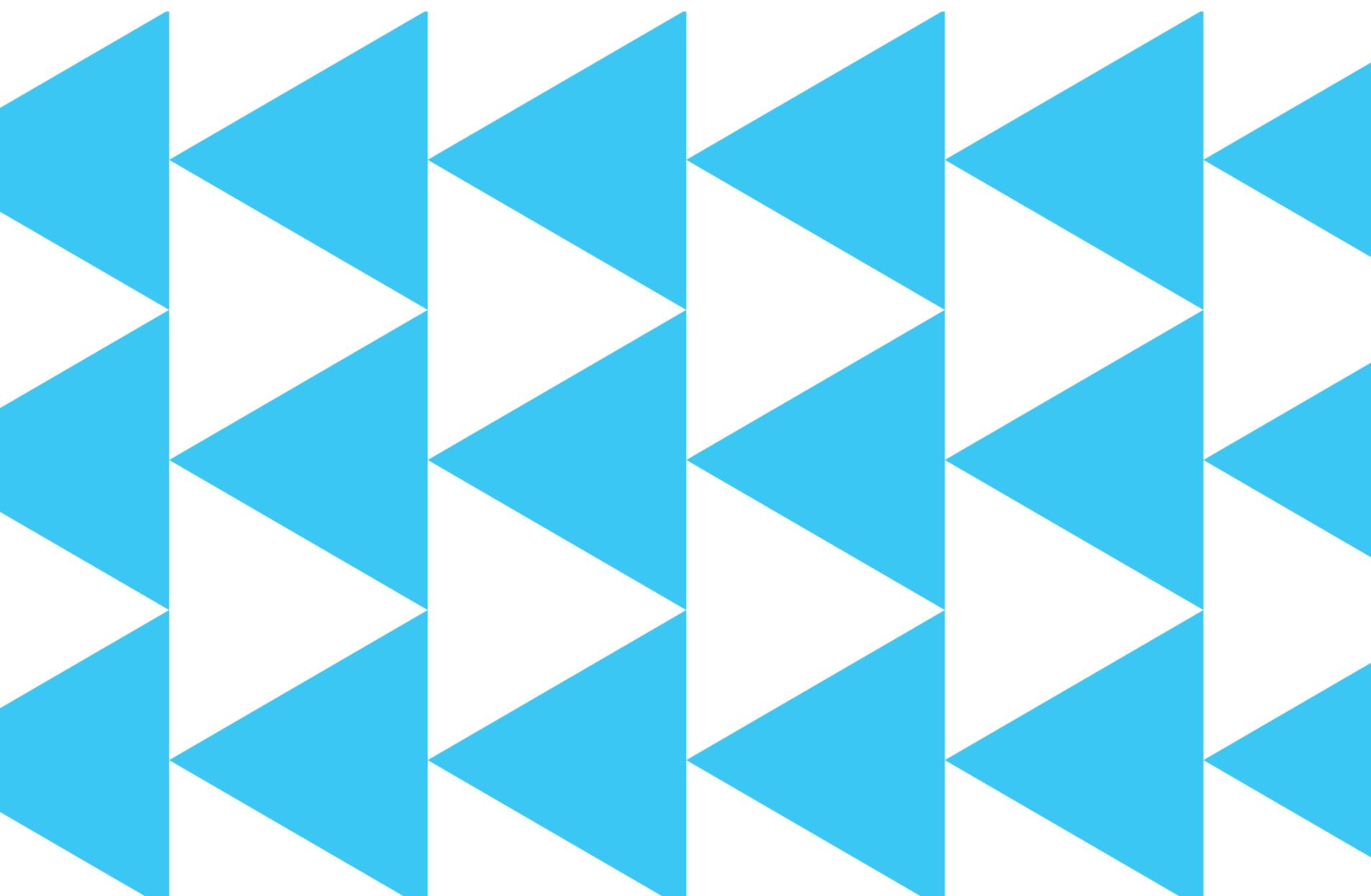
### WHERE

Industrial, automotive, food processing, semiconductor, electronics or pharmaceutical parts, cookware and appliances

### WHO

Vicote

[www.victrex.com](http://www.victrex.com)



# TiO<sub>2</sub> coating

## Coatings

### WHAT

Titanium dioxide (TiO<sub>2</sub>) coating has the ability to react with some of the noxious components present in the environment (such as nitrogen oxides, NO<sub>x</sub>) under the action of ultraviolet light (sunlight or artificial). In this reaction, the pollutants are neutralized but the TiO<sub>2</sub> layer remains unaltered. Thin films of titanium dioxide also exhibit a behaviour opposite to the lotus leaf in that they are hyper-hydrophilic: water forms films on the surface, easily carrying all the dirt away.

### WHERE

Building industry, interior architecture, public works (roads, etc.)

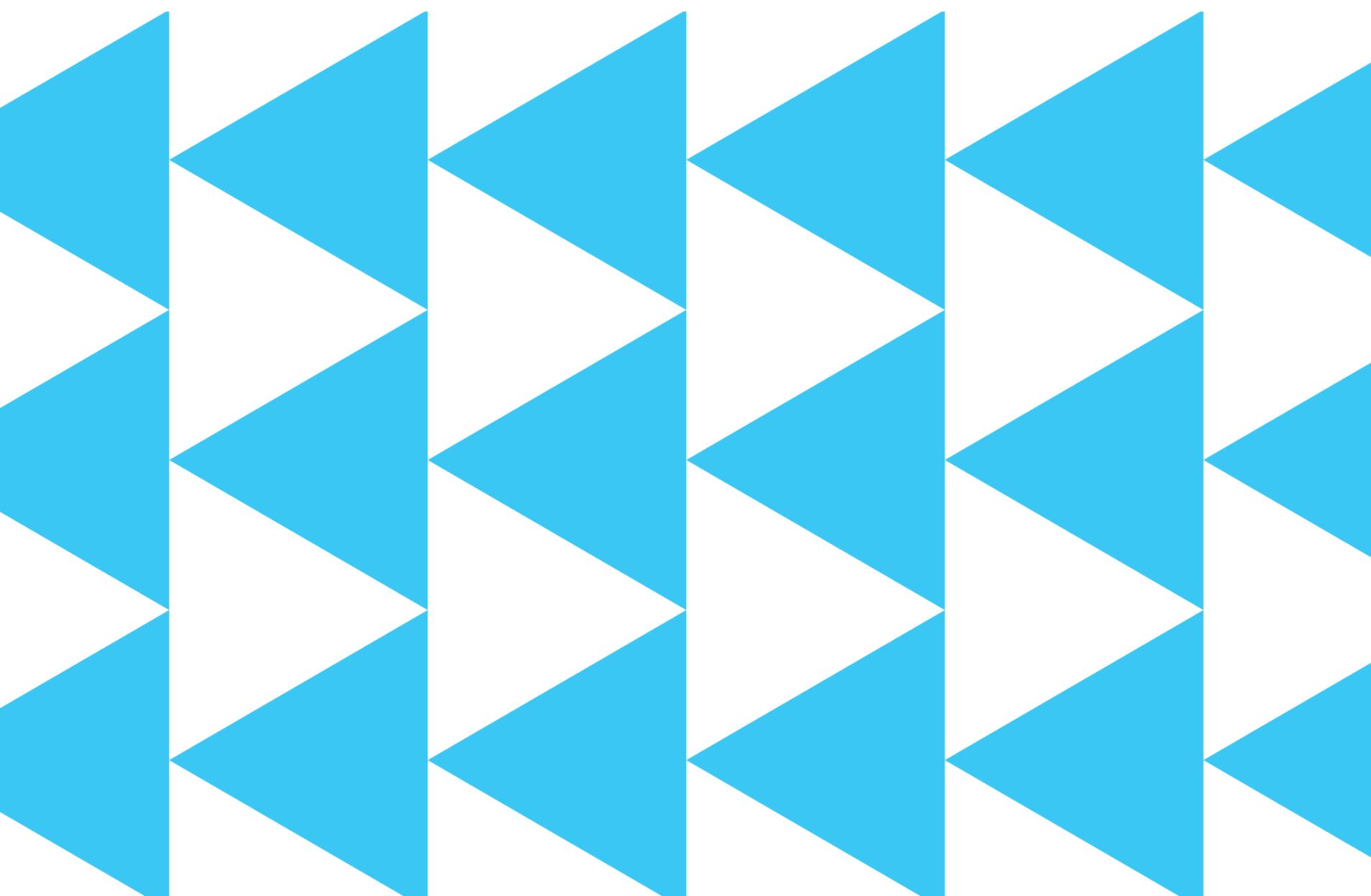
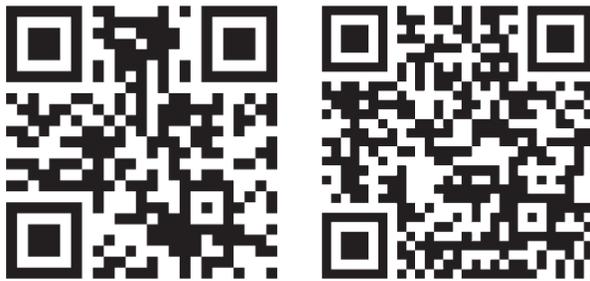
### WHO

**NOX-ACTIV®**

[www.icopal.es](http://www.icopal.es)

**ECOM4TILE®**

[www.ceracasa.com](http://www.ceracasa.com)



# Anti-fingerprint coating for stainless steel

## Coatings

### WHAT

Fingerprints on stainless steel are difficult to clean; they may require the use of many special detergents to remove them. Through a nanotechnological NSP (nanometer spray painting) process, an anti-abrasive metallic transparent coat can be applied to a stainless steel surface. Its enhanced strength provides the surface with strong and durable protection and greater hardness than conventional stainless steels. The processed surfaces have some excellent characteristics: they achieve waterproof, oil-proof, dust-resistant properties. They are easy-to-clean surfaces by just using a soft fabric or a soft paper to clean them. They also have self-clean properties in outdoor installations.

