



Neue Werkstoff- und Anwendungsentwicklungen aus Polycarbonat und seinen Blends

May 2025 | Spritzgießen-next

Schwerpunkt Automobilindustrie



Covestro

A global plastics manufacturer



Strong and global

- €14.2 bn in sales¹
- 17,500 employees²
- 48 production sites

Game-changing and beneficial

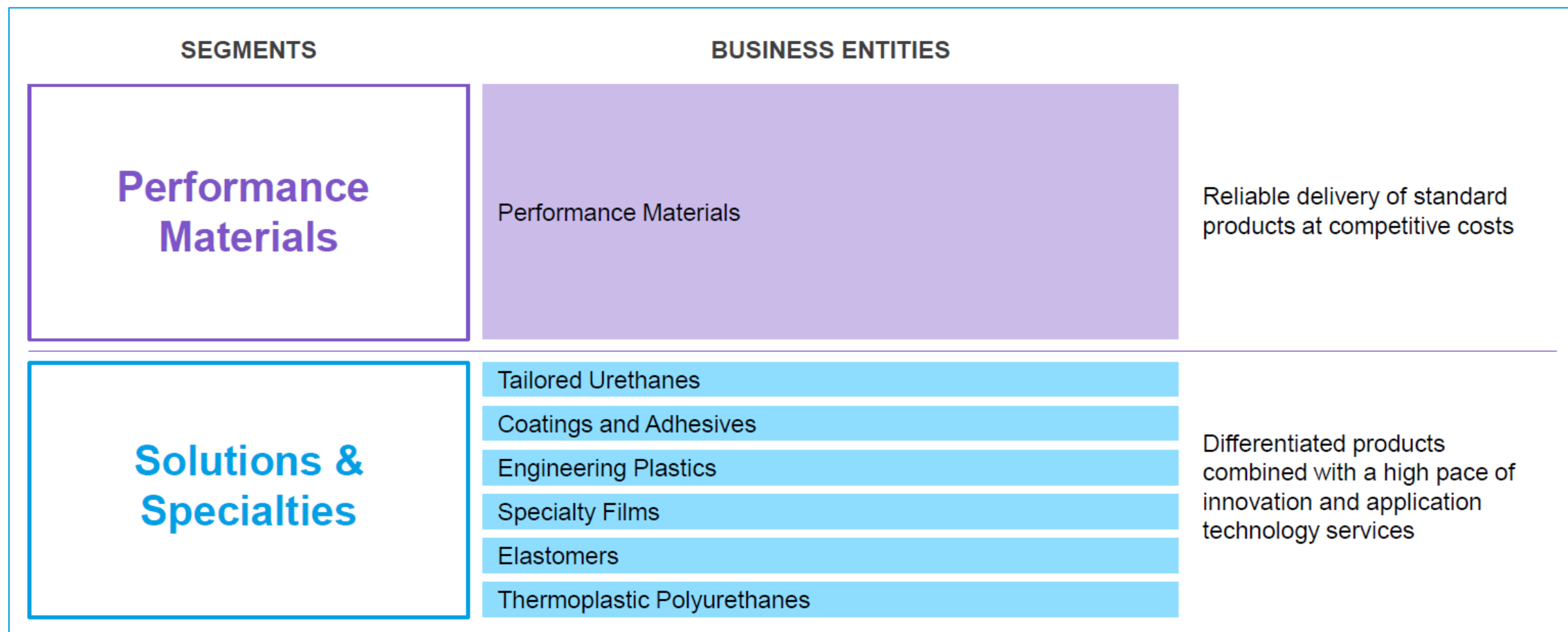
- Polymer materials of superior quality
- Across numerous industry sectors
- Keeping an eye on global challenges



Innovative and sustainable

- 1,350 employees in research and development
- 80 years of ideas and inventions
- Pioneer of the circular economy

Our structure

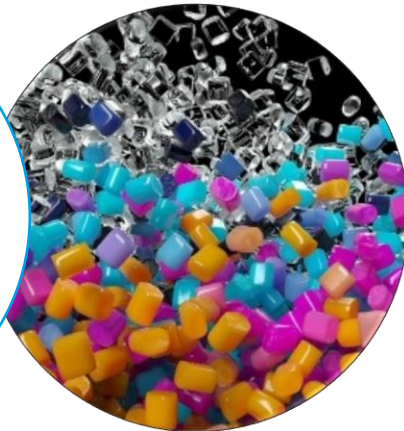


Our products - everywhere in modern life



Focused around two distinct polymer types

Polycarbonate



Components for
Polyurethanes



Providing solutions for various key industries



Automotive and
Transportation



Construction



Wood and Furniture



Electrical and
Electronics



Chemicals



Sports/Leisure,
Cosmetics, Health

Our product portfolio



Makrolon®

PC:
Though, versatile, proven and sustainable

Apec®

High-heat PC:
Outstanding heat resistance, high performance and toughness

Bayblend®

PC+Blends (PC-ABS / PC-ASA):
Balanced excellence, the best of both worlds

Makroblend®

PC-Polyester:
Ultra tough, colorful and rigid

Other products for Automotive (selected)

Makrofol® (PC film)

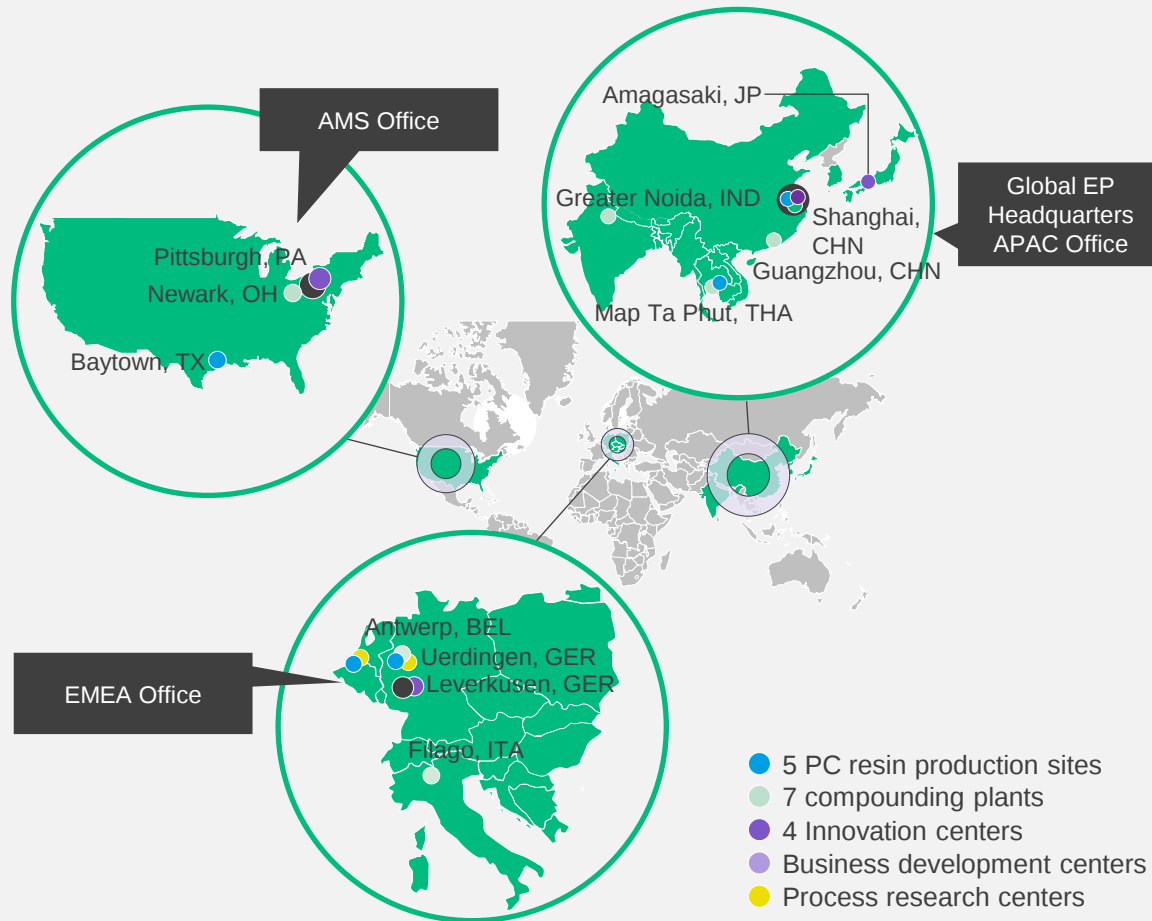
Desmopan® (TPU)

