

A close-up photograph of a car's headlight, illuminated with a vibrant purple light. The headlight is rectangular with a complex, multi-faceted design. The background is dark, making the purple glow stand out. The car's body panels are visible, showing a metallic finish.

**Interpon® RESICOAT®**

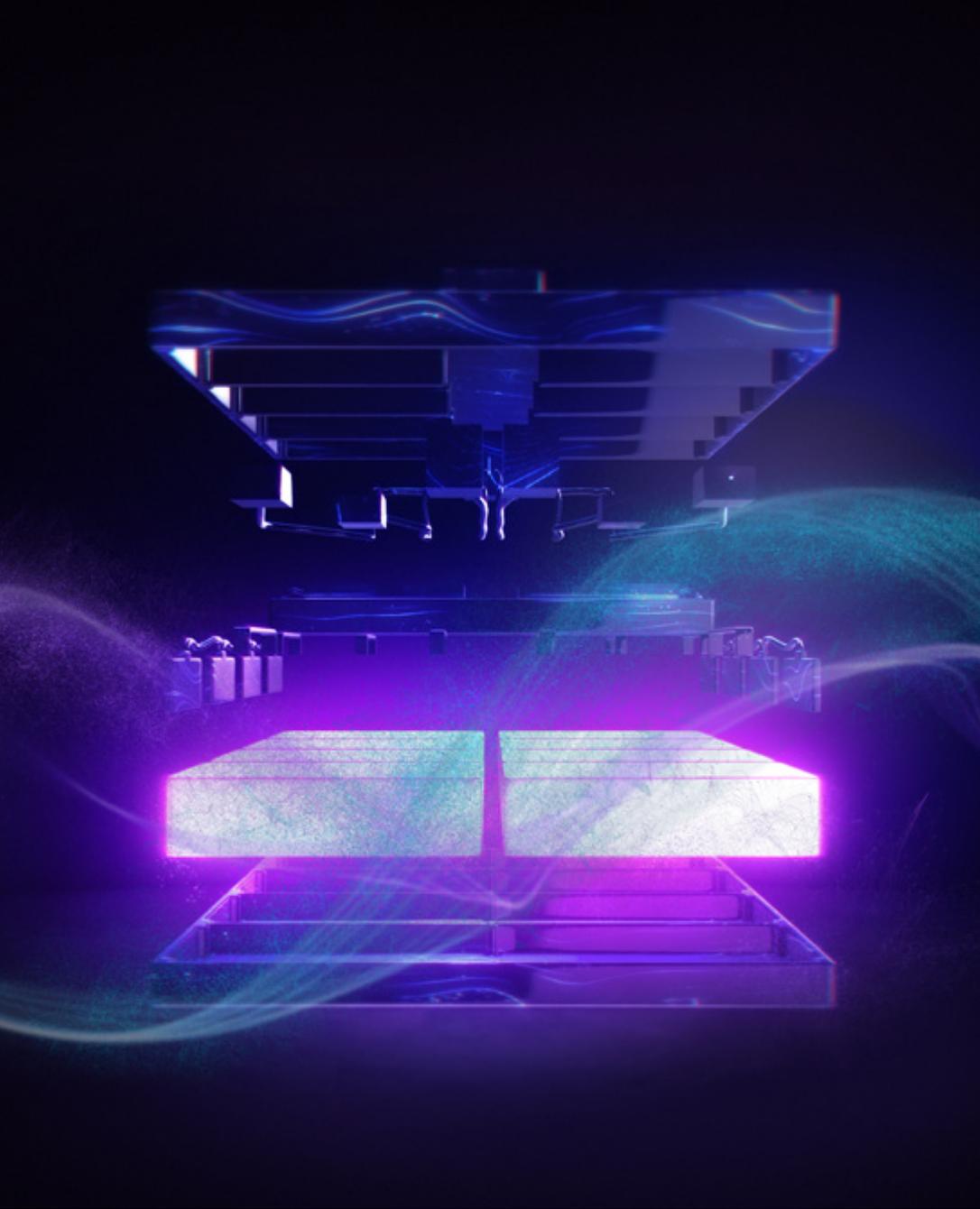
**White paper:**

The critical importance  
of powder coatings in  
driving an electric future

 **Automotive**

We're driving the current  
**to power your future**

**AkzoNobel**



# The critical importance of powder coatings in driving an electric future

The future is electric, and the rise of the modern electric vehicle appears unstoppable. Global CO<sub>2</sub> emission targets and changing consumer behaviours are driving change. Manufacturers, however, share familiar challenges, and common concerns, especially when it comes to safety and performance. Fluctuating temperatures in battery cells can lead to thermal runaways and the risk of battery failure.