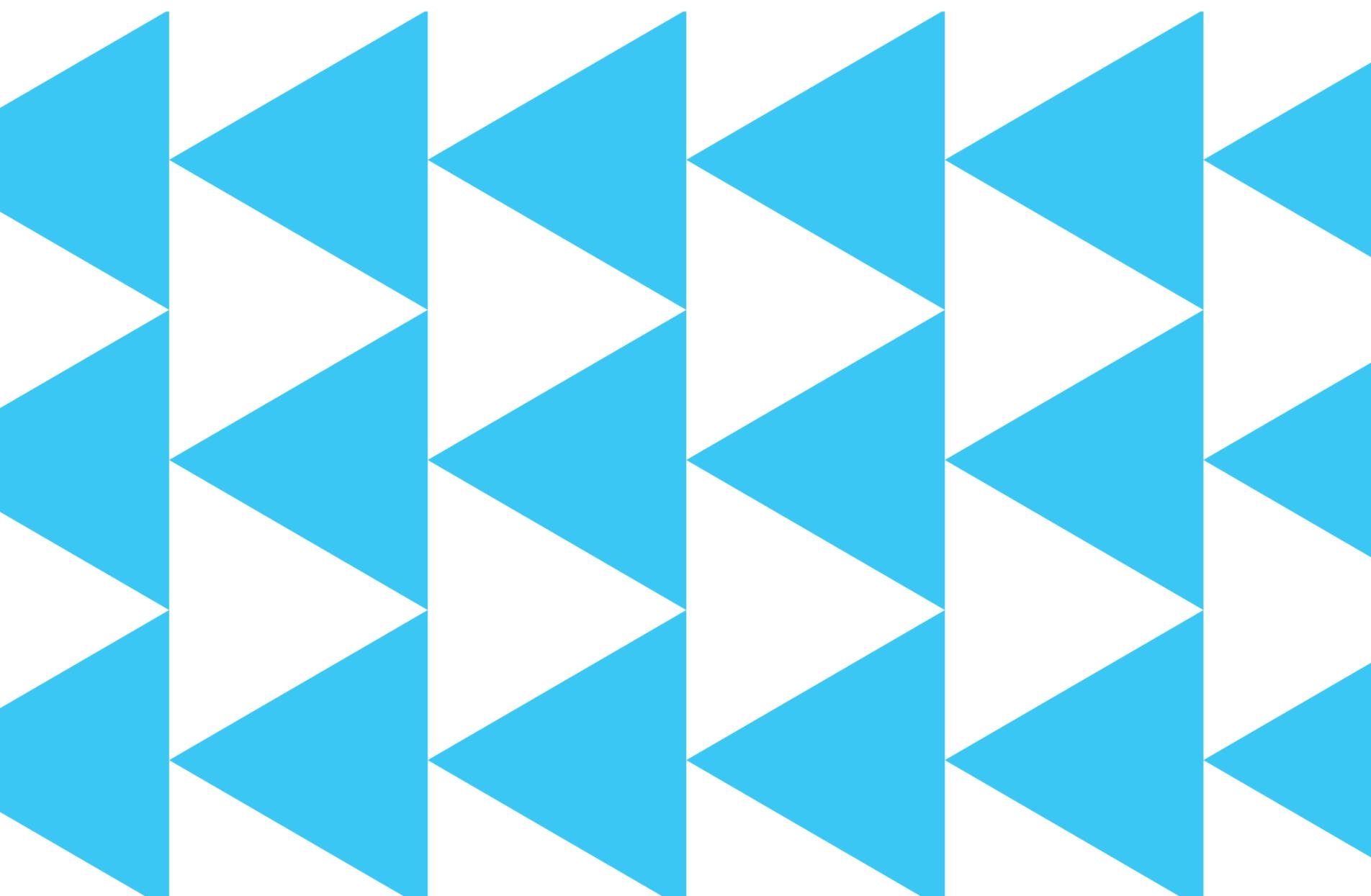
### WHERE

Architecture, interiors and industrial design

### WHO

**ANTIFINGERPRINTS®**

[www.theinoxincolor.com](http://www.theinoxincolor.com)



# Plasma electrolytic oxidation (PEO)

## Coatings

### WHAT

This process uses high voltages to create a uniform, dense oxide-based ceramic surface layer on light metals such as aluminium, titanium and magnesium. The surface has high hardness, wear resistance and corrosion resistance, yet is still relatively ductile. The treated surface has a hardness of up to 2000 HV, which is four times higher than hard anodized aluminium.

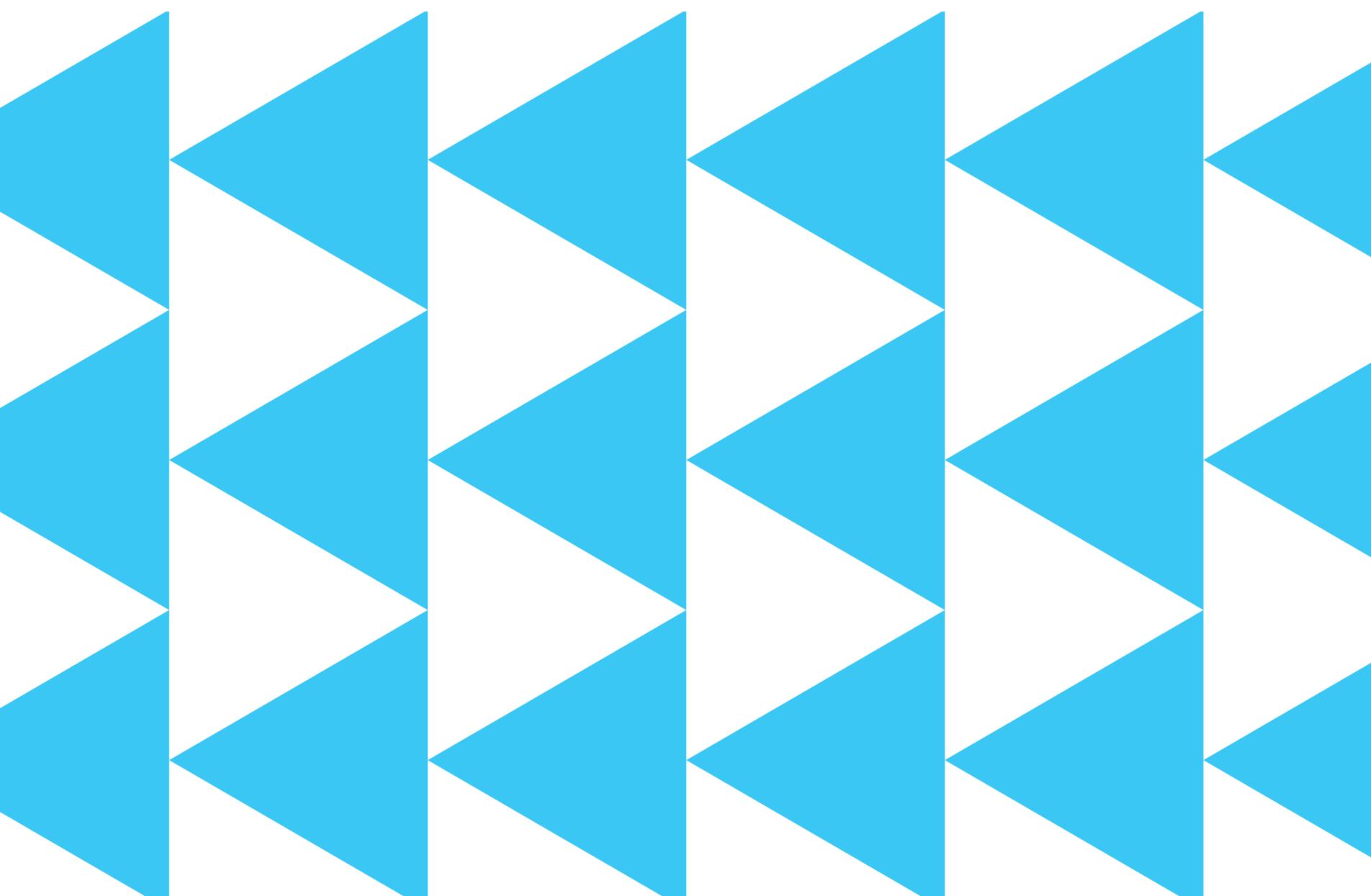
### WHERE

Extension of the life of aluminium moulds for plastic-injection moulding, wear-resistant surfaces on bike cranks, winches on boats and turbocharger rotors in the automotive industry

### WHO

**Keronite**

[www.keronite.com](http://www.keronite.com)



# Conductive indium tin oxide coating

## Coatings

### WHAT

This polymer film is coated with a transparent layer of electrically conductive indium tin oxide (ITO). The film has a light transmittance of 80%. The ITO coating is applied by physical vapour deposition on polyester film, but it can also be applied on acrylic, polycarbonate or glass.