Bayflex® (Soft PUR / IP)

Baynat® (PUR headliner)

Covestro Polycarbonates global operations

At a glance



Primary production plants

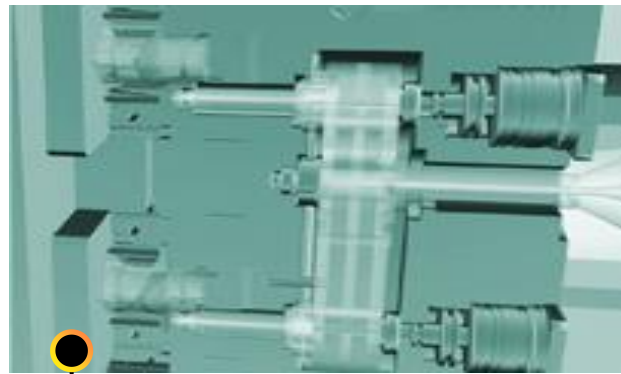
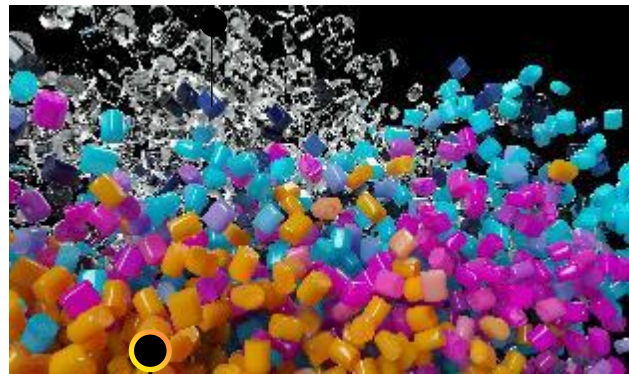
- Production of polycarbonate resin for either external sales or internal feedstock for compounding
- Nameplate capacity as of year end 2021: Covestro 1,600kt, including plants in Baytown (USA), Antwerp (BE), Uerdingen (D), Map Ta Phut (THA) and Caojing (PRC)

Compounding plants

- Refinement of polycarbonate resin through blending with other polymers or addition of colorants, fillers or other functional additives
- Color matching, technical service and small-scale production capabilities

Product & Application centered R&D Expertise

Service and know-how covering the whole process chain from Ideation to SOP projects



Industry Trends

Design Concept

Material Selection

Part Design / CAE

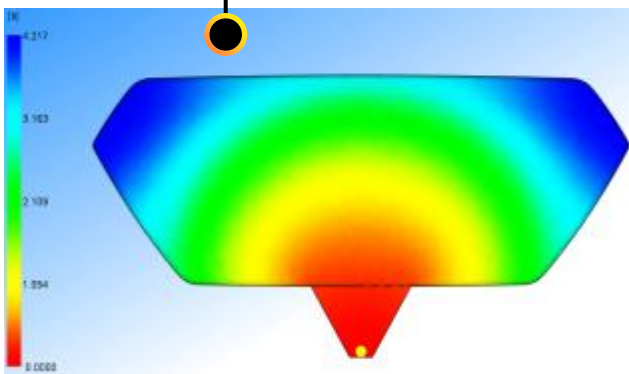
Mold Design

Technology Development

Injection Molding

Surface Technologies

System Solution



Picture(s): ©Covestro, 2020

Creating markets through innovation

Continuous technology development mirroring automotive market requirements



Engineering Plastics

Circular Solutions



Mechanical Recycling



© DedMityay - stock.adobe.com

Block-buster grades with **post-consumer** or **post-industry recycled content** for demanding applications

- High quality feedstock
- 25 to 75% recycled content
- Near to virgin performance
- Global / Regional portfolio
- MOB: IMDS / ELV readiness
- EE: certificate readiness

Renewable attributed Polycarbonates



Available

High quality, certified*, mass balanced PC - **bio-circular resources** replace fossil resources

- “Drop-in” solution with identical properties
- All applications in-scope
- Large CO₂ footprint reduction potential
- Global portfolio of grades

Chemical Recycling



Roll out ongoing

High quality, certified*, mass balanced PC – replacing fossil by **post-consumer-based resources** replace fossil resources

- “Drop-in” solution with identical properties
- Selected grades available
- Counts as recycling content
- Add. feedstocks in development

Design for Sustainability



Under development

Circular Design co-creation with customers

- Modular application design
- Highly complex / disassembly
- Material centricity (“mono”-material)
- Industry R&D programs, e.g., Nalyses project for EXT lighting (full supply-chain project, digital twin, etc.)

