

**ARKEMA**



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Innovative materials for a sustainable world

# Arkema, a pioneer in specialty materials

## What exactly are specialty materials?

Arkema is a materials science specialist that combines knowledge of polymerization and formulation with application know-how. This means we manufacture so-called “technical” or high value-added materials (highly resistant to heat, cold and abrasion, durable, recyclable, biobased, etc.), which are essential in many daily applications in order to meet the challenges of renewable energies, new technologies, diminishing resources, recyclability, and low-carbon mobility.

## What about Arkema?

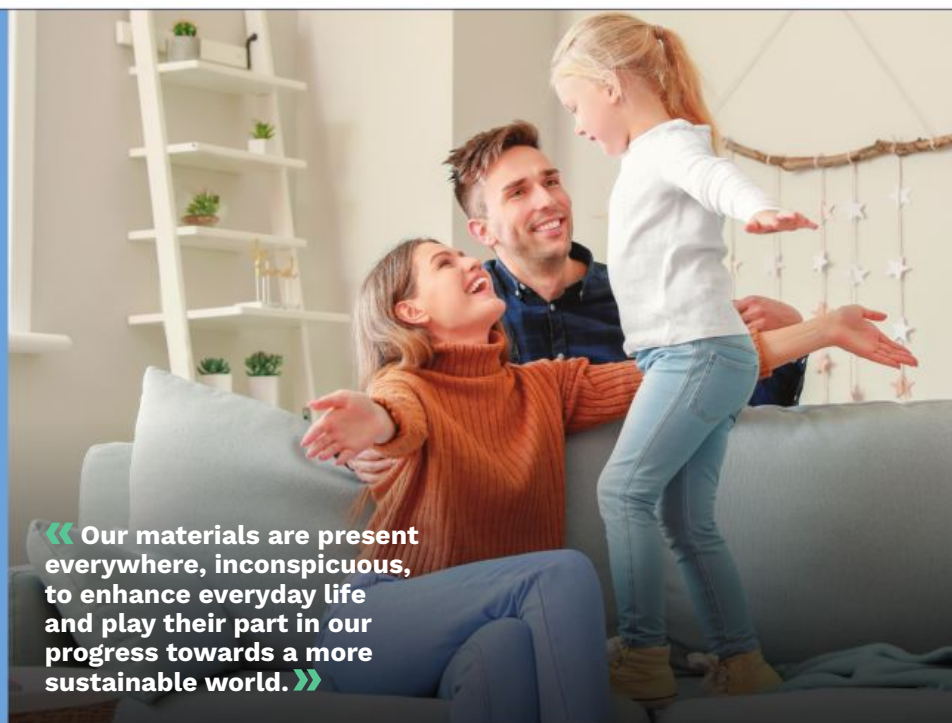
We are a global industrial group that typically produces a wide range of materials for use in all major industrial sectors for the manufacture of finished articles. Our products and solutions cannot therefore be identified by end-consumers..., and yet they are present everywhere, inconspicuous, to enhance everyday life and play their part in our progress towards a more sustainable world. For example, they contribute to the challenge of weight reduction in the aerospace and automotive industries, but also the development of more durable and odorless decorative and

industrial paints, the construction of better insulated and more comfortable housing, the manufacture of more powerful and autonomous electric batteries, the development of wind and solar energy, the design of lightweight and technical sports articles...

So, our materials, our resins for paints and coatings, our adhesives, although indispensable, are essentially unknown, hidden in thousands of finished products. But they deserve a closer look: with this booklet, *Arkema Inside*, take the opportunity to dive into the heart of our materials that are all around you!

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## Arkema at a glance



International group and  
**No. 1** French chemical company



Nearly **€12 billion**  
in turnover



**21,100** employees



**148** industrial sites  
in **55** countries



**2.3%** of turnover  
devoted to R&D



**1,600** researchers  
in **15** research centers



Over **60** R&D partnerships  
around the world



## Arkema – a company that is recruiting!

Every year, the Arkema group recruits nearly 2,000 employees worldwide, including 400 in France, in fields that include R&D, manufacturing, analysis, maintenance, regulations, marketing, sales, finance, etc. With more than 200 job categories, Arkema offers a wide variety of career paths accessible through all levels of education, such as on-the-job training, academic or technical high school, university, engineering school, or co-op programs. Everything's possible!

# Innovation addressing the challenges of sustainable development

In a world grappling with countless economic, environmental and social challenges, Arkema aims to provide its customers with sustainable and innovative solutions that contribute to the United Nations Sustainable Development Goals (SDGs), and to rank among the best in the industry. To achieve this, Arkema has long been committed to a responsible approach, and develops

innovative and environmentally sound materials. Our materials provide very concrete answers to our planet's major challenges: global warming, inadequate access to drinking water, and growing demand for energy. We invent and develop solutions and materials that are lightweight, sturdier, or simply more energy-efficient during production.

