Materials that make the world a brighter place

Our materials enrich our daily lives and make the world a brighter place. They contribute to efficiency, safety and sustainability, and have demonstrated their performance in countless projects and collaborations with our partners and customers.

Adhesives

Our broad selection of high-performance polyurethane raw materials for superior adhesives can improve the sustainability of your products and optimize your production processes thanks to faster curing times.

Flame retardancy meets reliable electrical performance

Flame retardancy is widely requested and specified by battery pack designers. Underwriters Laboratories (UL) 94 V-0 rating at nominal thickness

is a commonly used metric. Electrical safety is also satisfied by electrical properties measured in volume resistivity and dielectric strength.

Covestro’s Bayblend® FR series enable packaging solutions with the right flame retardancy and electrical resistance properties. With UL 94 V-0 listings all the way down to 0.75 mm thickness and a surface resistivity of 1016 Ω, this family of materials helps to meet the safety demands from battery manufactures.

Thin-wall flame retardant Bayblend® inspires novel designs

As battery packs are trending towards larger size and higher energy density, components are expected to be thinner, more integrated, and lighter. And the demand for materials able to fulfill these needs is increasing accordingly.

The new Bayblend® FR3080 EV is exhibiting more industrial acceptance. This advanced PC+ABS alloy combines a UL 94 V-0 listing at 0.8 mm in all

colors, high flow, excellent impact resistance and colorability. Compared with Bayblend® FR3010, Bayblend® FR3080 EV offers ~20% higher impact resistance (at 23°C), and thinner UL 94 V-0 certification. These material improvements enable new design possibilities.

Thermal stability supports long pack life

In the automotive industry, customers demand battery systems be guaranteed for no less than ten years. This includes not only the cells, but also packaging components. As a result, designers should choose engineering plastics with a continuous use temperature or RTI (Relative Temperature Index) that matches the temperatures a battery may see during its lifetime. Based on safety tests for lithium-ion battery systems such as thermal cycling, humidity and temperature aging an RTI of 80˚C in all three categories should be considered.

Heat and humidity play a role in evaluating long-term physical durability. Components are often evaluated in severe environments, such as the commonly used 85°C/85% RH aging for 500 to 1,000 hours. Covestro Bayblend® FR4065 EV combines resistance to high temperatures and

humidity. This product enables the integrated design of busbars while withstanding high temperatures (up to 110°C) caused by rapid discharge. Thermal stability over a wide temperature range helps meet the demands of long-term durability and part-to-part consistency from battery manufactures, OEMs and consumers.

Polycarbonate solutions support the electrification trend in mobility

The automotive industry is facing significant disruption as the shift towards electrification opens up new options for plastics in Li-ion batteries and electric powertrains. The boundaries between the electrical industry and automotive will move and therefore cause a paradigm shift. Electric powertrains come with new challenges and polycarbonates could be an unexpected solution to help OEMs stay ahead of the curve in a changing automotive industry.

Fast-charging batteries form the lifeblood of electric vehicles and many of our everyday devices. A quick charge or discharge makes battery temperatures rise steeply, which can compromise battery life, safety and efficiency . With Makrolon® and Bayblend® polycarbonates we can provide versatile battery packaging solutions to help safely manage these thermal conditions.

From electric vehicles (EVs) and buses to e-bikes and even planes, energy storage systems (ESS) will play a vital role in future mobility. As the share of renewable electricity generation grows, so does the need to compensate for its intermittent nature using battery storage.

The high-speed charging and discharging that we demand, particularly in cars, triggers a chemical reaction in batteries that can push their temperature to dangerous levels. Battery cooling systems are designed to maintain maximum operating temperatures of 40°C or less, and they should never exceed 60° C for an extended period. At 150° C and above, cell breakdown in batteries can turn into a self-feeding cycle called thermal runaway, putting the car’s occupants at serious risk. This makes battery thermal management and cooling systems crucial to ensuring high safety standards.

In parallel, in colder climates, batteries also need to be housed warmly enough to keep them working smoothly when outside temperatures plunge far below freezing.