Overview of the products of the Business Entity Engineering Plastics



Makrolon®

Versatile, proven
and colorful
(Polycarbonate)

Makrolon® RE CQ

Makrolon® RP CQ

Makrolon® R CQ

Apec®

Outstanding heat resistance,
high performance and
toughness
(High temperature
Polycarbonate)

Apec® RE CQ

Bayblend®

Balanced excellence:
The best of both worlds
(PC+ABS blend;
PC+ASA blend)

Bayblend® RE CQ

Bayblend® RP CQ

Bayblend® R CQ

Makroblend®

Ultra tough, robust
and rigid
(PC+PET blend;
PC+PBT blend)

Makroblend® RE CQ

Makroblend® R CQ

RE grades, attributed with mass-balanced bio circular sustainable share → [More information](#)

RP grades from chemically recycled post-consumer feedstocks attributed via mass balance → [More information](#)

R grades partly with mechanically recycled content → [More information](#)

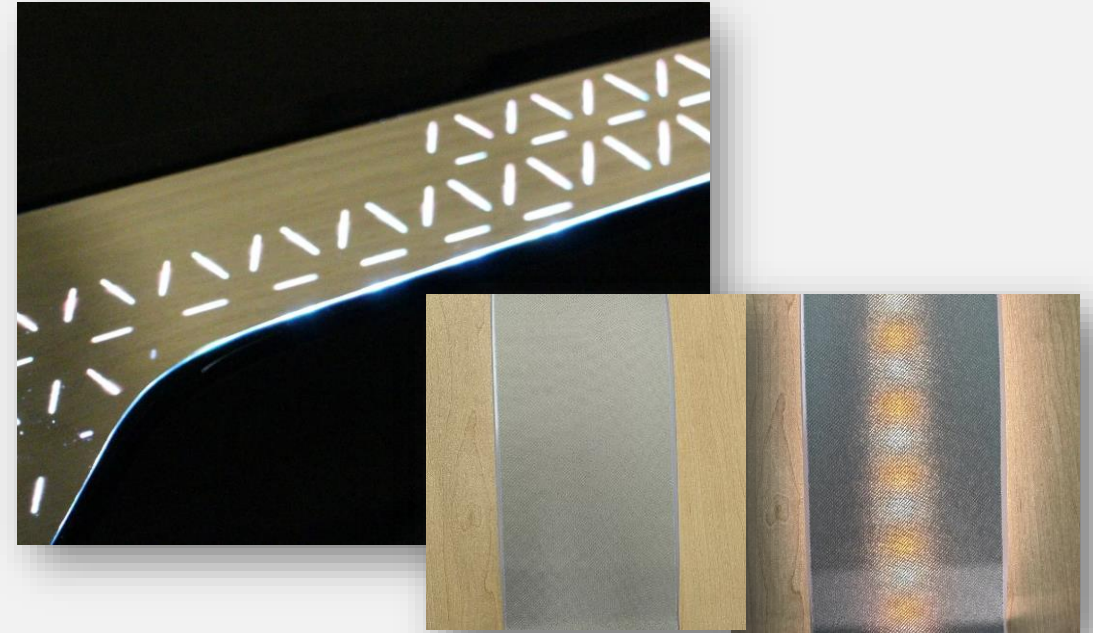
Optical Blends

Bayblend® OM85 UV



PC+ABS blend with balanced optical properties (light transmittance versus light diffusion), targeting automotive interior illuminated application by back molding of “natural & authentic” materials

- “Clever” Material option to work on variants with same material class (flow, shrinkage, mechanical performance, assembly, etc):
 - ✓ Bayblend T85 XF for black variant (MIC, IMD)
 - ✓ Bayblend OM85 UV for illuminated variant, e.g. IMD, hotstamping, etc.
- Lower in melt temperatures, thus suitable for backmolding of temperature and/or pressure sensitive A-surface materials
- UV stabilized, excellent lot to lot consistency with neutral color
- Neutral & good light transparency (@ 2 mm = 44%, @ 3 mm = 35%) in combination with high HPA (@ 2 mm = 53, @ 3 mm = 57)
- High-flowability
- The product is an addition to our existing line-up of translucent materials (e.g. Makrolon® translucent portfolio)



General material property profile comparable Bayblend T85 XF –
Enhanced optical properties and more available on request

Optical Blends



Makroblend® OM845 G - new PC-Polyester formulation, glass-filled and high transparency

A nearly transparent polymer blend based on polycarbonate, a co-polyester and 20% glass fiber. The product amazes with an almost clear transparency with simultaneously high rigidity, low distortion, low thermal expansion and very good chemical resistance.

- Target application:
 - ✓ “Natural” material surfaces like wood veneers, metal mesh, etc., functional parts including touch sensors
 - ✓ Where shrinkage control / adjustment is a must (dimensions, warpage)
- Lower processing temperatures than std. PC+GF to prevent damage to natural A-surface material like wood veneers and leather which is back injected
- High pencil hardness, good chemical resistance, colorable
- The product is an addition to our existing translucent of Makrolon® and Bayblend OM translucent materials

General material property profile and enhanced optical properties available on individual request



Performance	Makroblend® OM845 G (20% GF)	Bayblend® T88 GF-20 (20% GF PC/ABS)	Std. PC (20% GF)
MVR 260 °C, 5 kg (cm³/10 min)	16	14	9
Tensile Modulus (MPa)	5700	7200	6000
Izod notched impact (kJ/m²)	11	8	12
Izod unnotched impact	43	38	40
Vicat B120 (°C)	121	130	148
HDT @1.8 MPa (°C)	109	119	138
CLTE - Length direction	0.3x10 ⁻⁴	0.3x10 ⁻⁴	0.3x10 ⁻⁴
Light Transmission (%) @ 2 mm	~80	40.0	65
Haze @ 2 mm	20	99	96