## With two guiding principles:

- giving priority to eco-technologies and the use of renewable vegetable raw materials such as castor oil (a non-edible plant with low water consumption) or recycled materials, and
- making every effort to improve the lifespan and recyclability of our products, and of the applications that use them.

## Arkema directs its efforts on five innovation strands to address the following issues:

-  Managing natural resources.
-  Supporting the development of new energy sources.
-  Reducing the weight of materials used for transportation systems.
-  Developing new materials for electronic products.
-  Developing materials to improve home insulation and efficiency.





## Arkema, a responsible corporate citizen

**Arkema's commitment to sustainable development has three major objectives:**

1. Constantly reduce the impact of our activities on the environment and conserve natural resources.

**In concrete terms, Arkema plans to reduce its greenhouse gas emissions by 46% by 2030 compared to 2019.**

2. Develop innovative products from bio-based raw materials, optimize their manufacture and use throughout their lifecycle, improve the circular economy, and create recycling streams.

**In concrete terms, by 2030, Arkema plans to achieve 65% of its sales from «Impact +» solutions, in other words solutions that contribute to the SDGs and present no health or environmental risks.**

3. Integrate Arkema's operations and plants more fully into local life by focusing on information and consultation with the world of education and local residents through a community-based communication approach.

**In concrete terms, every year Arkema conducts some 1,000 educational or sponsorship initiatives at our facilities around the world involving local residents and the world of education.**



# An eco-sustainable home

The housing sector consumes 43% of energy worldwide, so it represents a major source of energy savings. Our materials are used in a wide range of equipment that help reduce energy consumption and heat loss in buildings.



## Power cables of rock-solid strength

Electric cable manufacturers are faced with highly stringent global standards in terms of fire resistance, moisture resistance, and mechanical strength. Our Luperox<sup>®</sup> organic peroxides, a range of hardening agents for resins used to manufacture these cables, provide an answer to the requirements of these standards. Another flagship product, our Rilsan<sup>®</sup> polyamide, 100% biobased as it is derived from the castor plant, is one of the few materials that can withstand high-humidity environments and the plague of termites; it is widely used by the underground cable industry.



## “Smart” glazing

Our Siliporite<sup>®</sup> molecular sieves are tiny beads that adsorb about 1/3 of their mass in water. Window manufacturers use them in double-pane windows to prevent condensation and preserve the window’s qualities for decades. Another product, particularly valuable in cold countries, is Certincoat<sup>®</sup> low-emissivity coating, which makes windows more efficient by letting in sunlight and preventing heat loss. The result is a 30% savings in heating.



### More solid PVC profiles

PVC is an excellent thermal and acoustic insulator for windows and shutters. Our Durastrength® impact modifier additives improve the impact resistance of PVC window profiles, while maintaining perfect UV resistance and helping extend their life. Our Plastistrength® processing aids are essential for facilitating the extrusion of profiles during manufacture by improving PVC viscosity.

### Gas for reversible air conditioning

There is a growing residential market for reversible air conditioning systems based on heat pumps. Easy to use, these systems generate only a third or a quarter of the CO<sub>2</sub> produced by fossil fuel boilers and maintain an optimum temperature throughout the year, heating in the winter and cooling in the summer. Our Forane® 410A fluid, a refrigerant, is recognized as one of the most efficient for reversible air-conditioning.



### Concrete that uses less water

New challenges for the construction industry include building cast concrete pillars and walls, producing higher performance concrete at lower cost, and optimizing processes to consume fewer raw materials and less energy. Our additives Ethacryl™ (for conventional concrete) and Rhealis™ (for dry concrete) are superplasticizers that, when added to concrete, require less water and dry more quickly.



### Long-lasting putty

Our putty from Bostik (an Arkema subsidiary specializing in adhesives) is used to stabilize and isolate window frames in homes. It is formulated from simple molecules, Arkema's acrylic monomers, which allow the putty to adhere to surfaces better and retain its elasticity over a long time.

### White paint: an alternative to air conditioning

From primer to base coat to top coat, Arkema offers a complementary range of products tailored to cool roof constraints, saving up to 30% in air conditioning costs. Our Encor® Flex elastomeric emulsions can be used to formulate high performance cool roof coatings that provide waterproofing, long-term reflectivity and durability that help with energy savings in new and existing buildings. Kynar Aquatec® PVDF emulsion has been specially designed for long-lasting reflective



paints. Resistant to UVs and to fouling, this Kynar Aquatec® latex-based topcoat offers a solar reflectivity throughout the life of the coating, far superior to traditional paints.