How do batteries stay cool?

Heat generation can be offset by forcibly cooling down the battery, or by slowing down the charging process. A slow recharge is not what customers want on a road trip, so thermal reduction is usually required. Cooling can be done actively using liquid coolants or passively using air, though air cooling is generally not well-suited for fast-charging batteries.

In contrast, liquids such as a water/ ethylene glycol mix or dielectric fluids perform the cooling job well, achieving an even temperature around the entire battery surface. Water-based coolants must be kept separated from electronic components to avoid short-circuiting the battery. In some systems, a dielectric fluid cools the battery cells through direct contact.

What role can phase change materials (PCM) play?

A hybrid approach to battery thermal management is offered by phase change materials (PCM). These are materials designed to absorb heat and energy by melting at a specific temperature that is tuned with the application. This takes up less space than traditional liquid cooling, making it highly interesting for applications such as electric motorcycles.

Which Covestro polycarbonates are suited to which cooling approach?

No matter which battery thermal management systems approach a manufacturer chooses, we offer a range of reliable, safe polycarbonate-based materials for battery packaging. These resins provide excellent dimensional stability and durability over a wide range of temperatures.

For air-cooled systems, we offer Bayblend® FR3040 EV, a blend of flame-retardant polycarbonate and acrylonitrile butadiene styrene (ABS). Used as a cell holder, it allows rapid UV-cure adhesion of cells to achieve consistent cell-to-cell spacing allowing uniform airflow.

Makrolon® TC110 FR is a thermally conductive, electrically resistant, flame retardant material ideally suited for air-cooled systems acting as heat sinks, cell holders and frames.

For liquid-cooling, Bayblend® FR 4065EV is a great solution for battery housing because when tested, it retains more than 90% of its original impact strength after being immersed in water/glycol coolants. This is higher than other competitive polycarbonate blends and in the same range as other thermoplastics such as Polyamide 66.

Where manufacturers choose the phase change materials route for cooling, Makrolon®, Bayblend® and Makroblend® grades' chemical resistance has been tested against commercially available materials where the consistency can change depending on the battery temperature.

How can manufacturers benefit from our battery thermal management systems expertise?

We have been working with Tongji University in Shanghai and Toronto University to develop innovative material solutions for cool and safe battery packaging. Customers benefit from our engineering expertise in battery thermal management systems, our data and simulation tools, and our network of field service representatives. We help manufacturers take full advantage of the properties inherent in our materials.

By working with you to understand your design objectives, and recommending and testing the ideal material mix, we can help bring your energy storage and battery-driven applications to life.

Durability is our most important criterion. EV charging stations need to be able to withstand harsh outdoor conditions for years, in settings that range from deserts with high temperatures, UV intensity and sand exposure, to coastal Arctic locations with subzero temperatures and prolonged saltwater exposure. Retaining key properties such as impact strength, color fastness and surface quality throughout this wide range of extreme conditions is vital.

Aesthetic flexibility is another major consideration. The materials we use should accommodate a variety of colors, shapes and finishes suited to different use cases, ranging from public to private installations of EV charging stations.

Why does EVBox choose Covestro for material solutions in electric car charging stations?

Ten years ago, our founder Bram van de Leur called Covestro with a great idea: his new company EVBox needed to develop a housing for an EV charging station. He had already worked with Covestro in the CD industry, and knew the company could produce plastics that meet durability requirements while also offering color options, transparent parts, and design flexibility. That's how the first steps were taken.

Today, Covestro Makrolon® makes up the majority of materials used for housing parts in EVBox electric car charging stations. With Makrolon® we can combine hardware protection with aesthetics and design flexibility. Covestro's expertise in polymers also shows in their support with our technical feasibility studies on long term durability. This helps minimize our risk during the development stage. We also value the injection molding support that Covestro provides during the A, B and C sample phases we go through in product development.

In recent years, our partnership has intensified as EVBox has scaled up to meet the high volumes and quality standards of the automotive industry. In multiple large-scale and complex industrialization projects, Covestro is a trustworthy partner providing material solutions, testing and validation support. Their dedicated team is reliable and truly understands what we need to achieve to be successful.