### WHERE

Industrial components and medical devices, suited also for low volume manufacturing of geometrically complex components

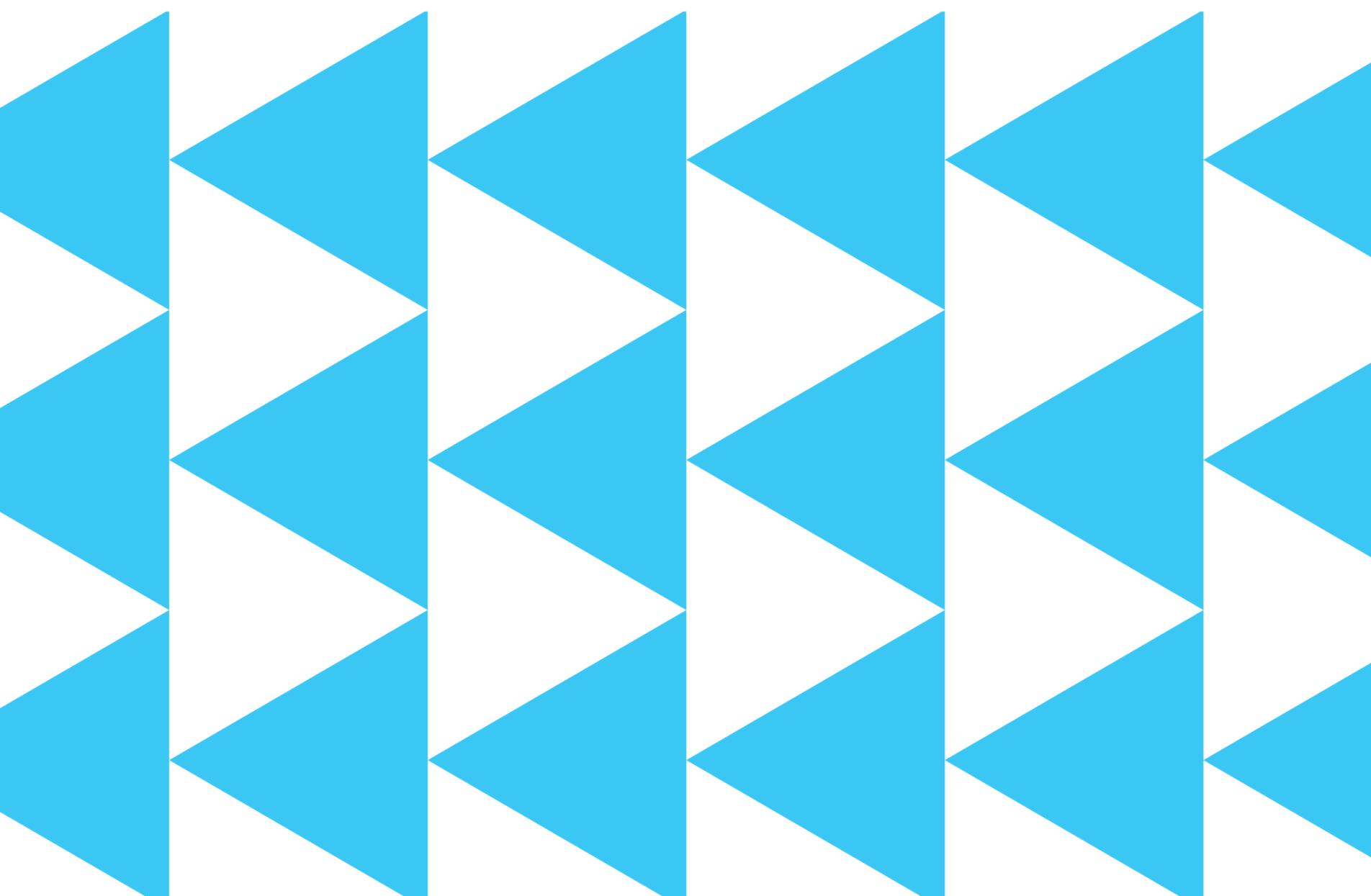
### TRY IT

Connect the leg of the LED to the exposed surface of the battery.

### WHO

Diamox Indium Tin Oxide Coatings

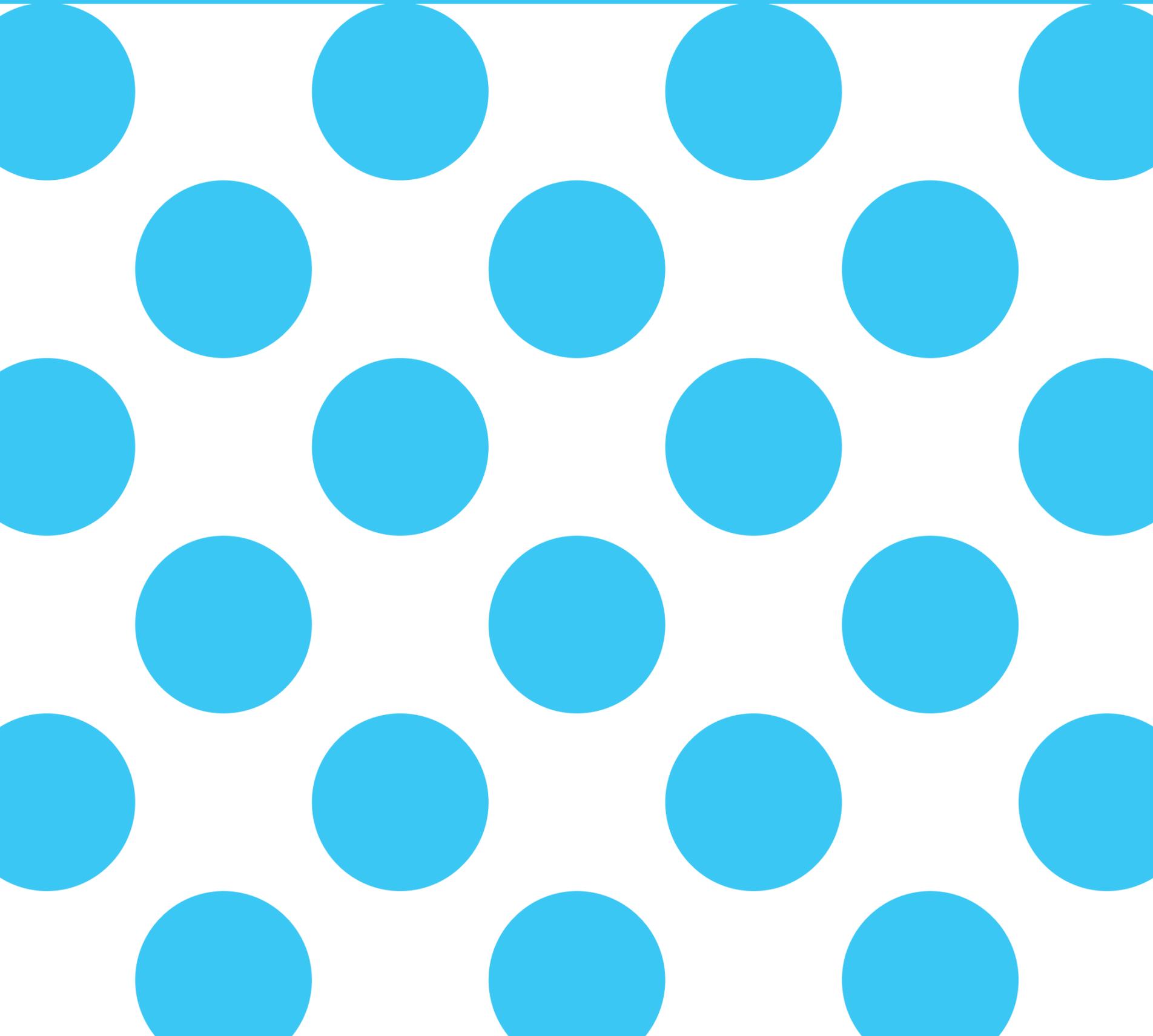
[www.diamondcoatings.co.uk](http://www.diamondcoatings.co.uk)



# ADVANCED COMPOSITES

In composites a matrix material is combined with a reinforcement material to create a new material with different characteristics to the individual elements. The structure of composites allows for a higher strength-to-weight ratio compared to pure materials, and composites can therefore reduce the weight when they are applied in cars, airplanes or ships.

Glass and carbon fiber composites have been used for decades for high-end sports equipment, leisure boat hulls and bathtubs, and they are now paramount in the production of windmill wings, commercial aircrafts and cars, where they help to reduce weight and, therefore, fuel consumption. There are also more exotic composites such as metal matrix composites and ceramic composites used for specialised applications.



# Natural composite material

## Advanced composites

### WHAT

Biotex is a high performance composite material produced using flax fibers. The fibers are manufactured using a proprietary technology that ensures a high degree of fiber alignment. The resulting material has a high performance property with a strength comparable with that of conventional glass re-enforced fibers.

It is available as yarn, woven fabric or as preconsolidated sheets where it is combined with naturally derived plastics, offering exceptional stiffness, good impact resistance and light weight.