# In the kitchen

Detecting a gas leak from the stove, preserving food thanks to more airtight and perfectly sanitized, but also recyclable, packaging, drinking high quality water from the tap, cleaning our kitchens with effective and biobased products... All this is possible thanks to our solutions.



## Fluids that make things cold

Forane® refrigerants are found everywhere cooling mechanisms are needed: in domestic appliances – such as refrigerators and freezers – and in industrial refrigeration, as well as in shops, supermarkets and refrigerated transport. These fluids are also used for air conditioning in buildings and vehicles.

## Biobased and biodegradable surfactants, for effective and sustainable detergents

Up to 100% plant-derived, GMO-free and not competing with food production, Sensio™ surfactants are derived from the sustainable castor seed cultivation chain, in which Arkema is a major player. These surfactants enable manufacturers of cleaning and detergent products (hard surface cleaning, laundry detergents, dishwashing products) to produce concentrated formulas that are more effective than standard cleaning products, i.e. with greater cleaning, degreasing and lathering power. For a sparkly clean kitchen!



## Perfectly filtered drinking water

Arkema has developed a new, highly durable Kynar® fluoropolymer to produce ultrafiltration fibers for the production of drinking water. This material is particularly effective at retaining most viruses and bacteria. In water treatment plants, Kynar® PVDF filtration modules increase treated water volumes by 20%, and double the life of the filtration module, with constant energy consumption.





### Adhesives for food trays

Bostik's Reseal M-resins® repositionable adhesives are used for resealable lidding so that cheese and deli packs may be opened and resealed dozens of times. For a longer shelf life of food as well as less waste.



### Hotmelt adhesives for recyclable cardboard packaging

Bostik's Kizen® adhesive technology is designed to facilitate the recycling or composting of cardboard packaging. With its high adhesion performance, the amount of Kizen® adhesive used on packaging can be reduced by 50% compared to other traditional hotmelt adhesives.

### Food cartons and bottles that are perfectly sanitized

Before assembly, cardboard panels for soup, fruit juice and milk cartons are sterilized in a Valsterane® hydrogen peroxide bath. PET\* plastic bottles with screw caps are enjoying increasing success on supermarket shelves. They are made aseptic through a spraying process using fine spray nozzles for which Arkema has developed an ultra-pure grade of Valsterane® hydrogen peroxide.



\* PET: polyethylene terephthalate

### Transparent plastic for food processors

Rilsan® Clear, a bio-sourced transparent polyamide already well known in optics and electronics, is also used in kitchen appliances and food processors.



The polyamide is free of Bisphenol A, more transparent than glass, lighter and more flexible than polycarbonate, and resistant to heat and cleaning products. It is used in coffee machines, food mixers and steam cookers.

### A gas that's safer because of its odor

Gas doesn't naturally have any odor, but thanks to our Spotleak® odorizing agent – which is derived from sulfur chemistry and added by gas companies – gas can be transported safely. This very particular odor makes it possible to immediately detect any leaks and so keep people safe. The odor disappears as the gas burns.



### Longer-lasting returnable bottles

Certincoat® and Tegoglas® are two solutions for glass surface treatment that are applied during bottle making, guaranteeing stronger glass and preventing scratches. Applying the Kercoat® protective coating on bottles delays scuffing and white streaks on the glass, while the Opticoat® coating masks them when they do appear. This way, the lifespan of returnable bottles can be extended up to 50 cycles!

For returnable bottles, as well as bottles earmarked for the glass recycling stream, Bostik designs labelling adhesives that can be very easily removed with water without leaving a trace on the glass.



# In the bathroom

Whether for bathroom sealing or in products stored in our cupboards and closets such as diapers, medicines, beauty products and makeup, our products are lurking all around us!



## A scented shower

For an invigorating shower, nothing is better than a soap based on Oleris®, a castor oil derivative that is essential for enhancing scents, aromas and fragrances. In shower gels and shampoos, our Rheostyl™ additives enable the rheology of the formulations to be adjusted, i.e. homogeneity, viscosity and flow properties.

## Curly or straight hair?

Arkema's thioglycolic acid is an active component of cold perms and hair straighteners. It's also used in depilatories, and in many other applications in the pharmaceutical and agrochemical industries.



## Baby stays dry

The ZeroCreep Avancé™ adhesive from the Arkema subsidiary Bostik is used for fasteners and elastics in disposable diapers. It provides maximum elongation of the elastic and perfect adhesion to follow movement, thereby avoiding leakage. Just 2 to 3 g of this adhesive bond the twenty or so components in a diaper. Other effective products for diapers are superabsorbent polymers (SAPs) made from Arkema's acrylic acid. Less than 10 g of this superabsorbent polymer gel is enough to absorb up to 100 times its mass in liquid!

## There is no medication without synthesis intermediates



Medications in the medicine cabinet are used by the whole family. Some active ingredients are manufactured using a synthesis intermediate made from hydrazine hydrate and amines produced by Arkema.