Powder coatings are increasingly playing their part in protecting batteries and associated components from overheating and insulating them against other threats that can reduce performance and increase risk. New trends are also emerging in powder coating systems to support manufacturers in bringing a new generation of vehicles to a demanding 21st century consumer. And powder coatings are renowned for their intrinsic benefits of helping to support sustainability (by being free of Volatile Organic Compounds and creating minimal waste) and accelerating processing times.

Authors:



**Gustavo Carvalho**  
Automotive Key Account and Segment Director, AkzoNobel Powder Coatings.



**Yidong Meng**  
Global Segment Manager Functional, AkzoNobel Powder Coatings.

Powder coatings are increasingly playing their part in protecting batteries and associated components from overheating and insulating them against other threats that can reduce performance and increase risk.

# Electric Vehicles move into the fast lane after a slow start

The development of all-new electric cars, vans, buses and trucks is firmly at the front and centre of nearly every motor manufacturer's future plans. It might be a surprise, therefore, to learn that an 'electric' vehicle is hardly a modern innovation. From the moment the first commercial, rechargeable lead-acid battery was invented in 1859, it took only 25 years for an Englishman – Thomas Parker – to combine the two in a carriage to create the first production electric car.

Since then, however, development has been slow, and painfully so. In the early years, EVs became vanity projects for the super-rich, and it was not really until the launch of the Nissan Leaf that an affordable EV became available to a much wider audience. More recently, there has been significant progress. According to the global EV database EV Volumes.com, 2.65 million new EVs found new owners in the first half of 2021, an increase of 168% on the corresponding period in 2020. All regions and most countries witnessed strong increases in EV sales with growth rates of between three- and eight-times higher than for total light vehicle sales.

All of the big automotive manufacturers have committed to rolling out hybrid and pure electric vehicles with the likes of Mercedes and VW committing to halting development on combustion engines. This shift has very much inspired consumer confidence and dispelled some of the original worries in the market including range, cost and value for money which in turn has seen the demand for electric vehicles accelerate dramatically. The rise in popularity of electric vehicles is also being driven by increased accessibility as new, more affordable models are launched onto the market.

While much of the focus from a media perspective, perhaps understandably, has been on consumer vehicles, a mini revolution has also been taking place in the commercial and public sector vehicle space. Indeed, in many respects they have been ahead of the game. Commercial enterprises are increasingly looking at moving to electric fleets to satisfy their wider sustainability agenda and 'green' commitments in meaningful ways to avoid being accused of 'greenwashing'; regional governments and local authorities are urgently looking to shift their fleets from fossil fuels to electric, similarly to meet environmental and clean air targets; and public transport operators and road hauliers are also looking at how buses, trucks, and other larger vehicles can also be converted to electric, without impacting deliveries of people or product.



According to the global EV database EV Volumes.com, 2.65 million new EVs found new owners in the first half of 2021, an increase of 168% on the corresponding period in 2020.



# Macro-economic and environmental factors are driving change

Driving all this change, of course, are various macro-economic and environmental factors, and the race to achieve a more sustainable future. Electric Vehicles, or more specifically the shift from gasoline and diesel engines to electric, is seen as fundamental to reducing CO<sub>2</sub> emissions, and the world is committed – at least in the main – to attaining a carbon-zero future.

In December 2020, Reuters reported that the European Union (EU) aims to have at least 30 million emission-free vehicles on its roads by 2030 as part of an ambitious goal of carbon neutrality by 2050, prompting the President of the European Commission, Ursula von der Leyen to declare that Europe 'Walks the talk' on climate policies. According to pressure group Transport & Environment, cars are responsible for 12% of all greenhouse gas emissions in Europe.

In America, President Biden recently (July 2021) set a target for 50% of all new vehicle sales in the US to be electric by 2030 while also tightening pollution standards for cars and trucks, in a barrage of actions aimed at reducing the largest source of planet-heating gases in the country.