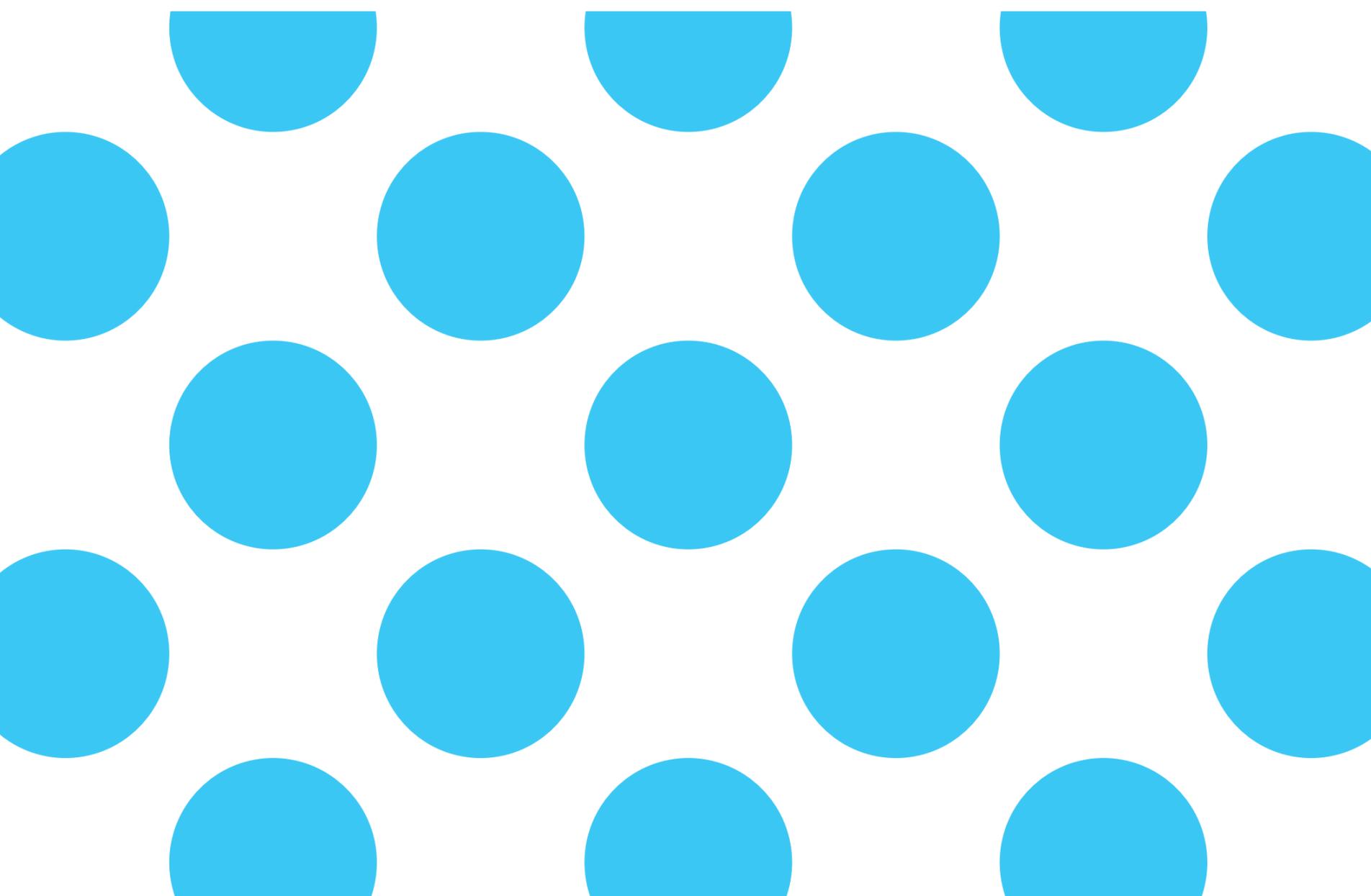
### WHERE

Car door panels, marine headliner panels, sports equipment, consumer goods

### WHO

Biotex

[www.compositesevolution.com](http://www.compositesevolution.com)



# Plastic that feels like real metal

## Advanced composites

### WHAT

Makrolon TC8030 is a polycarbonate containing 60% aluminium content that combines the formability of plastic with the engineering properties of aluminium. The aluminium in the compound increases the thermal conductivity of the plastic, which means it can cool down quicker from high temperatures. The aluminium in the compound also changes the surface properties of the material, improving the scratch and abrasion resistance and extending the life of the product. The new polycarbonate is a real alternative to aluminium with the added benefit that it does not require any post-treatment, enabling cost-effective production with low energy consumption.

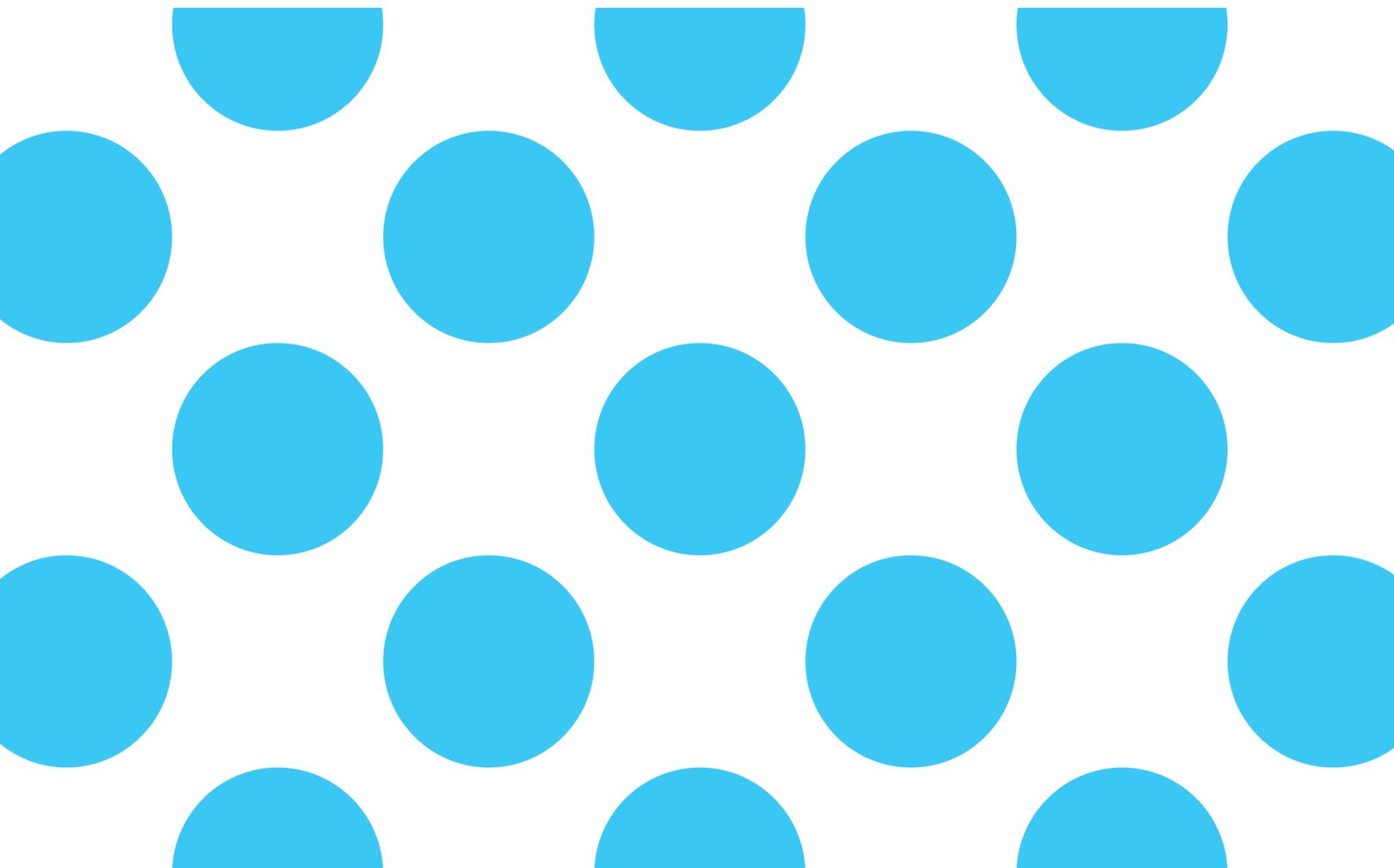
### WHERE

Designed primarily for LED heat sinks, Makrolon TC8030 has many potential applications including electronic devices and automotive components

### WHO

**Makrolon TC8030**

[www.bayermaterialsciencenafta.com](http://www.bayermaterialsciencenafta.com)



# OLED modules VELVE

## Advanced composites

### WHAT

OLED (organic light-emitting diode) is a light-emitting diode (LED) in which emissive electroluminescent layer is a film of organic compound which emits light in response to an electric current. OLED illuminate by surface rather than by spot, eliminating uneven lighting and shadows. Since the ultra-thin design can be mounted on ceilings and walls, light installation is now possible even in areas previously considered problematic.