Makrolon® Ai2215 EL

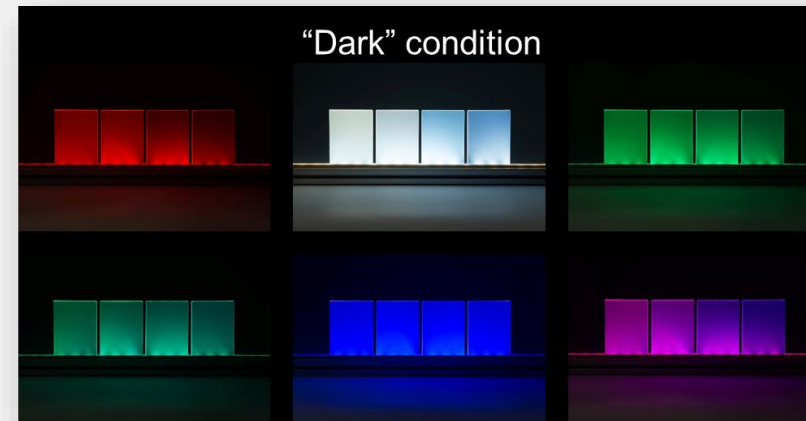


New surface illumination effect, superior optical performance, high flowability

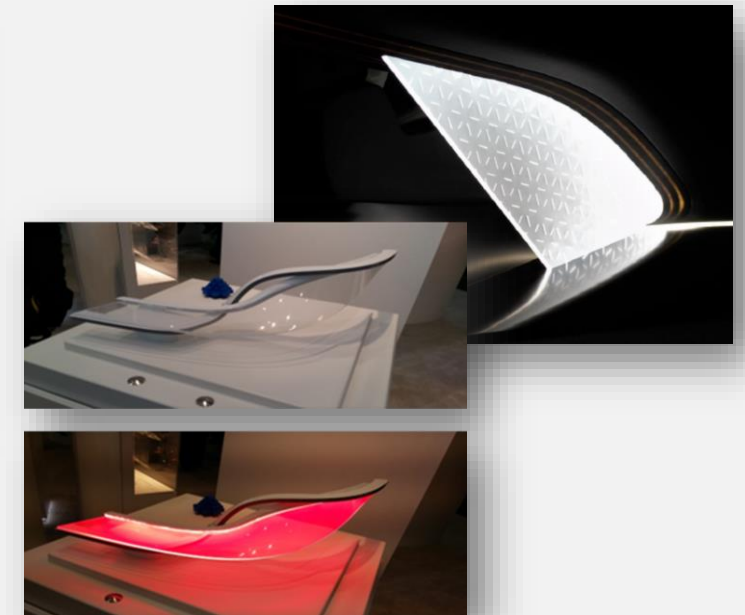
- Makrolon® Ai2215 EL is an optically clear grade with a new additive formulation, combined with well-known Makrolon properties.
- Light is coupled-in at small application “edge” – “light” is coupled-out at entire surface.
- Edge light offers the unique opportunity to display flat or 3d-shaped elements for special lighting effects in automotive.
- The area is bright, homogeneous and – depending on the LED – colorful!



© Covestro AG, 2020



© Covestro AG, 2020



Material property profile and enhanced optical properties available on request

Case Study Rearlamp

SOP Application for Makrolon Ai2245 EL



Light transmission & diffusion

Excellent light transmission & diffusion ensure optimal distribution & uniformity for edge lighting.

Superior Thermal Management

Higher heat deflection temp than PMMA, withstands ambient & LED heat better.

Increased Design Freedom

Functional colors allow complex, sleek lighting design with hidden sources, boosting creativity.

Regulated Color Development

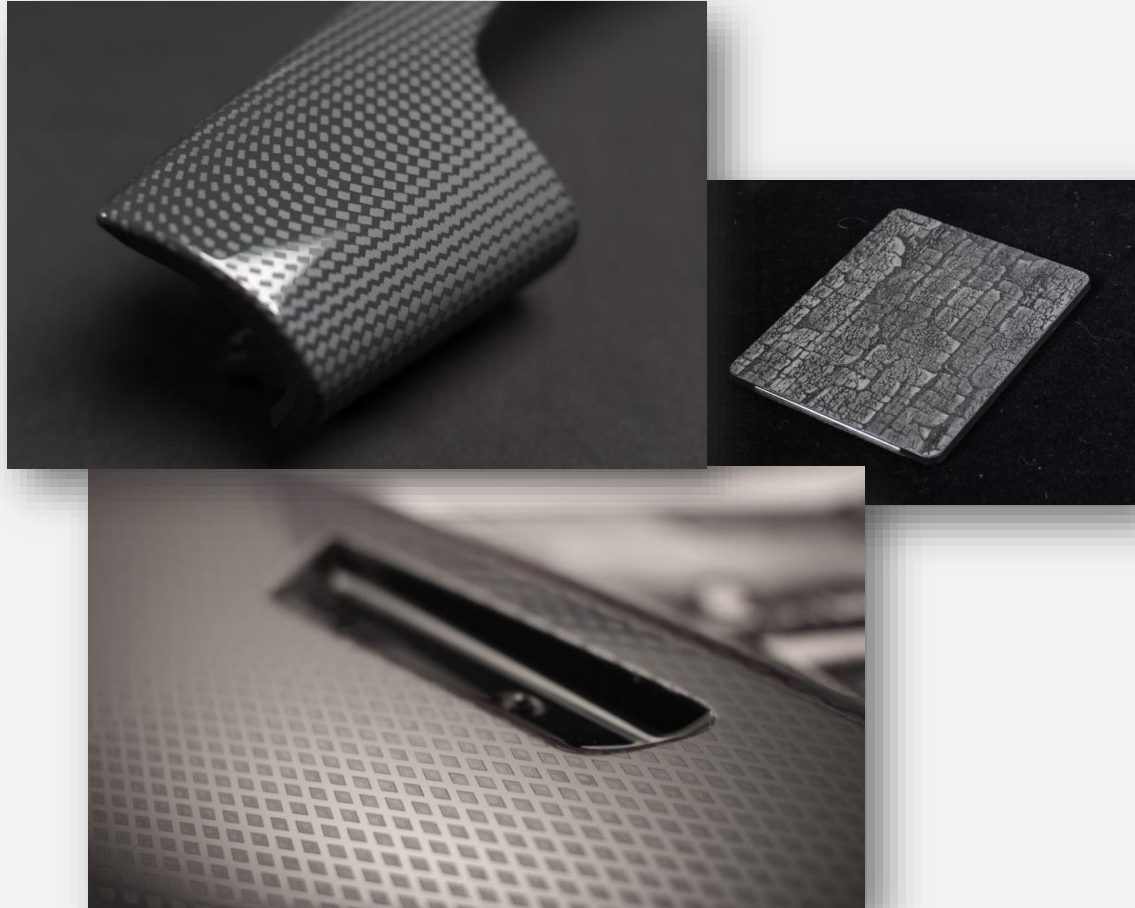
Meets rear lamp coloration needs with desired red color lit & unlit, adhering to regulations & aesthetics.

Space-Saving

compact and space-saving lighting solutions, contributing to overall vehicle design

One-shot molded-in-color trim parts

Reduced part cost and better CO₂ footprint as well as new design possibilities for OEMs



For OEMs:



Cost reduction of part



Easier recyclability / CO₂-Footprint reduction



New & attractive laser mold surface treatments & design effects

For TIERs:



Complexity reduction:
Less production steps, less technology suppliers, less
Material mix, lower scrap rate