Electric vehicles comprised less than 2% of all car sales in the US last year, with many Americans still preferring large, carbon-intensive SUVs. However, electric vehicle sales are rising quickly. Ford, which has said 40% of its sales will be electric by 2030, recently unveiled a battery-driven version of its F-150 model, which has been America's best-selling vehicle since the 1980s. A joint statement by Ford, GM and Stellantis said that the companies were aiming for 40% to 50% of electric sales by 2030. "This represents a dramatic shift from the US market today," the statement read, adding that this could only be achieved if the federal government is able to provide incentives to buy electric cars, invest new charging infrastructure and bolster research and development funding.

This 'shift' towards EVs in the West is matched by similar growth in the East. A report in the New York Times says that China, responsible for more than 25% of worldwide CO<sub>2</sub> emissions, intends to be climate-neutral by 2060. A switch from 'conventional' powered vehicles to electric is a key part of its strategy and is already well underway. Bloomberg analysts expect there will be more electric cars on China's roads than conventional cars by the mid-2030s, and China is considered a leader in the development of new EV technology.

President Biden recently (July 2021) set a target for 50% of all new vehicle sales in the US to be electric by 2030.

# Common challenges faced by global EV manufacturers

Regardless of who is currently leading the charge to an all-electric future, manufacturers around the globe face a set of common challenges. Perhaps the biggest is one of safety, and one of their most effective weapons in reducing risk is their choice of coatings for the battery and the motor.

Global regulations on passenger safety are becoming increasingly demanding, and rightly so. EV fires are uncommon, but not so uncommon as to be unheard of. Forbes recently reported (July 2021) two fires where the vehicles 'spontaneously combusted', and whereas the incidences of EV fires per mile travelled is far lower than 'conventional' vehicles, avoiding fires is a top priority and understanding where the risks are coming from is key.

Perhaps the most widely reported risk is thermal runaway of the Lithium-ion batteries used in EVs, e-bikes, e-forklifts, e-trucks - indeed all electrically-powered vehicles. Such batteries have a narrow operating temperature range (between 15°C to 45°C), and thus the functional safety of the battery and the entire vehicle depends to a large extent on the battery cell remaining in this range. If the temperature exceeds this critical level, an unstoppable thermal runaway can occur and the vehicle may catch fire.

Thermal runaways occur as a result of one of several factors: an internal short circuit; an external short circuit; overcharging the battery beyond its maximum voltage; or excessive currents when charging or discharging the battery. Maintaining the mechanical and thermal stability of the battery has to be guaranteed, and one way of maintaining such stability is the use of powder coatings.



Perhaps the biggest (challenge) is one of safety, and one of their most effective weapons in reducing risk is their choice of coatings for the battery and the motor.