## Soft creams and powders

Liquid and compact foundations, pressed and loose powders, lipsticks, eyeshadows, moisturizers and sunscreens – all these skincare and makeup products contain

Orgasol® fine powders, texturizing agents that impart a soft, smooth consistency and improve the gliding, fluid effect on the skin. For natural-looking makeup with consistent coverage and no shine.



## A perfectly sealed bathroom thanks to Bostik

Ideal for wet rooms, Bostik's showerproof tile adhesives bond all types of tiles to all types of surfaces: mortar, concrete, cement, plaster or wood panels. Their formula ensures instant stability onto the wall (no slipping) and high resistance to water. Bostik's high

performance sanitary silicone sealant is used to seal around bathtubs, shower trays, basins, toilets, or as joints between furniture and floors or walls... A long-lasting waterproof sealant thanks to its anti-mould treatment.



## Flawless nails

Our Synolac® and Synocryl® resins are the main texturing components of this nail polish. Long-lasting shine guaranteed!



## Mascara and perfume bottles: with 3D-printing, life is more beautiful



This is one of the great successes of our Rilsan® polyamide 11 in the world of cosmetics: mascara brushes from a famous cosmetics brand are 3D-printed with our Rilsan® polyamide 11 powder.

Produced in their millions, these brushes stand out by their unique shape, and feature microcavities for unparalleled comfort and speed of application.

More broadly, 3D-printing with Rilsan® powders is proving increasingly popular in a variety of applications, notably in cosmetics packaging, for perfume bottle caps: in a sector that sees a constant stream of new bottle designs, 3D-manufacturing is an asset for unleashing creativity, but also a key driver for minimizing time-to-market.

## For clean, healthy skin

Acne is not inevitable! The Luperox® A75FP additive is an active ingredient in the composition of certain acne treatments. Thanks to the benzoyl peroxide from which it is derived, it easily penetrates into the



follicles and prevents pores in the skin from becoming clogged. It acts as an oxidant and antiseptic, reducing the number of blackheads. Its powder consistency means it can be formulated for gels, creams and make-up removers.

# In the lounge

For a cozier interior with a refined decor that invites you to relax with a book, in high-tech or trendy products... Inconspicuous, our materials enhance our living environment by making it more comfortable and pleasant to live in.



## Oh, my beautiful bag!

Encor® resins are used in paints, but they are also essential to unify and enhance the appearance of the leather of this handbag. With the Encor® solution, the grain of the leather is more supple and does not peel off. This bag's metal buckle contains another discreet product from Arkema's chemicals range: the Foranext® fluorinated compound, which is used in precision

metallurgy as a degreasing agent for metals (steel, stainless steel, bronze, copper and aluminum).

With this product, the metal can be cleaned, rinsed and dried to eliminate any impurities.



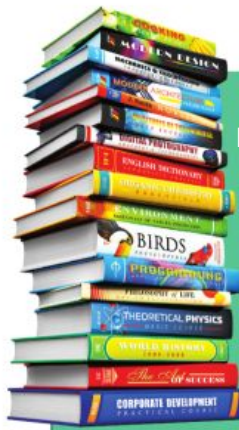
## A beautiful, silent wood floor

What's more pleasing than a wood floor that's always matt or shiny, with no scratches? The secret is to install parquet flooring that has already been varnished with Sartomer® UV-cured resins, providing protection and excellence of finish that withstand scratches and stains over a long time. When it comes to installation, the Bostik Axios™ Tri-Linking™ solution is much more than just a glue. The membrane that it forms when dry prevents the wood from splitting, acts as a barrier to ground moisture and dampens noise to 38 decibels. All of which for greater comfort, and soothing to our ears.



## Bright TV screens and smartphones

Sartomer® acrylate resins are used to produce clear adhesives for TV screens and touch screens for smartphones and tablets, thereby contributing to optimum image reproduction. They impart key characteristics to adhesives: durability, transparency, prevention of yellowing. These same resins are also used to formulate protective coatings for smartphone and tablet casings, ensuring high scratch resistance and a unique matt or gloss finish.



## High-quality paper

Without Arkema's chemistry, the pages of these books wouldn't be white, and the pages of magazines wouldn't be glossy. Albione® hydrogen peroxide and Alpure® sodium chlorate, two essential products for pulp bleaching, achieve stable, exceptional whiteness without damaging the fibers. To improve the paper's "coating" (i.e. its surface aspect), Arkema deploys its unique expertise to control the viscosity of coatings applied to the paper's surface. Its Rheocoat™ and Rheocarb™ additives provide printability and give the surface a smooth matt or glossy finish.