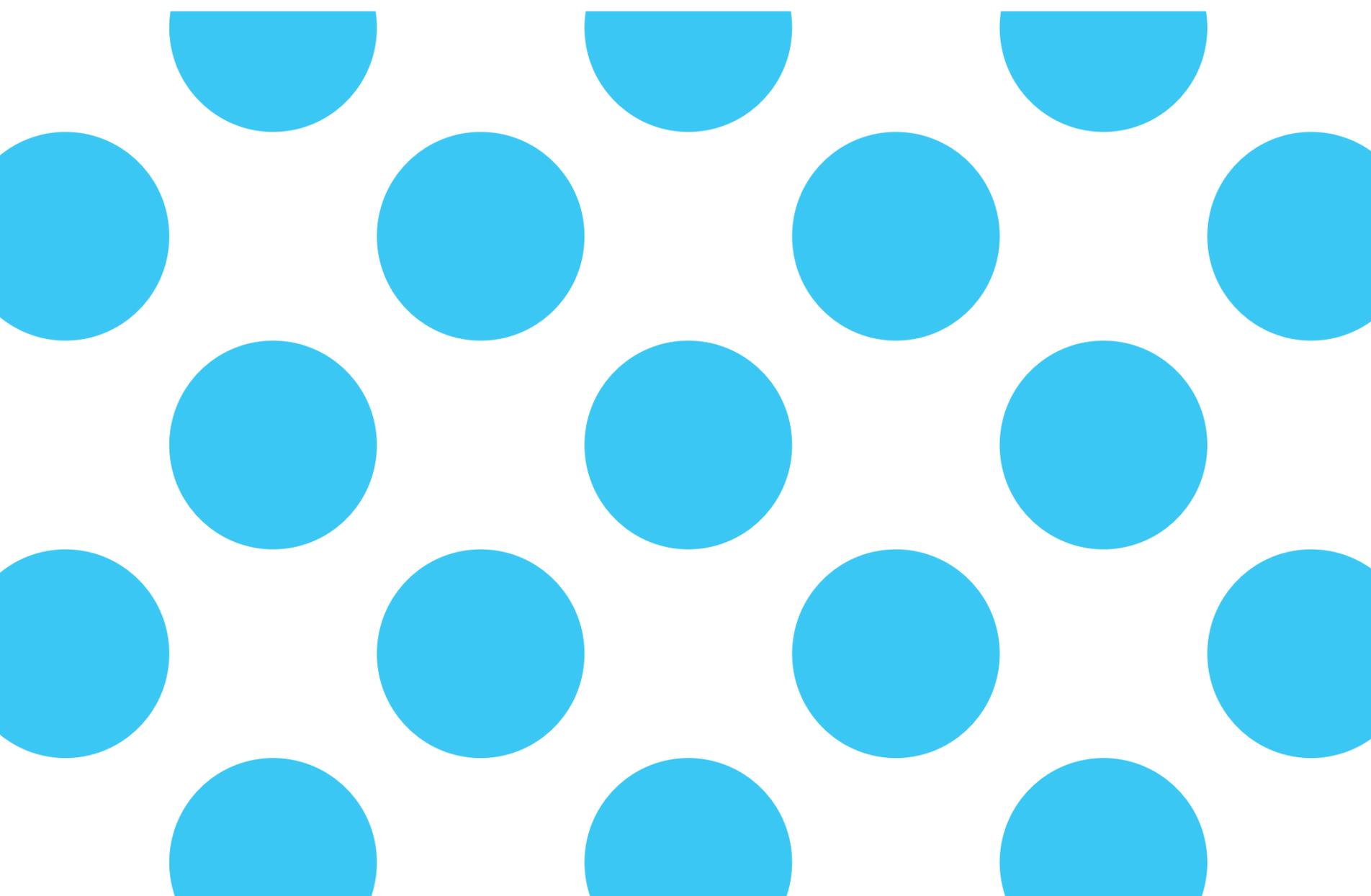
### WHERE

Lighting

### WHO

Verbatim

[www.verbatimlighting.com](http://www.verbatimlighting.com)



# Mono-material composite

## Advanced composites

### WHAT

Composite materials, by their very nature, present some difficulties for recycling. Separation of the different elements which provide the strength can prove to be complex. PURE is a self-reinforced composite material based on co-extruded polypropylene tapes. It is a single-material product which can be recycled easily, its design enabling it to offer composite-material advantages without the disadvantages of these materials.

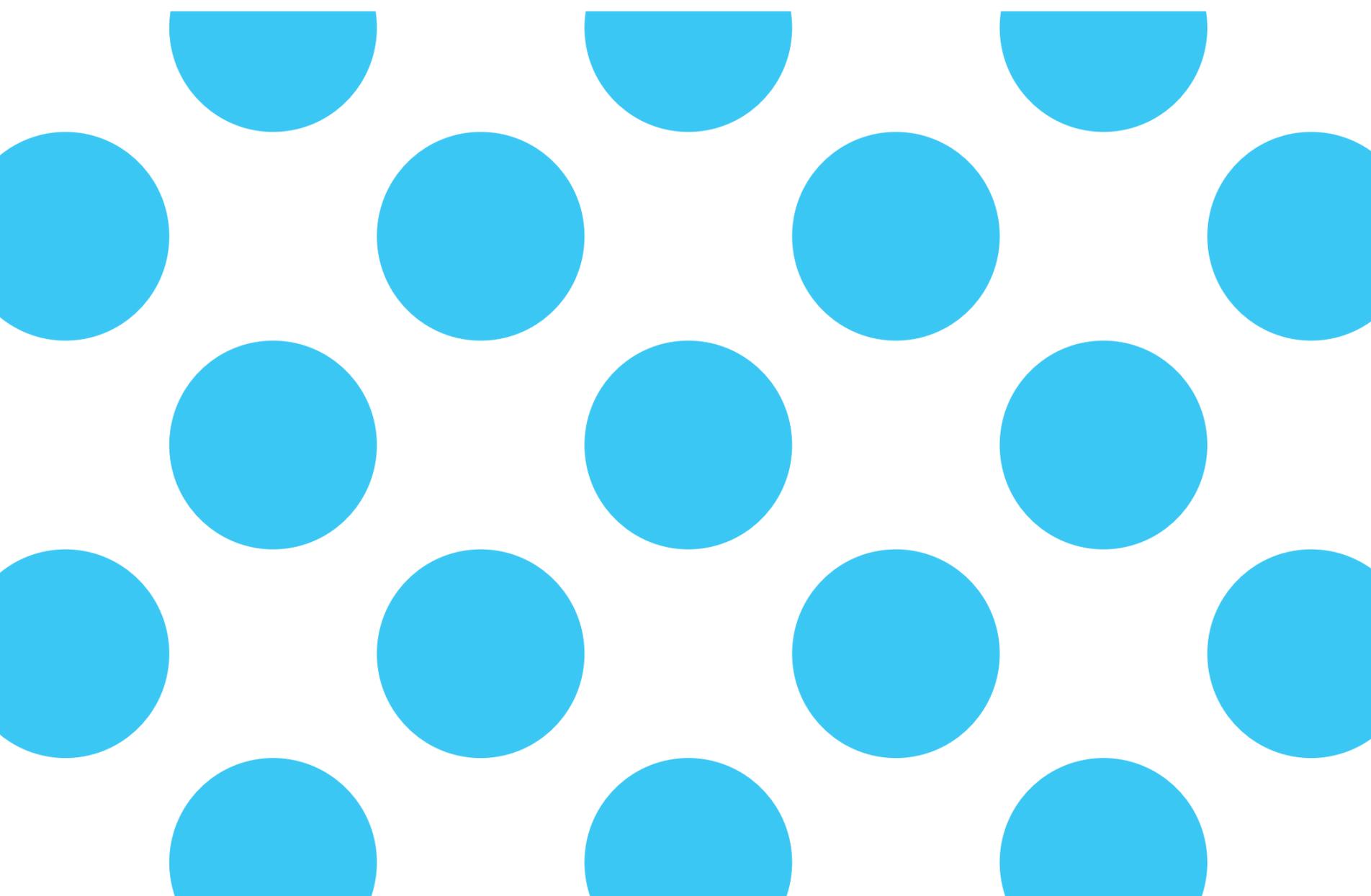
### WHERE

Anti-ballistics, tubes and pipes. Consumer products – helmets, ski boxes, luggage. Building industry, sandwich construction, automotive / transportation...

### WHO

PURE®

[www.pure-composites.com](http://www.pure-composites.com)



# Coffee composite

## Advanced composites

### WHAT

This material is extracted from used coffee grounds. It is therefore eco-friendly and does not harm the environment. It is used for making totally handcrafted objects. When dry, its texture and aroma are slightly similar to actual coffee. The strength of the material is very similar to that of any clay or mud, though this one is not waterproof. On the other hand, it can be easily repaired by gently wiping any scratch with vaseline or unscented oil.