# The importance of powder coatings in cooling efficiency and improving lifetime performance

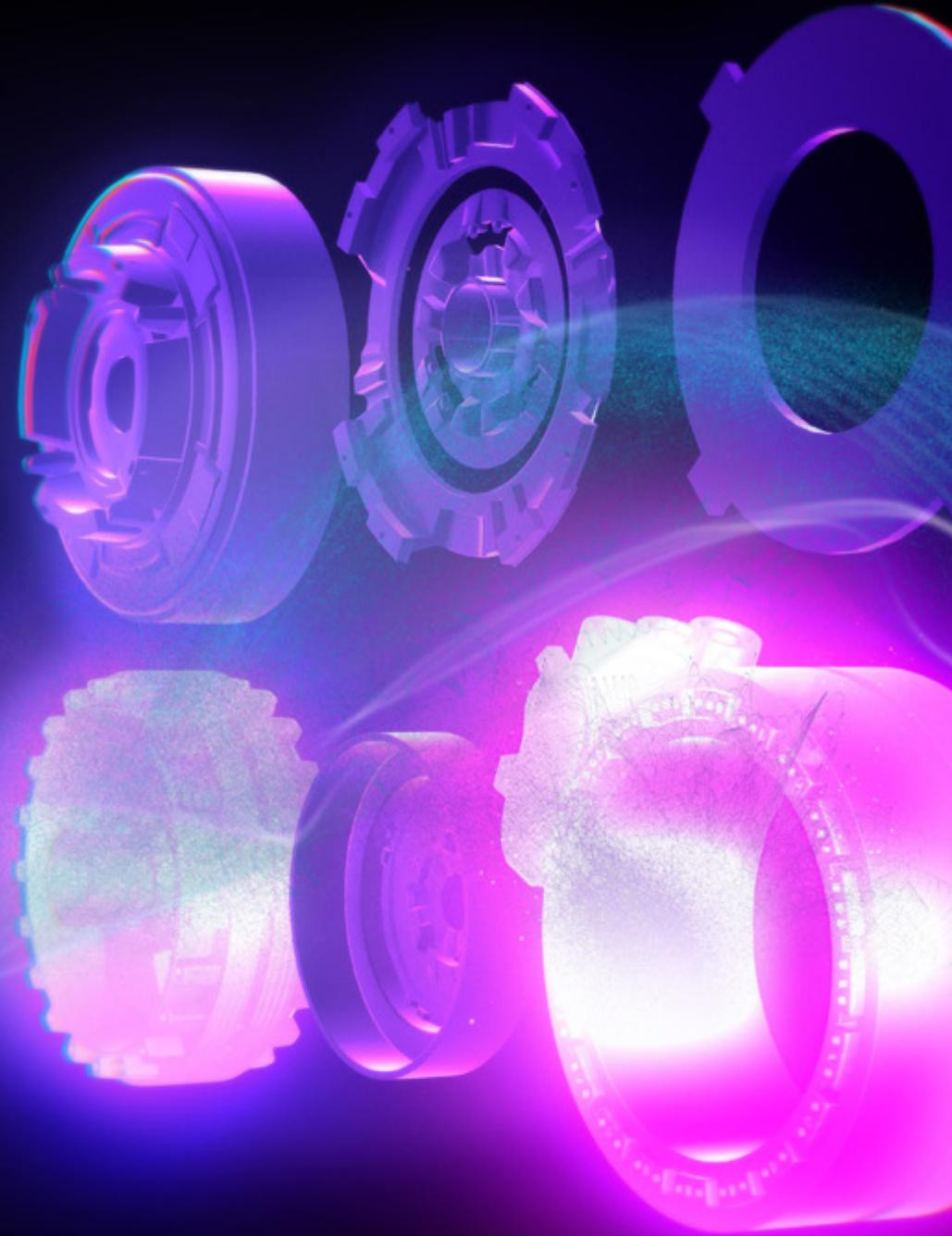
While powder coatings can insulate the battery directly, they can also play a key role in protecting the vehicle's cooling systems by electrically isolating and protecting its components and helping to keep the battery within its optimal temperature range.

Helping to prevent extremes of hot or cold is not just about risk; it is also about performance. If the temperature is too low, the battery's power is decreased, reducing capacity and – ultimately – vehicle range. If the temperature is too high, the battery degrades at an accelerated pace. Powder coatings also support the longer-term performance of the battery by protecting it against corrosion and other threats.

Beyond the battery and the cooling system, powder coatings protect the wider electric ecosystem of the vehicle – its cooling plates and tubes, stator hairpins, bus bars, battery cell and housing – many of which have long-term heat resistance requirements. EV charging points generate considerable heat; fast chargers can push battery pack temperatures to 270°C after just a few minutes of charging, so being able to protect the battery and vehicle components from such extremes supports the longevity of the vehicle and its operational safety.

Powder coatings have a high heat emission rate (i.e. 'thermal emissivity'), which means they can help to control radiative heat transfer by tailoring surface emissivity (like bus bars). Radiative heat transfer is mainly an issue at higher temperatures where conventional thermal insulation methods are not sufficient.

Powder coatings also support the longer-term performance of the battery by protecting it against corrosion and other threats.