## A coating that warms up walls

Bostik has developed the first thermal insulation leveling coating for interior wall preparation that reduces heat loss by 15%. It contains glass microbeads that capture heat while offering the same quality of preparation before painting as conventional coatings. It's an ideal coating to improve the thermal insulation of walls in old and new buildings.



## A floor that's always clean

Bleach (the generic name for sodium hypochlorite) is the ideal product to disinfect everything in the kitchen and the bathroom, as well as the living room's parquet and floor tiles. Highly pure, Arkema's Bactivel® bleach is also used in industrial detergent applications (especially in the food industry) and in the production of drinking water.

## Solvent-free paint that is 97% biobased too

Beautiful decoration is based on choosing quality paint. The Synaqua® resin enables the formulation of what are called "solvent-free" water-based paints that are as effective in terms of gloss, covering power and toughness, as traditional solvent-based paints. Made from 97% biobased raw materials predominately from Nordic foresting byproducts, this resin makes it possible to manufacture paints with very low volatile organic compound (VOC) levels. Meanwhile, Coapur™ thickening additives provide paint with optimal texture and viscosity, for uniform coverage that does not run.



# In the heart of the city

Our solutions contribute to a greener and more sustainable urban environment, and to lower-emission transportation and less polluting factories.



## Skyscrapers and buildings stay beautiful for at least 40 years!

Finishing coatings based on our Kynar 500® fluorinated resin provide durable protection for metal panels and profiles for the façades and roofs of buildings and structures. This is the case for the Grande Arche de la Défense, the Louvre Pyramid and the Stade de France soccer stadium. Thanks to the toughness and sturdiness of Kynar 500® resins, metal façades and roofs are better protected against pollution, UV rays and weathering. Architects from the world's leading firms appreciate these high-end finishes that guarantee color retention for at least 40 years.



## Industrial water without sulfur residues

The effluents from refining, petrochemical and agribusiness plants contain sulfur compounds which, because they accumulate in wastewater treatment plants, cause odor pollution. Arkema has developed a process based on Albione® hydrogen peroxide, which eliminates these residues, without generating sewage sludge or toxic byproducts. Hydrogen peroxide byproducts are super-clean reagents: water and oxygen!





### Highly durable concrete reinforcement

For civil engineering structures, our Elium® thermoplastic resin makes it possible to manufacture ultra-strong and durable glass-fiber composite concrete reinforcement to replace traditional concrete reinforcement in steel, which is liable to corrosion. For bridges or coastal buildings where steel structures are highly exposed and weakened by corrosion, this solution proves invaluable in terms of safety, durability, and also cost: a bridge reinforced with these composite materials can be in service for 100 years without incurring maintenance costs.

### Sustainable water pipes

As an alternative to stainless steel, the Rilsan® high performance polyamide fine powder coating is used to protect steel water pipes, pumps and valves from abrasion and corrosion. The coating is produced from renewable resources, and its manufacture requires less energy and emits less CO<sub>2</sub> than metallic coatings. Its very long durability results in lower maintenance costs for the pipes.



### “Greener” roads

Recycling products from road stripping helps reduce the amount of new aggregates needed to build or renovate roads. Adding our Cecabase RT® additive to the bitumen helps increase the proportion of recycled aggregate – up to 70% – by making it easier to blend into the bitumen. This additive also lowers the heating temperature needed for laying the bitumen, thus reducing energy consumption by up to 50%.



### Sulfur-free gasoline



Arkema is a world-leading producer of thiochemicals, or sulfur-based products, used to remove sulfur from fuels. Naturally present in oil, sulfur is the source of acid rain, which is harmful to the environment. Its content in fuel is therefore highly regulated. Arkema, the world's leading producer of thiochemicals, manufactures a derivative, DMDS\* Evolution® E2, which it supplies to refineries worldwide. This product is essential for activating the catalysts used for hydrodesulfurization, the first step in refining which consists in removing sulfur from the fuel. A team of Arkema specialists – our Careflex® service – travels to refineries around the world to handle DMDS implementation for our customers.

\*DMDS: dimethyl disulfide

# Take a ride in a car!

Plastics that are stronger and lighter than metal for more fuel-efficient cars, adhesives for more sustainable but also recyclable transportation, sulfur-free fuels and electric or hydrogen-powered vehicles that are just as efficient as combustion-powered vehicles. Our materials are helping meet the challenges of clean mobility.



## A light, recyclable car

Thermoset composites are widely used in the aeronautics, automotive and wind power sectors: as they are light and have excellent mechanical properties, they meet the challenge of weight reduction, but are hard to recycle. The end of life of materials is becoming a major challenge for society, so Arkema developed the Elium® solution, the only liquid thermoplastic resin used like a conventional thermoset resin to manufacture fully recyclable composite parts. Used for car interiors, hoods and even wind turbine blades, this new resin will revolutionize the composites industry!