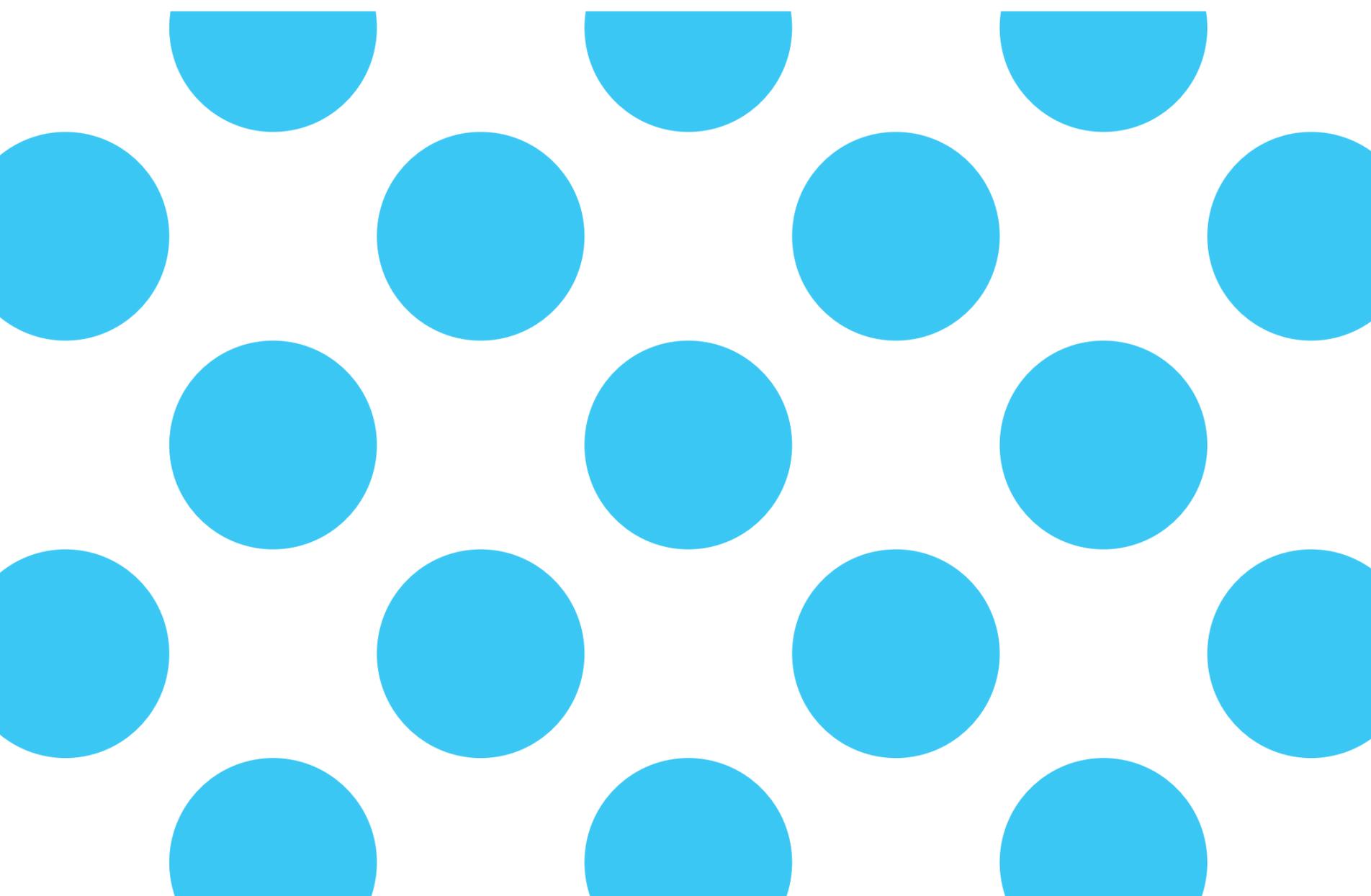
### WHERE

Handmade household products

### WHO

DECAFÉ

[www.rlauri.com](http://www.rlauri.com)



# Flax composite

## Advanced composites

### WHAT

The flax fiber can be considered as a complementary fibre to glass or carbon, which can bring new properties to parts and increase the quality of your final products. Lineo manufactures both “ready to use” flax reinforcements in composite manufacturing with conventional processes and pre-impregnated material based on an epoxy resin system and pre-treated flax fibers.

These bio-based fibers are of great interest for the composites market because of their dampening properties, weight reduction and mechanical and acoustic properties, as well as their aesthetic aspects.

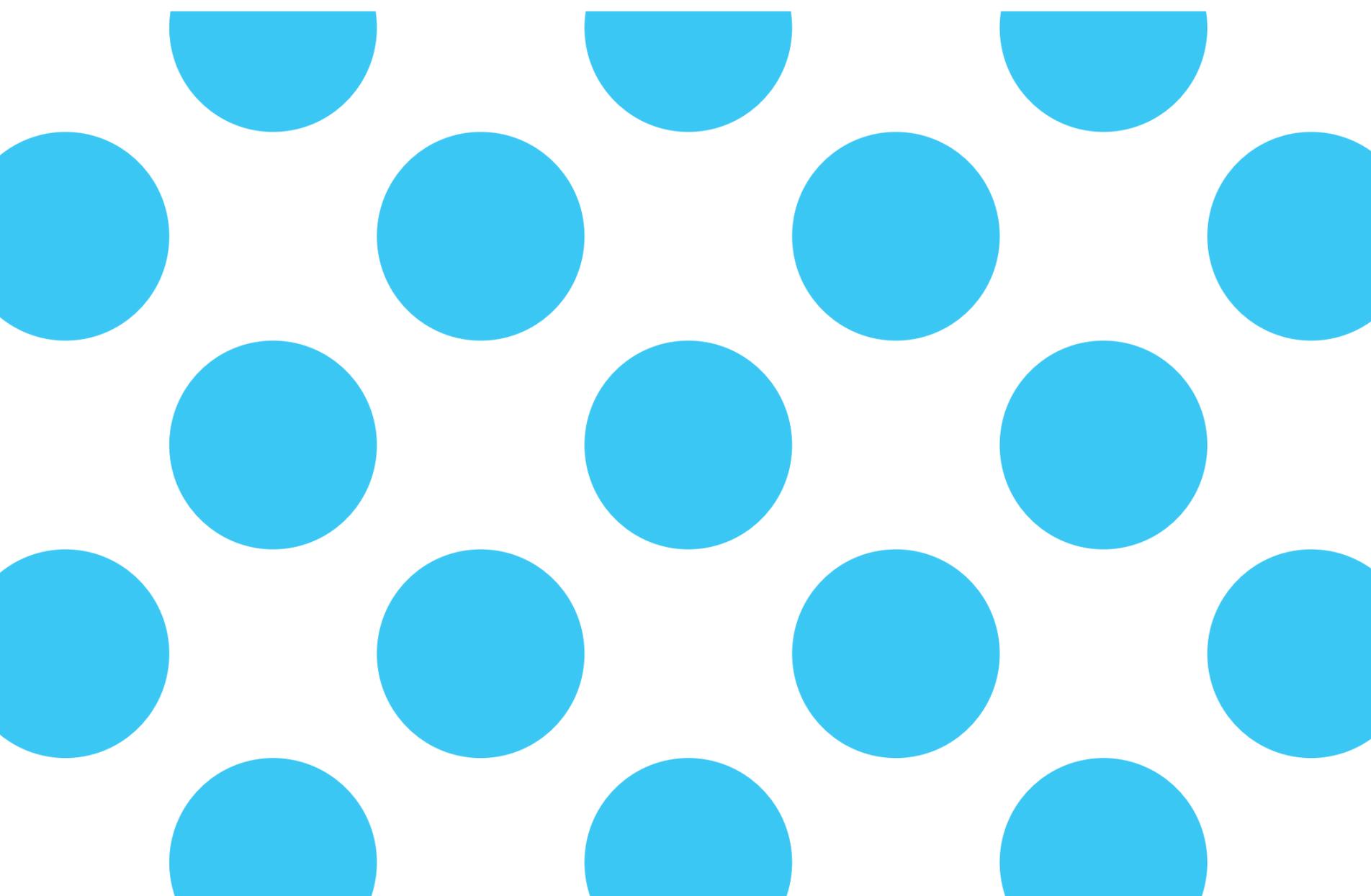
### WHERE

Sports and leisure, transportation, wind energy

### WHO

LINEO

[www.lineo.eu](http://www.lineo.eu)



# Translucent concrete

## Advanced composites

### WHAT

With the combination of concrete and transparent material, new composites arise with a wide spectrum of applications in various fields in architecture and interior design.

To achieve both translucence and high strength, an extremely fine-grained and highly flowable concrete has to be formulated.