Lower overall investment:
no coating line / no film backmolding / no lamination



Regulatory pressure to reduce emissions (VOC) during coating

One-shot molded-in-color

VW Group

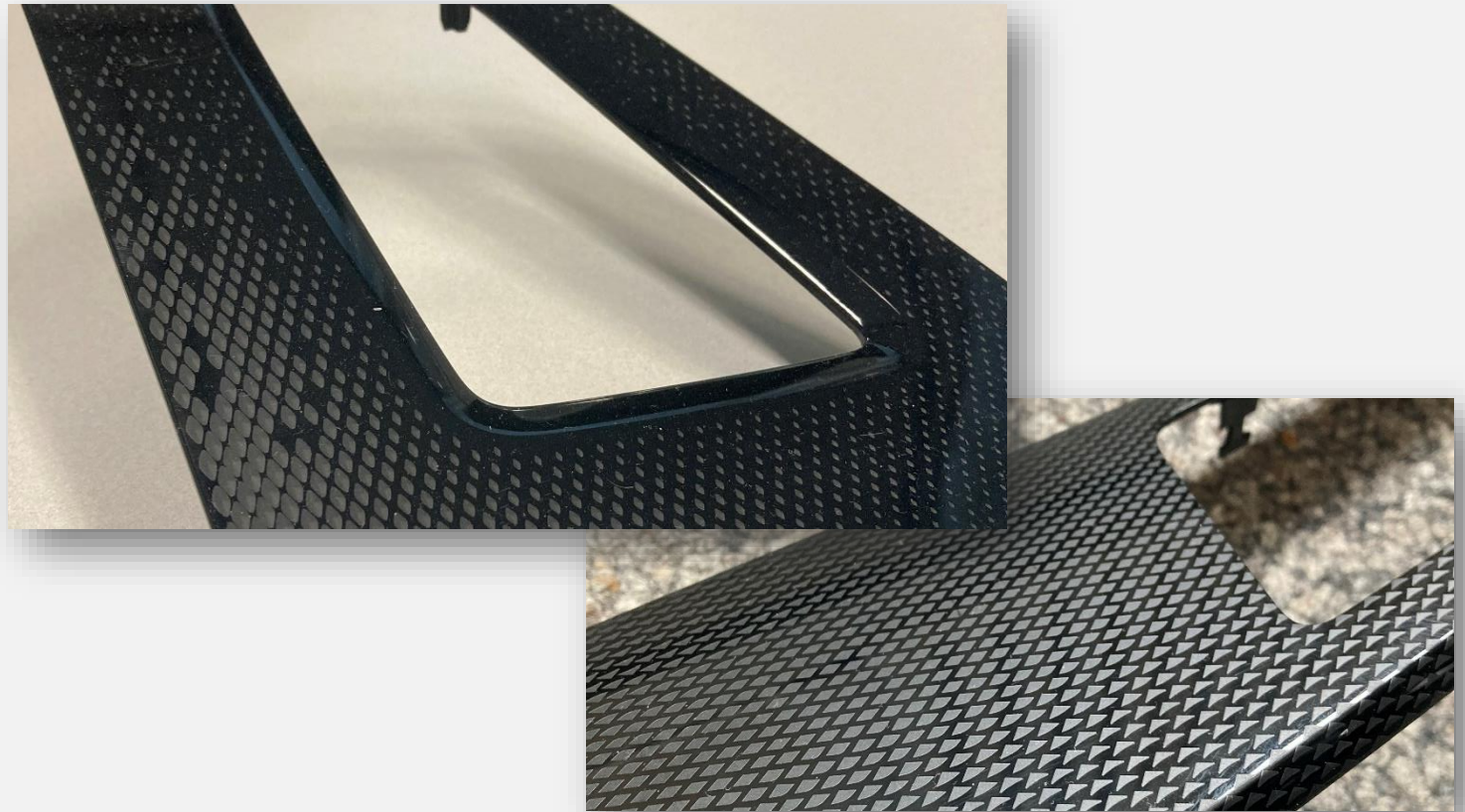


Makrolon Ai 2497

- Mono-Material
- Piano black
- Gloss-Matte combination
- Avoids secondary processes
- Reducing additional costs
- Environmentally friendly
- Recyclability given

✓ Approved as per VW TL 52728

Various serial applications (global), details available upon request



Bayblend® T85 BSR

Addressing noise issues in the interior



Bayblend® T85 BSR reduces sounds generated when two materials rub against each other e.g. in automotive interiors.

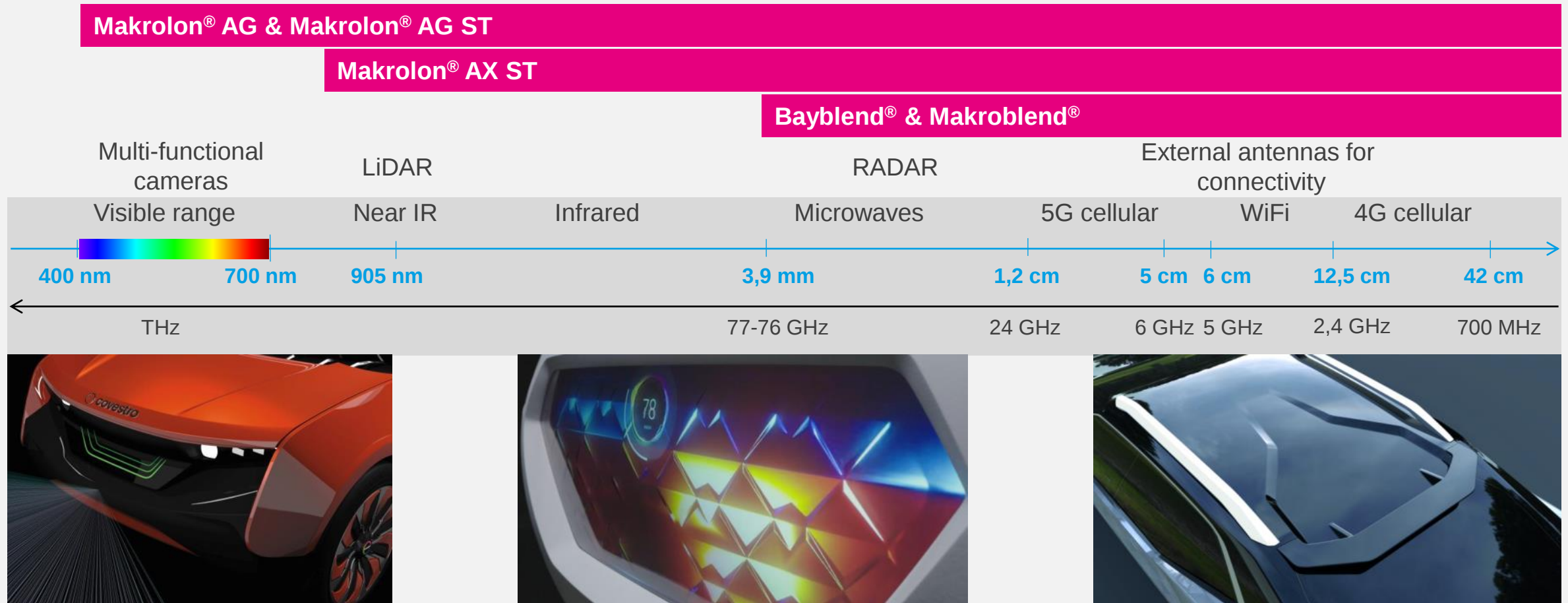
This reduction of Buzz Squeak and Rattle (BSR) and Noise Vibration and Harshness (NVH) is especially prevalent at ambient and low temperatures.