## Elium® composite tanks: industrial gains and recyclability



For high-pressure storage (700 bars) of on-board hydrogen, current tanks are made of a thermoset (epoxy)

resin composite that has to be cured several hours after winding. Our Elium® liquid thermoplastic resin, combined with carbon fibers, provides the same sturdy properties with much greater industrial efficiency: its UV polymerization takes place as it is wound, offering significant time and energy savings. This technology, which could have its first applications on the market as early as 2023, also offers excellent possibilities for recycling the tank's composite material at end of life, whereas thermoset resins remain very difficult to recycle.



## High temperature resistant fuel lines

The development of renewable fuels and changing environmental regulations are generating additional technical constraints and posing new challenges for materials used in fuel systems. Rilperm® multilayer fuel lines combine several polymers, one of which is entirely of plant origin. These fuel lines meet the requirements for using biofuels at higher temperatures.



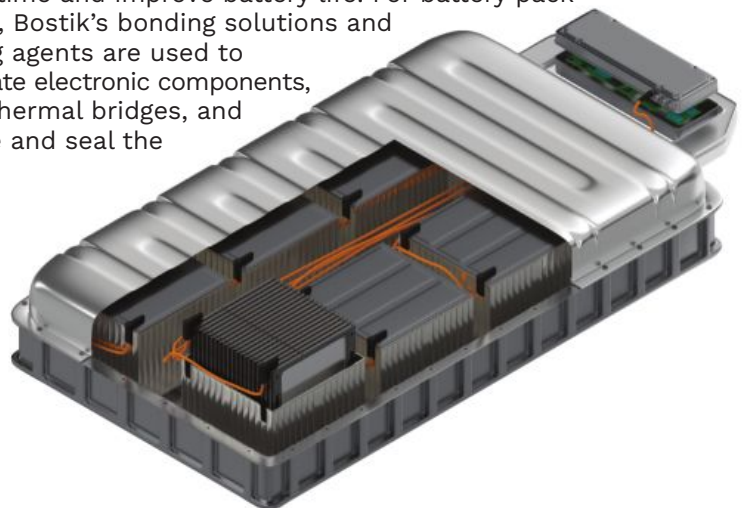
## Car interiors with an impeccable finish

Car textiles are fixed in place by our special Platamid® adhesives, which can bond materials of different types and shapes: silk, wool, cotton, cellulose, synthetic fibers, leather, plastic foams, paper, wood, metal, etc. These thermofusible or “hotmelt” adhesives enable bonding between different mediums. These solvent-free adhesives have various industrial applications, including upholstery for automotive interiors, furniture (such as sofas and armchairs) and garment manufacture.



## Our solutions at the heart of every cell and in the battery pack

Our Kynar® PVDF, a fluoropolymer with very high electrochemical stability, serves an essential function as a binder in the formulation of electrodes, by promoting the adhesion of active particles onto these current collectors, which are the source of electricity generation. Thanks to its resistance to high voltage and to the solvents in the electrolyte (the liquid through which the current flows), it is also used as a protective agent for the separator film, thereby improving the lifespan of the hundreds of cells that make up the battery. Another key driver for battery performance is our Foranext® ultra-pure electrolyte salts, which are very stable at high voltage, helping reduce charging time and improve battery life. For battery pack assembly, Bostik’s bonding solutions and insulating agents are used to encapsulate electronic components, prevent thermal bridges, and assemble and seal the battery.



## High temperature plastic engine parts

A high-performance polyamide, Rilsan® HT (high temperature) is one-sixth the weight of steel and withstands high temperatures of up to 220°C. Thanks to its exceptional characteristics, it replaces steel or aluminum in the manufacture of complex engine parts; it helps reduce the weight and therefore fuel consumption. This is a “green” plastic, as it is 70% made of castor oil.

# Time for a vacation

Landscapes featuring fields of crops, wind turbines or solar panels, pleasure boats, lighter planes for flying across the world – at first, these sights would appear to have nothing in common. But they do! Our materials and solutions are at the heart of all these applications which you come across or use while on holiday.



## Boat building: an adhesive accommodating the recycling of composites



This pleasure boat has structural parts and a hull made from a fiberglass and Elium® resin composite. Thanks to Elium®'s thermoplastic nature (the resin can be heated and recovered), these parts are fully recyclable at end of life, and can be

reintroduced in the manufacturing process of new boats. Bostik has developed a methyl methacrylate structural adhesive grade for boat component assembly that is compatible with the Elium® resin recycling process. Not only does this adhesive facilitate the recycling of composite parts, but 70% of the adhesive's raw materials are also fully recyclable.