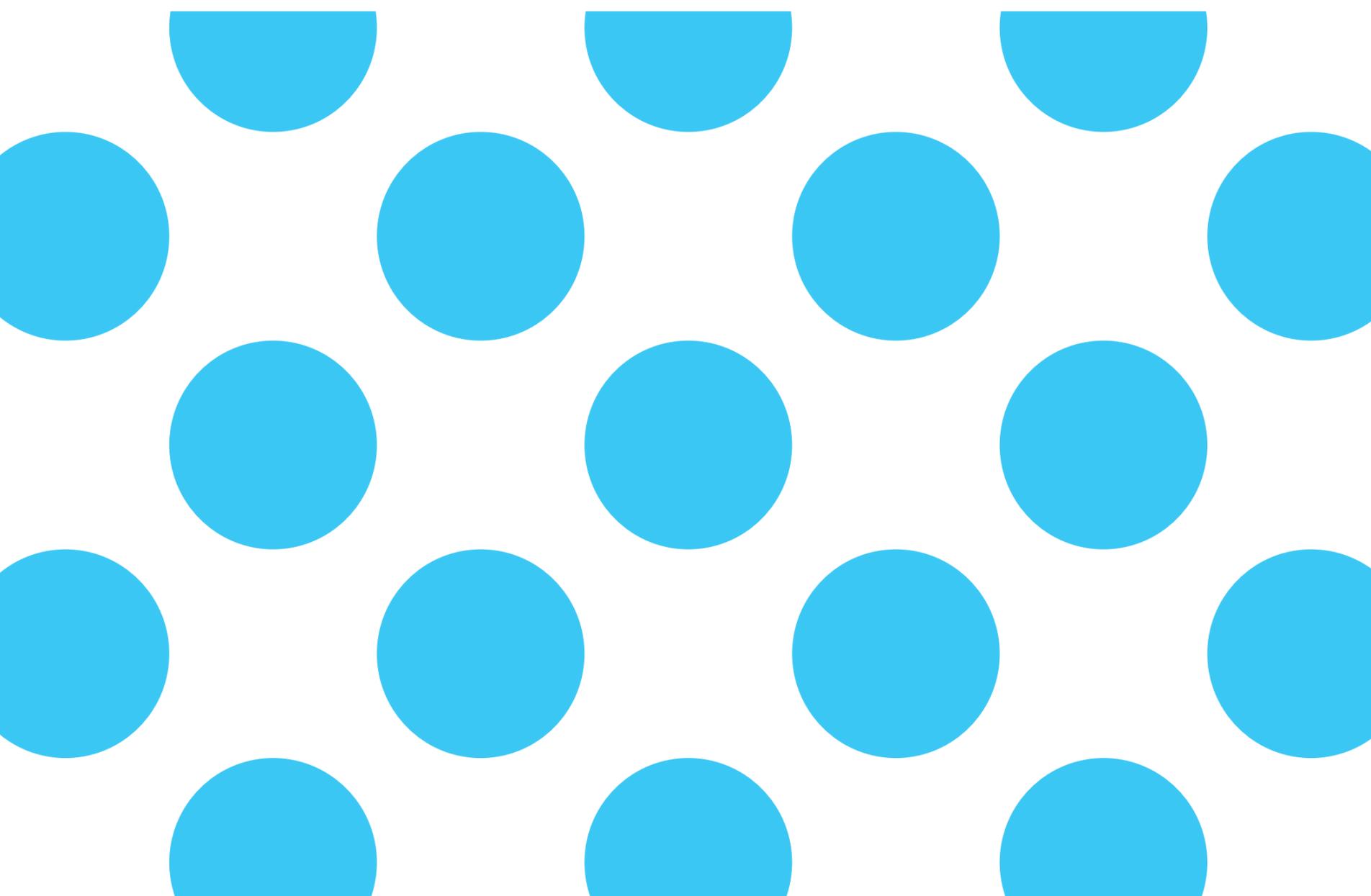
When edge lit, the acrylic grid embedded into the concrete mass allows the transmission of light from the light source to the whole area of the panel.

### WHERE

Architecture – partitions, stairs, solitaire panels, interior design – desks, bars...

### WHO

LiCrete®, LiCrete Block™  
[www.gravelli.com](http://www.gravelli.com)



# Flexible porcelain tape

## Advanced composites

### WHAT

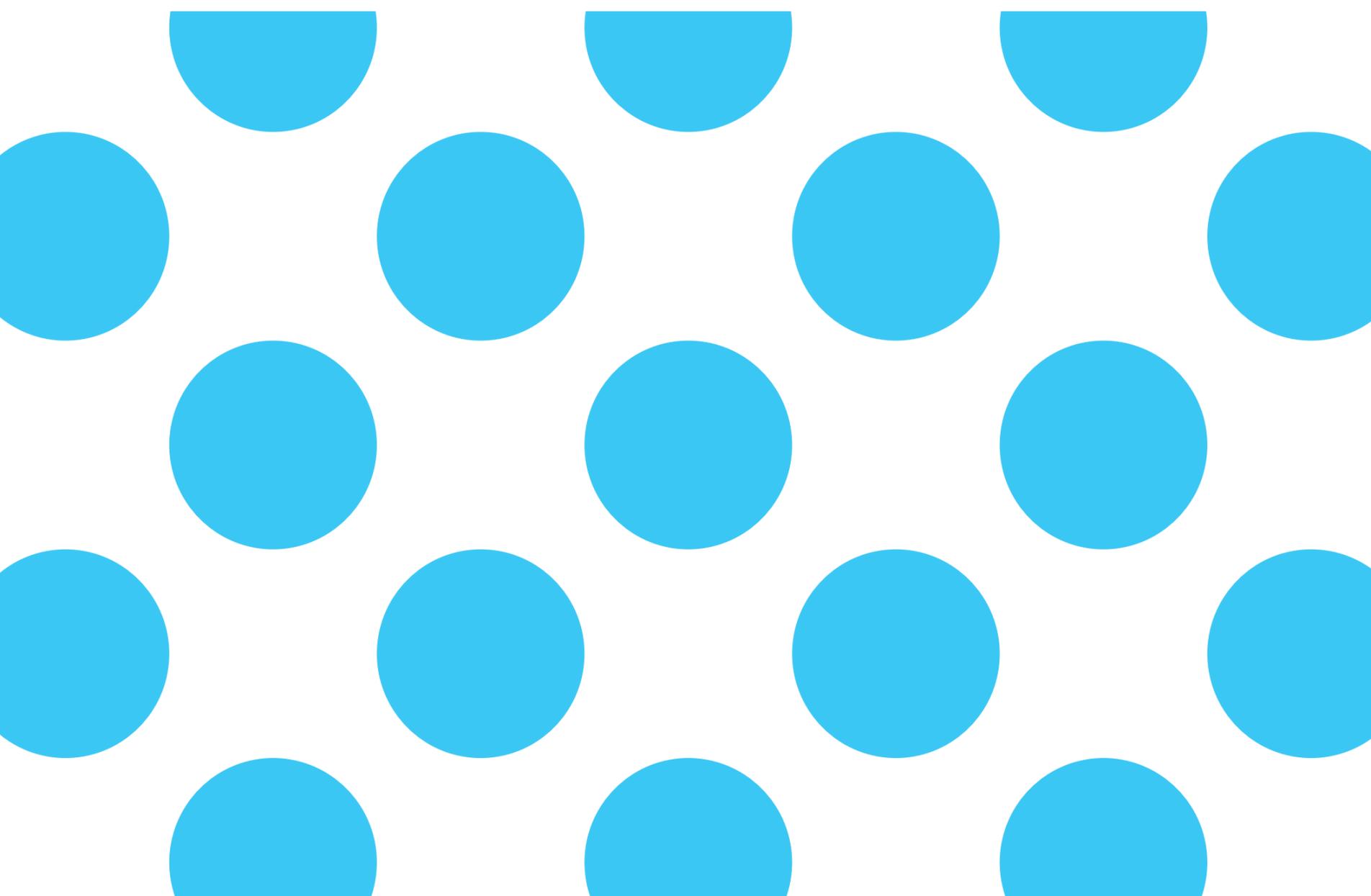
Flexible tape is based on ceramic raw materials and an organic binding matrix. Because of its high flexibility and the contained binder components, the tape offers new possibilities in ceramic treatment and shaping, such as punching, embossing, cutting, folding, bending, laminating and glazing. It fires in the same way as common porcelain.

### WHERE

Both artistic and technical – for decoration, lighting, furniture and representing art, as electrical insulator, for mechanical processes as composite material component or as dielectric

### WHO

**Keraflex®**  
[www.kerafol.com](http://www.kerafol.com)



# GELS & FOAMS

Gels and foams are fascinating materials with inherent versatility. All biological structures (red blood globules, lung fluid, membranes, etc.) depend on these substances. Mimicking the natural structures, a wide range of industrial gels and foams has been developed.

Gels are solid, jelly-like materials that can have properties ranging from soft and weak to hard and tough. Gels have a lot of applications in food industry, paints and adhesives industries, production of orthotics and prosthetics tools, sport equipments, etc.

Foams are made up of a solid and gas phase mixed together to form a foam. Metal, glass, ceramic, composites and concrete-foamed material become lighter and, generally, their thermal and sound insulating properties are enhanced. Foams are used in packaging, cushioning of furniture, transport and automotive industry, and as building insulation, etc.



# Aerogel

## Gels and Foams

### WHAT

Aerogel is a sponge-like structure of silica (glass), with an air content of more than 90%. It has an extremely low thermal conductivity and is also the world's lightest commercially available solid material (65 - 85 kg/m<sup>3</sup>).

### WHERE

Insulation in roof lights, where it provides great insulation while still allowing light to enter the room. Aerogel is also incorporated into textiles used for outdoor clothing and footwear

### WHO

Lumira<sup>®</sup> aerogel and Enova<sup>®</sup> aerogel

[www.cabot.com](http://www.cabot.com)



# Foamed composite of PVC and wood fibers

## Gels and Foams

### WHAT

FFC™ is obtained from PVC charged with natural fibers and expanded to produce a lightweight material. The homogeneous mixture is ready for direct extrusion from dry-blend without having to go through the granulation phase, thus allowing for a simplified and economical production process.

FFC™ is workable just like wood. It is self-extinguishing and has excellent physical and mechanical characteristics such as dimensional stability, resistance to humidity, good elasticity level (thus allowing for the processing of curved surfaces as well), and thermal and acoustic insulation.

### WHERE

Furniture, interior architecture, building industry

### WHO

FFC FOAM FIBER COMPOSITE™

[www.ffcmaterial.com](http://www.ffcmaterial.com)



# Dilatant impact-protection material

## Gels and Foams

### WHAT

This material has shear-thickening or dilatant properties, which means the elasticity varies depending on the force it is subjected to. It is soft and flexible when moved slowly, but when moved quickly – for example, when compressed by an impact – its molecules lock together, thereby absorbing and dispersing the force of impact.

### WHERE

Protective clothing for motorcycling, mountain biking, winter sports and personal protection

### WHO

D30

[www.d30.com](http://www.d30.com)



# 3D advanced foam

## Gels and Foams

### WHAT

An auxetic material, unlike traditional stretch materials, will get thicker when stretched rather than thinner. Equally, if an auxetic material is compressed, it will get thinner. This happens because the unique cellular structure of auxetic foams opens up and expands under tension. Auxetic materials demonstrate how changes in structures can drastically alter the behaviour of a material and create opportunities.