Value proposition:

- A polymer solution to avoid noise
- Helps to avoid costly tape/felt, grease or others solutions
- Typical Bayblend properties: good flow, high heat and high impact properties.
- BSR package does not migrate
- Available in colors (black, white, etc.)
- Global availability



Covestro's resins are transparent for exterior sensors



Makrolon® AX2675 ST color 978001

NIR-transparent black for LiDAR sensors



- Polycarbonate for special applications in Auto exterior which cover LiDAR sensors
- Specified Near-IR transparency for excellent LiDAR signal transmission
- High purity through advanced melt filtration and dedicated production lines
- Excellent lot-to-lot stability of properties
- Optimized for wet coated applications
- Based on well established Makrolon® AX and Makrolon® AG family
- High radar transmission at 24,05 – 24,25 GHz (ISM Band), 21,65 – 26,65 GHz (UWB Band) and 76 - 77 GHz (Long Range Radar)
- Holistic customer service package

IR-transmission
specification for every
delivered lot:

> 89%
@ 2 mm
@ 905 nm

Products

Makrolon® AX2675 ST 978001

Functionalized roofs with LiDAR and camera integration

Pushing autonomous driving with **SENSOR ROOF** applications



Product benefits:

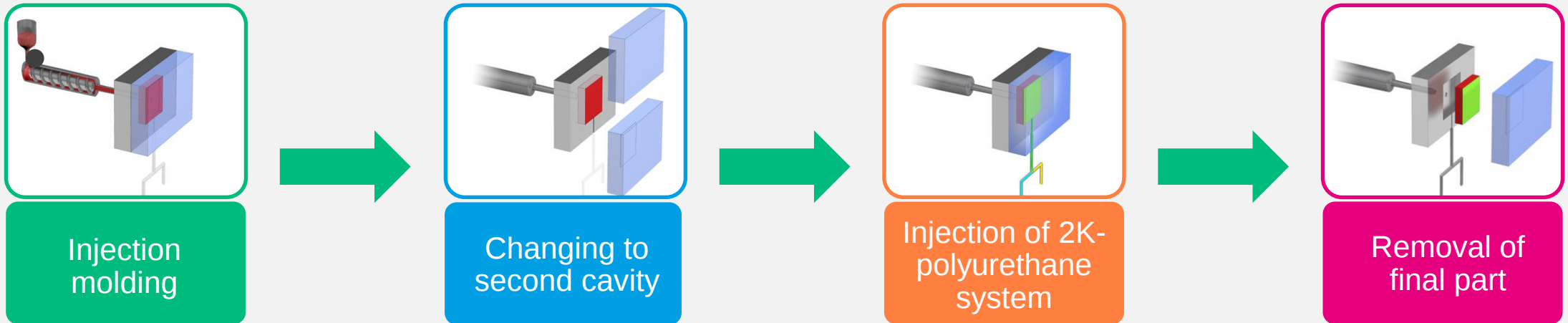
- Integration of sensors and cameras, especially LiDAR sensor for roof panels
- LiDAR transparent black resin for seamless sensor integration
- Integration of sensor heating for de-icing
- Light integration like e.g. ADAS light possible
- 15 years experience in panoramic roofing

Makrolon® AG / Makrolon® AX

Bayblend® T Series (2nd component)

Makroblend® UT (Sensor roof housing)

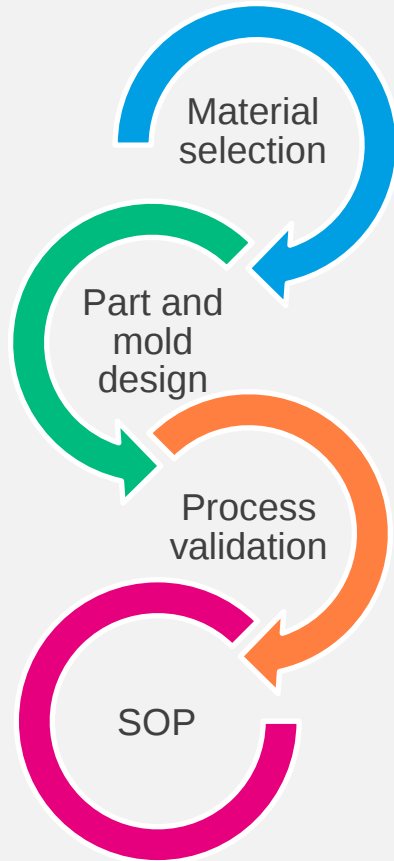
Direct Coating – process flow



Direct Coating (DC) is a Covestro & partners technology development that combines **Thermoplastic Injection Molding** with the in-mold formation of an almost solvent-free 2K PU coating by **Reaction Injection Molding**.

Support along the whole project

Covestro as a go to partner for Direct Coating projects



- Application specific material recommendations

- Part and mold design for injection molding and RIM process
- Rheological calculation thermoplastic and coating
- Warpage calculation of the final setup

- Direct Coating trials in our technical labs globally
- Testing capacities in our Surface Technology Lab
- Brought network along the process chain

- On side support
- Trouble shooting during the serial production

Direct Coating - Colors and Design (K2016)

Multicolor parts including metallic effects and film inserts in one step



Printed films + transparent coating



Effect coating (blue)