## Lighter airplanes that consume less fuel

The Kepstan® PEKK (polyether ketone ketone) polymer has unusual characteristics that are adapted to the extreme constraints of an aircraft engine environment. It has excellent resistance to chemical irritants, abrasion and very high temperatures, with continuous resistance above 200°C. It is widely used to replace metal parts that are twice as heavy. Reinforced with carbon fiber, it can be used to obtain lightweight, rigid composites that replace steel and aluminum in structural and fuselage parts, with a significant weight reduction.



### Protecting fruit and vegetable crops

For fumigating soils prior to planting vegetable and horticultural crops, the Paladin® fumigant has proven to be effective against soil pests and weeds. It is based on a sulfur derivative, a substance naturally present in the environment, so it breaks down very quickly in the atmosphere.

### DMDS gives wings to green fuels

To reduce the carbon footprint of air transport, the use of biofuels derived from biomass is now booming. Their production involves new refining processes in which DMDS, an additive derived from the chemistry of sulfur, in which Arkema is the world leader, plays a key role.



### Ultra high performance adhesives for composites

Bostik's Skin to Core™ laminating adhesives ensure bonding between the different layers of composite panels in an aircraft cabin. Applied in a thin layer (14 to 72 g/m<sup>2</sup>), their ease of use enables manufacturers to save on materials and reduce waste.



### Well-protected blades

Sartomer® specialty acrylates are used by manufacturers of wind turbine blades for protective coatings. Easy to use, these high performance reactive diluents are more environmentally friendly as they help reduce VOC (volatile organic compound) emissions of composite and gelcoat systems. The use of UV formulations also allows immediate repair of the blades thanks to instant drying. In the future, it will be possible to make these blades with Elium®, the new thermoplastic resin for recyclable composites.

### High-performance photovoltaic fields for the long term



Photovoltaic panels are developing considerably throughout the world. Their benefits: an inexhaustible source of energy without greenhouse gas emissions. These panels are made of materials that must not be damaged by UV rays. Our Luperox®

organic peroxide is used to harden the transparent resins that encapsulate the silicon cells and protect the electrical circuits. These resins must remain UV stable over time and not “yellow” as they need to protect the cells that capture the sun’s rays and convert them into electricity. Our organic peroxide ensures the stability of this transparency. For the panels’ backsheet, our Kynar® fluoropolymer, applied as a thin white film, protects the panels against high temperatures and abrasive dust, thus extending lifespan. In addition, its white color reflects the UV rays onto the other panels, which helps optimize the yield of solar fields.

# Leisure time

Enjoy your favorite sport using high-performance, comfortable equipment; surf the Internet without worrying about your smartphone's battery life; fix everything at home with a glue that lets you give free rein to your creativity – these are just a few activities where Arkema materials and Bostik glues add real value to your leisure time!



## An effective, good-looking ski helmet

This ski helmet is protected by a varnish based on UV-cured Sartomer® resins. The result: an elegant satin-effect material that stands up to any punishment!

## Shoes “energized” by Pebax®

The Pebax® elastomer has won over the leading sports brands with its unique combination

of strength, lightness and flexibility. It is used to create high-performance, lightweight insoles for sport shoes.

Pebax® soles absorb impacts and release maximum energy, like a spring, where most plastics tend to dissipate it. This remarkable energy return provides excellent propulsion for running. You want proof? Most of the athletics medal winners at the Tokyo Olympic Games wore shoes with soles containing Pebax® material. In its more rigid form, this material is also used to make lightweight ski boot shells that do not become stiff at low temperatures.

It is available in a biosourced version that is equally high performance, and sold under the Pebax® Rnew brand.





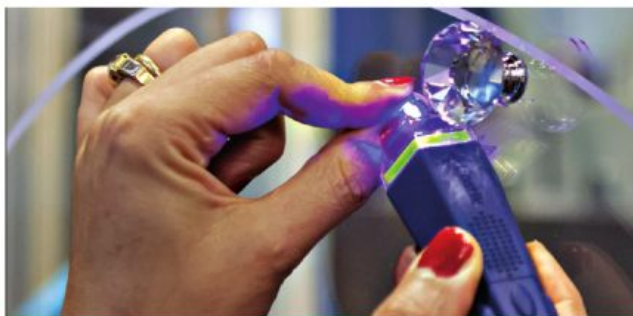
## Lightweight designer glasses and smartphones

Rilsan® Clear is one of the rare polymers to combine chemical and impact resistance, slim components, lightness, softness to the touch, transparency and glossiness. These qualities make it a sought-after material for eyewear manufacturers to develop frames with a creative design. 20% lighter than polycarbonate and 40% lighter than aluminum, this polymer was recently adopted by tablet and smartphone manufacturers to produce particularly lightweight and sleek casings and internal frames. It is also a “green” plastic, as it is derived from the castor oil plant.