Why Makrolon® offer the right material solutions for an EV-ready future

- Weatherproof: Makrolon® housing parts resist moisture, rust, UV, and wide temperature changes.
- Safe and robust: Casings are electrically insulated, tough, impact safe and flame retardant.
- Flexible design: EV charging brands can express their identity with forms, colors and textures.
- Cost-effective: Durable Makrolon® components can be mass-produced easily.
- Reliable partnership: Covestro supports you from material validation through full-scale production.

Coatings, paints and inks – High-performance protection

Our innovative and more sustainable solutions help coatings manufacturers advance their formulations. We develop, manufacture and market a high-quality range of

raw materials for coating formulations. Discover our products!

Composites

Explore our selection of high-performance composites with superior properties such as flexible tapes or sheets that look and sound like metal. Our versatile solutions are cost-effective and ready to scale.

Elastomers

We provide a wide range of high-performance raw materials for superior cast polyurethane elastomers – along with professional, customized support based on our innovative material systems and proven machine technologies.

Films

Explore our broad range of high-performance polycarbonate films, polycarbonate blend films and TPU films – with properties tailored to meet your specific needs.

Foams

Our extensive range of high-performance polyurethane raw materials offer solutions for flexible, rigid and integral skin foams – with properties tailored to meet your specific needs.

Makrolon® TC thermal conductive plastics: next-generation heat management

Heat-reducing materials for electronic devices act as an enabler for the digital revolution. Our Makrolon® TC thermally conductive plastics combine heat management with the properties next-generation materials demand: functional integration, reduced weight, and reduced RF interference for wireless connectivity.

Materials with thermal conductivity will enable the electronic devices of tomorrow to operate smoothly. Already, 5G network infrastructure, Wi-Fi routers, electric vehicle batteries and LED lighting require more than just heat management. Thermally conductive materials should provide interference-free wireless connectivity, longer battery life, impact safety and less weight.

Lightweight Makrolon® TC thermally conductive plastics are easy to process and give design flexibility to product engineers. Polymer grades for injection molding, extrusion, 2K molding and 3D printing can be tailored for electrical conductivity or insulation. We support customers in material selection, using computer-aided simulations to achieve the best performance and heat management for your application.

Our team of experts continuously work on improving our tools and applications, so we did with the Heatsink Screener Tool using Makrolon® TC. Are you interested in comparing polycarbonate Makrolon® TC with aluminum for heatsinks in a quick, easy and precise way?
The Heatsink Screener is a web-based tool to quickly compare (screen) Makrolon® TC versus cast aluminum for heatsinks. It also highlights the weight savings potential of Makrolon® TC over aluminum, while maintaining similar heat management performance.

From security cameras and logistical trackers to video projectors, the internet of things (IoT) relies on a steady 5G signal and uninterrupted in-house Wi-Fi. Makrolon® TC products combine good thermal conductivity with stable radio frequency (RF) transmission. Since they are not made of metal, they avoid signal shielding, making it easier to integrate an antenna into any router, wireless device or household appliance. Housings made of Makrolon® TC seal and protect valuable electronics from dust and moisture. Makrolon® TC provide strong flame-retardant properties to ensure a safe and reliable operation.

Battery applications: thermal conductivity meets impact resistance

High temperature reduces a battery’s power output and extends its charging time. Cell holders for lithium-ion batteries designed with electrical insulating Makrolon® TC dissipate heat effectively, enhancing the device performance and extending its useful lifetime. In addition, Makrolon® TC110 and TC110 FR grades pass the impact tests required for many battery-powered portable devices.

LED heat sinks: lighter than aluminum and more flexible in design

Today, energy-efficient LEDs are the norm when it comes to lighting

applications. However, the design and shape of industrial luminaires still do not enable players to fully exploit the potential of LED technology. Makrolon® TC polycarbonate performs effectively as a LED heat sink, yet is lighter and offers far more design opportunities than aluminum. Injection molding reduces complexity and assembly cost, and enables designers to create non-traditional shapes, use in-mold processes and optimize joining techniques.