# Supporting a more sustainable manufacturing process

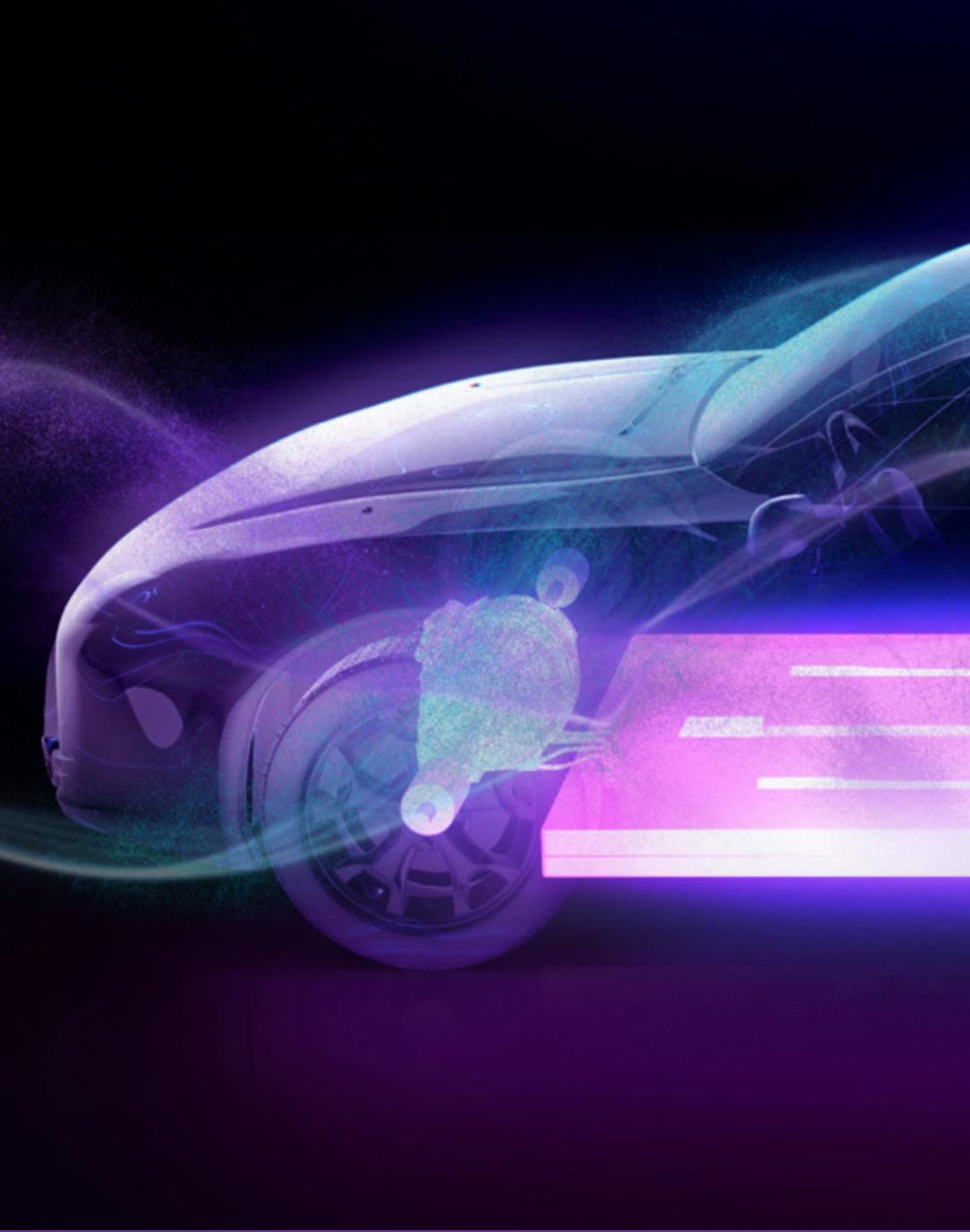
The other big challenge that all manufacturers of Electric Vehicles face is the need for their own manufacturing processes to be sustainable.

The automotive industry has many significant environmental regulations and directives to which they must comply: these include but are by no means restricted to the EU Directive that determines the removal of certain metals, chemicals and elements within the manufacturing process including lead, mercury, and hexavalent chromium; REACH which determines the Registration, Evaluation, Authorization and Restriction of Chemicals; GADSL which details a Global Automotive Declarable Substance List. There is also a database for information on Substances of Concern used in Products (SCIP) and rules on the treatment of waste from electrical and electronic equipment (WEEE).

The use of powder coatings supports manufacturers with all such regulations and directives. Being free of Volatile Organic Compounds (VOCs) they protect the environment and the people within it, creating minimal waste, and enabling powder that has been oversprayed to be re-claimed and re-used. The durability afforded by a powder coating also enables the surfaces it is protecting to last for longer, extending a product's lifetime and performance, and stretching the period before a product needs to be replaced.



The durability afforded by a powder coating also enables the surfaces it is protecting to last for longer, extending a product's lifetime and performance.