## A more powerful, longer-lasting battery

Temperature variations and repeated charging and discharging cycles have a negative impact on lithium-ion batteries. The result on the electrodes is a loss of adhesion of the active particles – the very basis for battery power. This causes a decrease in battery life or even battery failure. To address this problem, smartphone battery manufacturers use the Kynar® fluoropolymer as a binder to make the active particles stick to the aluminum (cathode) and copper (anode) electrodes. Its exceptional adhesion and resilience help improve battery life for smartphones and electric cars.



## The pleasure of fixing everything!

Fix & Flash by Bostik is a new generation of ultra-efficient light-curing glue. Totally innovative and suitable for all types of materials, it dries in a few seconds on contact with LED light rays emitted by a mini-lamp provided in the kit. Gluing back together broken wood, plastic, porcelain and metal objects has never been so quick and easy! In a few seconds, the object will be as good as new, and ultra-strong. Good for everyday repairs, the Fix & Flash glue lets you give free rein to your creativity and opens the door to all sorts of fun activities. It's perfect for today's DIY craze!

## Lightweight, super-resilient sporting goods

Many bicycle frames and hockey sticks made of epoxy resin (a very strong and light plastic resin) contain our Nanostrength® additives. They act at the nanometric level on the molecular structure of the plastic resin, making it stronger and more resistant to impact.



# Arkema Inside quiz

Test your knowledge of the properties of our materials and what they do. If you are not sure, scan the flash code on the back of the brochure to find the answers in our video!



**1.** To prevent heat loss, a transparent Certincoat® coating is applied to interior glazing. It enables savings in heating costs of the order of:

- A:** 10%
- B:** 30%



**2.** White roofs and walls protected by Kynar Aquatec® transparent resin reflect light rays and reduce energy consumption from air conditioning. Thanks to Kynar Aquatec®, the paint's whiteness and reflectivity last longer than:

- A:** 10 years
- B:** 20 years



**3.** Glass bottles whose surfaces are treated with Certincoat® and Tegoglas® coatings are stronger. The lifespan of returnable bottles can therefore be extended by up to:

- A:** 20 cycles
- B:** 50 cycles

**4.** The Kynar® fluorinated polymer is used to make filtration membranes to produce drinking water. These membranes have the ability to filter:

- A:** 99% of bacteria and viruses
- B:** Seawater



**5.** In a diaper, superabsorbent polymers (SAP) – gel polymers made from Arkema's acrylic acid – can absorb:

- A:** 10 times their mass in liquid
- B:** 100 times their mass in liquid

**6.** Which 3D-printed object made from Arkema's polyamides can be found in a bathroom?

- A:** bathtub faucet
- B:** mascara brush



**7.** Bostik, Arkema's subsidiary, has developed an insulating interior coating that reduces heat loss by 15%. It contains:

- A:** Glass microbeads that capture heat
- B:** Tiny particles of straw that form an insulating layer after drying





**8.** Arkema manufactures solvent-free, water-based paints. The resins in these paints are made from what percentage of plant-based raw materials:

- A:** 50%
- B:** 97%



**9.** The Cecabase RT® additive is used to fluidize road bitumen when it is laid. The bitumen is therefore heated to a lower temperature, reducing energy consumption by:

- A:** 10%
- B:** 50%

**10.** The metal panels and profiles of skyscrapers are protected by a Kynar 500® PVDF resin coating. This coating provides protection against corrosion, pollution and UV rays for at least:

- A:** 20 years
- B:** 40 years



**11.** To replace metal, engine parts can be engineered from Rilsan® HT, a polyamide that withstands high temperatures and reduces engine weight. It is:

- A:** Half the weight of steel
- B:** One-sixth the weight of steel



**12.** Which plastic that is highly resistant to heat and impact can replace steel or aluminum in the structural and fuselage parts of planes to reduce weight?

- A:** Kepstan® PEKK
- B:** Levoc® PVC

**13.** What is special about the Elium® resin used to make composite parts, particularly for boat hulls and wind turbine blades?

- A:** It is thermoplastic, so can be reheated and recycled
- B:** It is thermoset, so is very strong



**14.** What raw material is used to produce the Rilsan® Clear material, which is used to make eyeglass frames and cellphone casings?

- A:** Castor oil
- B:** Palm oil

**15.** Which elastomer brand is popular with manufacturers of soccer shoes, running shoes and ski boots?

- A:** Pebax®
- B:** Sportbax®



**16.** Which refining stage consists in removing sulfur from oil, using our DMDS, to produce gasoline that will emit no sulfur?

- A:** Hydrodesulfurization
- B:** Hydrosulfurization

#### Answers:

13. A / 14. A / 15. A / 16. A  
9. B / 10. B / 11. B / 12. A /  
5. B / 6. B / 7. A / 8. B /  
1. B / 2. B / 3. B / 4. A /

# MA

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the “Arkema Inside” video