Transparent
soft-feel
coating

High gloss, opaque pigmented,
self-healing coating



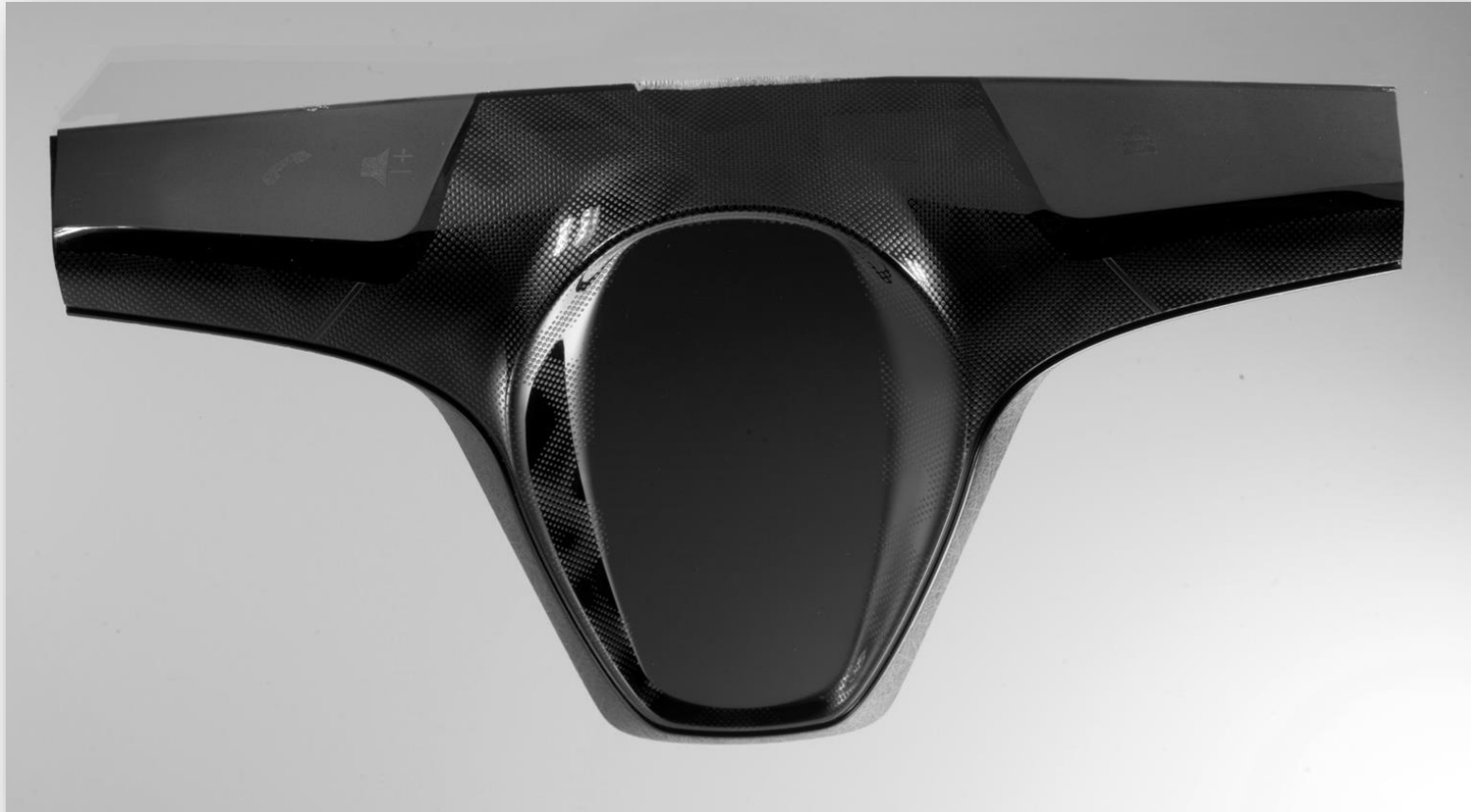
Black soft-
feel coating

Metallic-effect coating



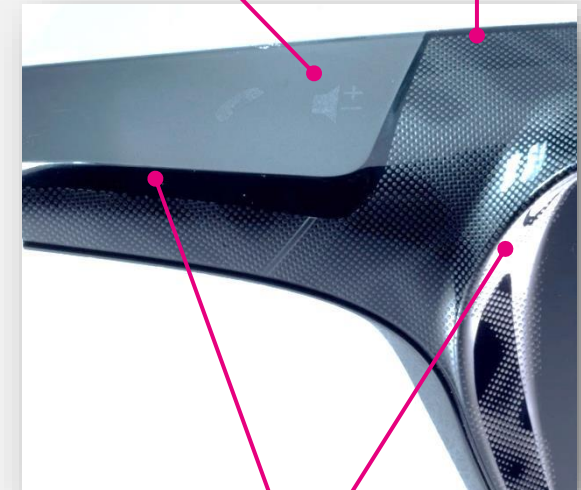
Various Surfaces and Haptics in One Step

Highly 3D shaped part with 2 different coatings



Fine structures with
precise symbols

Laser structured
graining



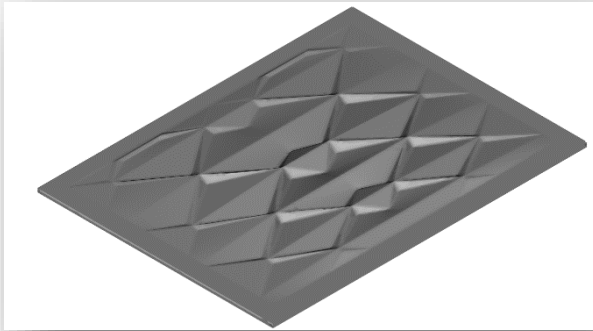
High gloss next to structures

Part and mold design – simulation (examples)

Prediction of coating filling behaviour

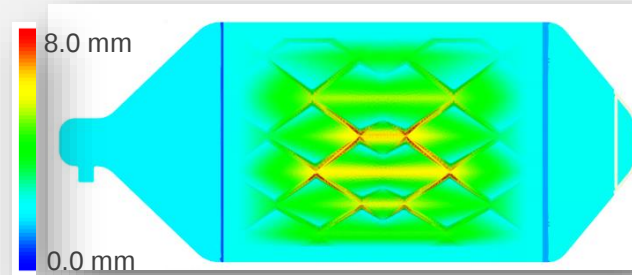


Design example

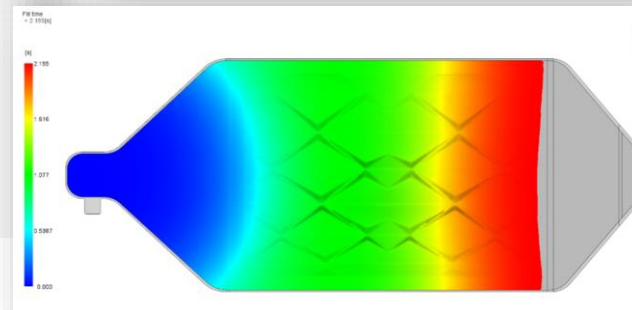
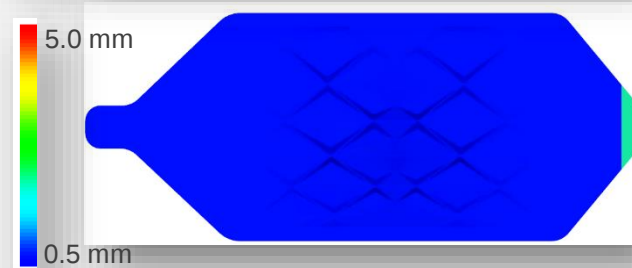


Uniform PUR coating

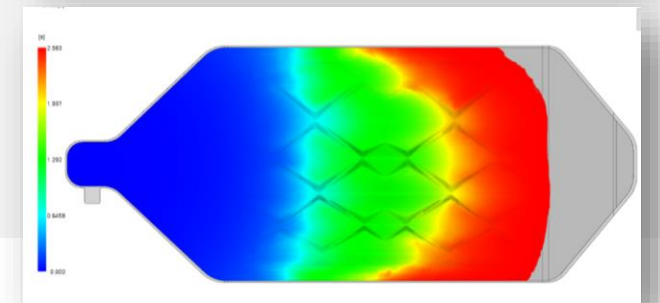
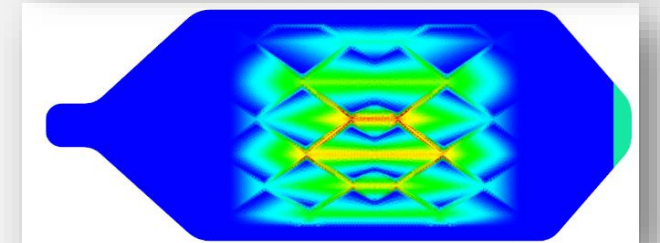
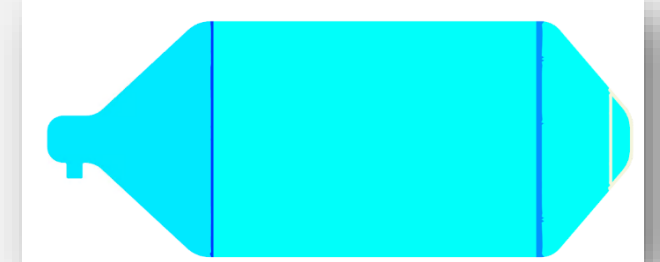
PC
thickness