## Powder coating innovation for 21st century e-mobility

Powder coatings are available and proven and new innovations continually being developed that go further in enhancing thermal management systems and superior electrical insulation to help power the next generation and allow electronic components to perform in extreme environments. Powder coatings can be found on the engines, motors, battery systems and electrical storage units, protecting not just the here and now, but developing coatings that support the ultra-light automotive platforms of the future.

Interpon and Resicoat powder coatings from AkzoNobel, for example, are tried and tested over more than 50 years. It is this past experience, the assurance of various UL approvals, and the company's current technical expertise that is now paving the way for future standards. Products include the Interpon A6000 range, designed for every part of an EV from its battery pack to the cooling system.

The range provides vehicles and their components with exceptional resistance to thermal shocks, reliable adhesion characteristics, and high dielectric strength. It is also available in a broad range of colors, textures and finishes.

Products also include the Resicoat EL series that provides cooling tube and cooling plate coatings to support vehicle safety as well as battery performance; busbar coatings with improved heat dissipation and low fire load with a longer lifetime during thermal impact; and powder solutions that are specifically designed for the electrical insulation of welded hairpin stators. Resicoat EL helps provide consistent electrical insulation for the life of the key components, supporting optimal EV and Hybrid performance, and delivering the highest levels of thermal conductivity, electrical insulation, edge coverage and continuous (void-free) film coverage.

Interpon and Resicoat powder coatings from AkzoNobel, for example, are tried and tested over more than 50 years.

# Further trends in powder coating development

While the focus of this paper is primarily on the role that powder coatings play in the protection and performance of battery and associated systems, there are other innovations and trends of interest that benefit designers and manufacturers of future vehicles.

Traditional, multi-layer systems have, in certain cases, been superseded by single layer systems where the use of a primer is no longer required, or single layer bright metallic finishes which don't require a clear coat for protection and durability.

Many manufacturers are switching to using a powder coating because of its environmental credentials, as previously outlined, and because in becoming more sustainable they don't compromise on performance. Powder coatings provide superb levels of durability and protection against chips and scratches off and on the road.



Many manufacturers are switching to using a powder coating because of its environmental credentials, as previously outlined, and because in becoming more sustainable they don't compromise on performance.

# Switching on to an electric future

**The march towards an electric future is unstoppable, and AkzoNobel is developing powder coatings that support the innovators of next generation technologies used to power the world's most advanced electrical vehicles. We're actively supporting our customers through partnerships and product development to create, power and protect the designs of the future.**

We're building on our years of experience and the reputation of our brands and going further – going further in thermal management and superior electrical insulating properties to help power up the next generation – going further in helping electrical and electronic components perform in extreme environments – going further in where our coatings can be applied, not just on the vehicle body but also on motors, battery systems and electrical storage units – going further in developing coatings that support the ultra-light automotive platforms of the future.

Our solutions are founded on the innovation, performance and technical expertise that comes from more than half a century of positive thinking. Together, we have our sustainable future covered, helping the automotive industry in driving the current to power its future.

Discover more about Interpon's innovative and sustainable powder coatings at: **[automotive.interpon.com](https://www.automotive.interpon.com)**



**People.  
Planet.  
Paint.**

# AkzoNobel

We've been pioneering a world of possibilities to bring surfaces to life for well over 200 years. As experts in making coatings, there's a good chance you're only ever a few meters away from one of our products. Our world class portfolio of brands – including Dulux, International, Sikkens and Interpon – is trusted by customers around the globe. We're active in more than 150 countries and have set our sights on becoming the global industry leader. It's what you'd expect from the most sustainable paints company, which has been inventing the future for more than two centuries.

For more information please visit [www.akzonobel.com](http://www.akzonobel.com) and [www.interpon.com](http://www.interpon.com)

All products supplied & technical advice given are subject to the standard terms of sale of the AkzoNobel supplying company.  
Copyright ©2021 Akzo Nobel Powder Coatings Ltd. Interpon is a registered trademark of AkzoNobel.

Issue 1 - 10/2021.

## Follow us

Powder Coatings by AkzoNobel



[automotive.interpon.com](http://automotive.interpon.com)

**Interpon®**     **RESICOAT®**

 **Automotive**

We're driving the current  
**to power your future**