Mobility: A proven solution to reduce weight and complexity

Makrolon® TC polycarbonate in automotive applications opens the door to

new possibilities, such as more flexible heat sink designs, integrated electronics, and the use of housings for thermal management.

Decreasing component weight is an effective way to boost vehicle fuel efficiency and performance. Makrolon® TC is a proven solution in the automotive industry to do just that. It reduces the weight and complexity of components compared to ones made of die-cast aluminum, while keeping the thermal management performance stable. Using computer-aided simulation to redesign components can even lead to an outperformance of die-cast aluminum in terms of thermal management. For Electric vehicle (EV) batteries thermally conductive polycarbonates allow the design of innovative cooling cell holders. Also for various other E-Mobility applications Makrolon® TC offers even more benefits beside efficient thermal management. As an example, the good dimensional stability of parts made with Makrolon® TC may enable automation in battery assembly for electric vehicles, thus reducing costs in EV manufacturing.

3D printing: design freedom, resource efficiency and thermal management for personalized and small series production.

Depending on the selected grade, Makrolon® TC polycarbonates can be processed by injection molding, extrusion and even 3D printing; a resource efficient technology that enables personalized and small series production. Our application development team can help you design complex structures while using computer-aided component simulations to improve your heat management performance.

Sustainability: mono-material polycarbonate solution for simpler recycling and less energy consumption

Thermally conductive polycarbonates can be recycled together with conventional polycarbonate grades, which simplifies material management and reduces the complexity of sorting and storage during recycling. Compared to standard aluminum heat sinks, Makrolon® TC polycarbonate compounds consume 60% fewer resources during production and require 75% less energy to recycle.

Rethinking LED heat sinks with thermally conductive Makrolon® TC

LEDs consume way less energy than conventional lighting and emit less heat too. This opens up new opportunities for designers in terms of materials they can use as heat sinks for replacement lamps or next-generation luminaires. We developed Makrolon® TC as the optimal LED heat sink.

The LED market is growing rapidly as consumers switch from incandescent bulbs to more energy-efficient LEDs. We set ourselves the objective of anticipating lighting designers' and manufacturers' needs by ensuring that we have the ideal heat sink materials readily available for LED lighting development and production.

Challenge

Offer a heat sink to increase LED performance and lifespan

When a LED reaches a high temperature, its color attributes change, the lumen output decreases and its lifetime shortens. This makes an effective and durable heat sink critical to the performance of a LED. We set ourselves the goal of providing a superior solution to aluminum, which is heavier than the materials we have at our disposal.

Solution

Offer all the advantages of aluminum with added benefits

Collaboration with lighting industry partners led to the development of Makrolon® TC, a thermally conductive polycarbonate especially for LED heat sinks. The material has sufficient thermal performance with the added benefits of being lighter and more durable than aluminium. It also reduces production costs by eliminating assembly steps. Because the material is injection molded, it also gives designers the freedom to create non-traditional shapes, use in-mold processes and optimize joining techniques.

Why Makrolon® TC was the right solution for LED heat sinks

Flame retardant: Has an Underwriters Laboratories 94 flame class rating of V-0.
Thermally conductive: Material acts as a channel for heat to pass through.
Ultra-durable: The material is corrosion, abrasion and heat resistant.

Light weight: Helps to reduce the overall weight of the LED lamp.
Design freedom: Allows shapes and features not possible with aluminum.

Bayfol HX used to create Sony 360° display concept for floating holographic augmented reality images

The R&D Team of Sony Corporation in Tokyo is looking into new concept displays to contribute to Sony's strong innovation pipeline and create the next-gen image experience for consumers. One of the ideas they wanted to realize was a new display that can project floating images within a 360-degree direction while at the same time being transparent. Sony chose Covestro's photopolymer film Bayfol® HX to overcome challenges on the trade-off between image brightness and transparency in order to realize a breakthrough augmented reality (AR) display device.