### WHERE

Energy absorption products such as helmets, filters, bandages, surgical implants, anchors devices and dilators for the biomedical industry

### WHO

Auxetic Materials Network at the University of Bolton  
Auxetic Materials Research Group, University of Malta



# Stabilized aluminium foam

## Gels and Foams

### WHAT

Aluminium foam is a cellular structure containing a large volume fraction of gas-filled pores. The foams exhibit low densities in combination with exceptional mechanical and physical properties. Compared to synthetic materials (plastics, PUR foams), which are also lightweight, aluminium foams have special advantages: heat resistance, higher strength, incombustibility and recyclability.

### WHERE

Automotive industry, aerospace, engineering, construction

### WHO

Alusion™  
[www.alusion.com](http://www.alusion.com)



# Aerogel composite insulation material

## Gels and Foams

### WHAT

Aerogels are derived from gels in which the liquid component of the gel is replaced with air. The results are very low-density materials with remarkable thermal insulation properties.

Aerogels based on amorphous silica are the only solid insulators with better performance than air. Composed of up to 99.98% air by volume, they have 3-4 times better insulation ability of the common products, while transmitting light.

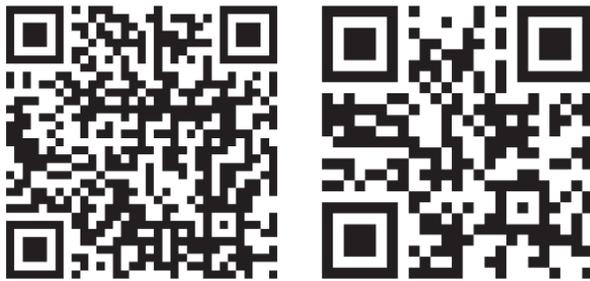
### WHERE

Thermal building insulation, window and skylight insulation, winter clothing, insulation for airplanes and automobiles, science projects

### WHO

Spaceloft®

[www.aerogel.com](http://www.aerogel.com), [www.stadur-sued.de](http://www.stadur-sued.de)



# Foam glass

## Gels and Foams

### WHAT

Foam glass is material for civil construction and insulation purposes. It is a lightweight, extremely fine-pored expanded glass with millions of hermetically-sealed pores. Since no diffusion can take place, the material is watertight and achieves an efficient barrier against soil humidity. Besides the outstanding mechanical and thermal properties, foam glass is an environmentally friendly product – it can be manufactured fully out of waste glass, with only a minimum of virgin additives.

### WHERE

Ground plate insulation, thermal insulation backfilling material for underground spaces, insulation of industrial roof, light fill in the road / railway

### WHO

#### REFAGLASS

[www.refaglass.cz](http://www.refaglass.cz), [www.foamglas.com](http://www.foamglas.com)



# ADVANCED TEXTILES AND FIBRES

Textiles are surfaces, generally flexible, resulting from the crosslinking of one or more fibers or yarns by stitching. As a result of the globalization of knowledge and technology, the textile industry is getting closer to other industries by means of nanotechnology. Conductive fibers are key drivers for the development of smart textiles. By means of nanotechnology, polymeric fibers can be converted into conductive fibers by varying the temperature. In this situation, these fabrics can accommodate sensors, electroluminescent devices, tactile membranes, etc.

The wide variety of fibers – whether polymeric, metallic or ceramic – gives rise to an infinite number of different characteristics that are obtainable to form exclusively functional fabrics.

# Luminous tex

## Advanced textiles and Fibers

### WHAT

Electronic textiles allow digital components and electronics, such as conducting wires, integrated circuits or LEDs, to be embedded in them.

This luminous fabric is the result of a technology that allows optical fiber to be woven in the same direction of the fabric's weft. The optical fiber weft is connected at one of its ends to a luminous source, and the optical fiber distributes the light across its length. The result is a luminous, flexible, elastic, washable and low-electric-consumption fabric integrated in a pillow that can change its colour by means of an IR remote control.

### WHERE

Textiles for decoration, fashion and accessories

### WHO

**LUMINOUS PILLOW**

[www.sensingtex.com](http://www.sensingtex.com)



# Three-dimensional fabric

## Advanced textiles and Fibers

### WHAT

This material is a spacer fabric with a closed surface that absorbs pressure while maintaining air circulation. The structure is formed from two exterior layers and a core made of multiple filaments that improve the elasticity of the panel. Parameters such as the material or the composition of the filaments allow variations to be introduced into the physical properties of the fabric.

Memory effect, high breathability, adaptable, recyclable and high UV-resistance are some of the most important properties of the material.

### WHERE

Cushioning, transport, sports and security clothes

### WHO

SPACE AIR®  
[www.pressless.de](http://www.pressless.de)



# Thermally activated 3D textile with shape memory

## Active materials, Advanced textiles and Fibers

### WHAT

Nititex is a textile structure incorporating filaments made of Nickel-Titanium shape memory alloy commonly abbreviated to NiTi or Nitinol. It is capable of being shape-set into a definite shape using a thermo-mechanical treatment. It behaves plastically when cooled down to a certain temperature and recovers its initial shape upon heating. NiTi textiles may be made purely of NiTi filaments or both NiTi filaments and other textile fibers.

### WHERE

Medicine applications – stents, angioplastics

### WHO

Nititex

[department.fzu.cz/ofm/nititex](http://department.fzu.cz/ofm/nititex)



# Electrical pollution-shielding fabrics

## Advanced textiles and Fibers

### WHAT

The growth of the electronic industry and the widespread use of electronic equipment have led to numerous electromagnetic interference problems having a negative impact on humans.

To easily create a safer and more economical home environment and workplace, metallized fabrics can be used. Even with only one layer and low weight, they procure more than 99% shielding efficiency against electromagnetic radiation.

### WHERE

Fashion and casual apparel or home textiles, workwear, automotive, army, sports and medical applications, construction or electronic industry

### WHO

XShield

[www.kufner-textil.com](http://www.kufner-textil.com)



# Aloe vera fabric

## Advanced textiles and Fibers

### WHAT

This lining acts directly on the skin by liberating small doses of Aloe Vera, which provides the skin with a regenerative action, deodorant and nutritional assets. It is a great antibacterial agent and improves perspiration and the sensation of comfort.

Aloe Vera microcapsules are uniformly distributed throughout the fabric and can handle long use with good results.

### WHERE

Clothes, sports and medicinal market

### WHO

**SWEETSKIN®**  
[www.sweetskin.es](http://www.sweetskin.es)



# Self-cleaning fabrics

## Nano materials, Advanced textiles and Fibers

### WHAT

Lotus leaves always stay clean and water drops and dirt never stain them. Dirt particles get absorbed by water droplets due to a complex micro- and nanoscopic architecture of the surface, which minimizes adhesion. Self-cleaning textiles emulate nature by embedding innumerable particles with a diameter of less than 100 nanometres on the textile surface. These textiles can self-clean and do not require laundering. Furthermore it has no effect on wearing, comfort, appearance, feel, breathability or elasticity.

### WHERE

Outdoor apparel, sportswear, workwear, shoes and home furnishings

### WHO

NanoSphere®  
[www.nano-sphere.ch](http://www.nano-sphere.ch)



# Luminous tex

## Advanced textiles and Fibers

### WHAT

Electronic textiles allow digital components and electronics, such as conducting wires, integrated circuits or LEDs, to be embedded in them.

This luminous fabric is the result of a technology that allows optical fiber to be woven in the same direction of the fabric's weft. The optical fiber weft is connected at one of its ends to a luminous source, and the optical fiber distributes the light across its length. The result is a luminous, flexible, elastic, washable and low-electric-consumption fabric integrated in a pillow that can change its colour by means of an IR remote control.

### WHERE

Textiles for decoration, fashion and accessories

### WHO

**LUMINOUS PILLOW**

[www.sensingtex.com](http://www.sensingtex.com)



# The thinnest and flattest carbon fiber

## Advanced textiles and Fibers

### WHAT

Compared to other carbon fiber composites, TeXtreme® is much flatter and smoother. This is because the textile is made with carbon fiber in flat 'tape' form, rather than the usual woven strands of a thicker gauge. This patented carbon reinforcement material achieves a superior surface smoothness, improved mechanical properties and significant weight saving that can be tailor-made to suit specific applications. It also extends the high-perceived value of this modern day luxury material.

### WHERE

Sporting equipment, aerospace industry, automotive interiors

### WHO

Textreme  
[www.oxeon.se](http://www.oxeon.se)



# Basalt fabric

## Advanced textiles and Fibers

### WHAT

Fabric with high thermal and dielectric properties, made from continuous filaments of basalt (a rock formed from the rapid cooling of basaltic lava). These natural mineral fibers extruded out of molten basalt rocks offer unique fire resistance and high mechanical properties. The principal features of the fabric are its resistance to fire, its high tensile strength, its dimensional stability at high temperatures and its resistance to electromagnetic radiation. It does not melt or shrink in flames and, when not mechanically stressed, keeps its geometric integrity. It is also used as a high-temperature insulator (i.e. ovens) and as a reinforcement in composite materials.

### WHERE

Railways, building sector, automotive, marine, aerospace, sport and leisure, wind energy

### WHO

**BASALT FABRIC**

[www.basaltex.com](http://www.basaltex.com)