PUR
thickness



Structured PUR coating

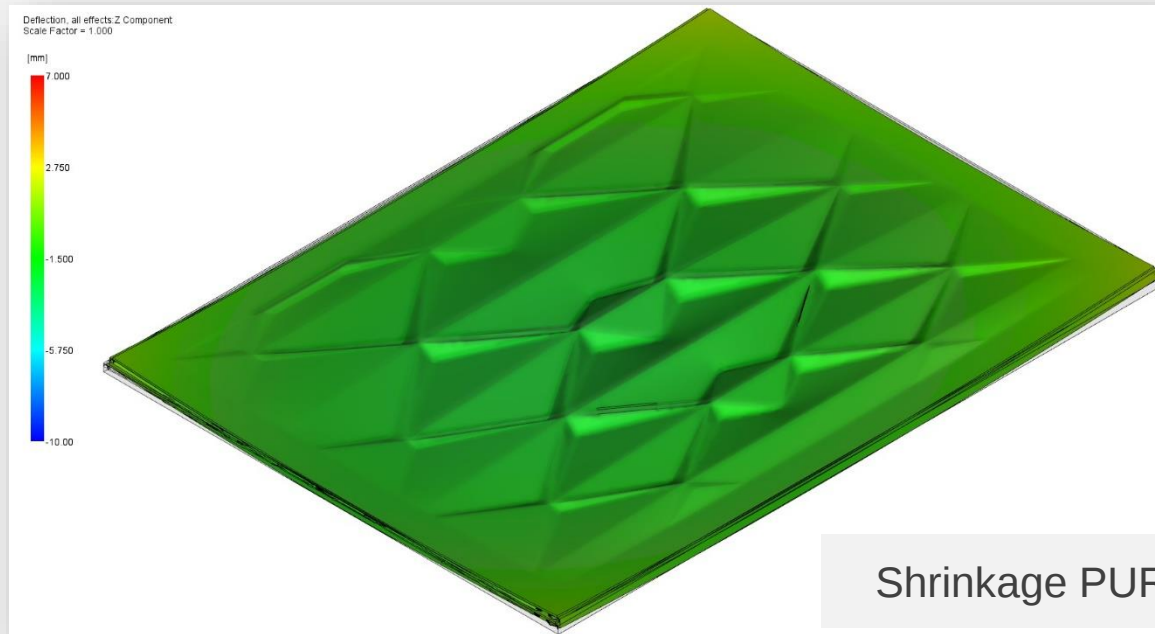


Part and mold design – simulation (examples)

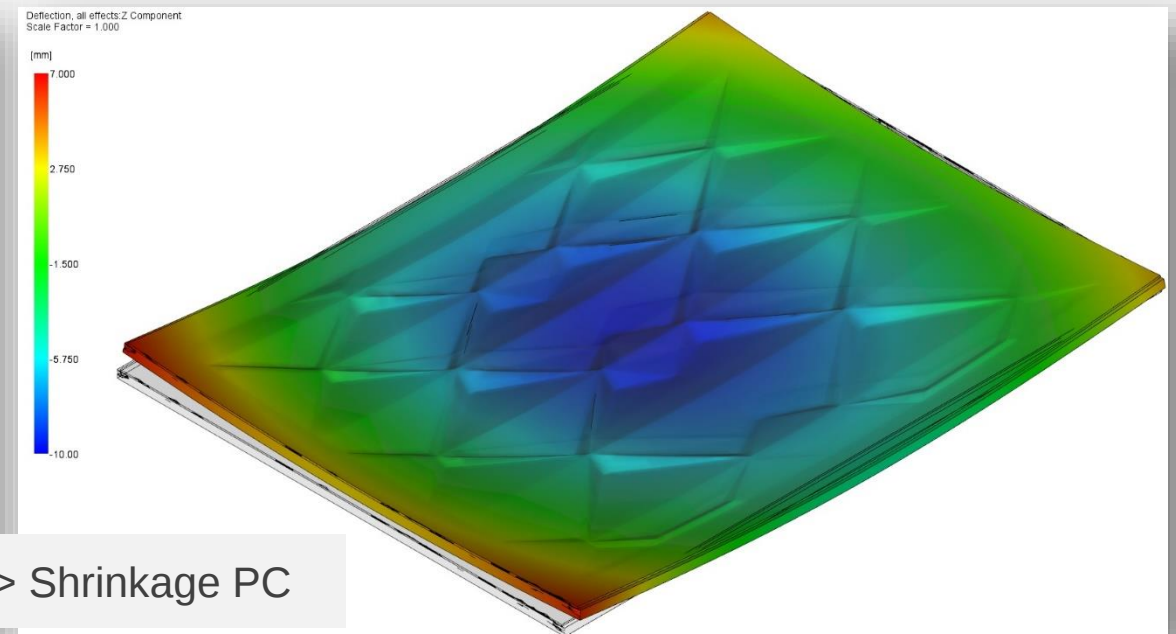
Combined warpage prediction for PC substrate and PUR coating



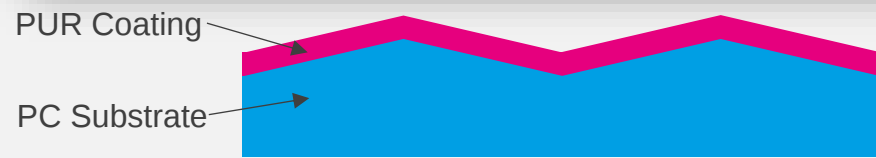
Uniform PUR coating:



Structured PUR coating:



Shrinkage PUR > Shrinkage PC



SOP example - front panel BMW iX

Current exterior Direct Coating application in Makrolon® AG 2677



- Application: Decorated front panel in BMW's "kidney style"
- Partner: BMW Group, Landshut site, Votteler
- Properties:
 - Transparent optical grade Makrolon® AG
 - 3D styling with multi color decoration
 - Partial film insert molding for RADAR heating with Makrofol® UV244
 - Protected by Direct Coating Polyurethane layer with self healing effect

Products

Makrolon® AG2677, Makrofol® UV244

Picture(s): © BMW Group

SOP example – Smartbar BMW i7

Current interior Direct Coating application in Makrolon® Ai2617



- Application: Replacement of classical interior control concepts
- Partner: BMW Group, Valeo, Weidplas, Rühl
- Properties:
 - Transparent optical grade Makrolon® Ai
 - Exclusive appearance by “Glass-Like Swarovski / Diamond” depth effect realized by Direct Coating Polyurethane layer with self healing effect
 - Integrated air ventilation unit
 - Ambient lighting

Products

Makrolon® Ai2617

Picture(s): © BMW Group

Outlook for new Direct Coating applications

Coloured coating systems for exterior applications



Outlook for new Direct Coating applications

Coloured coating systems for exterior applications



Makrolon® IMC

Tailored Makrolon® for Direct Coating / Direct Coating

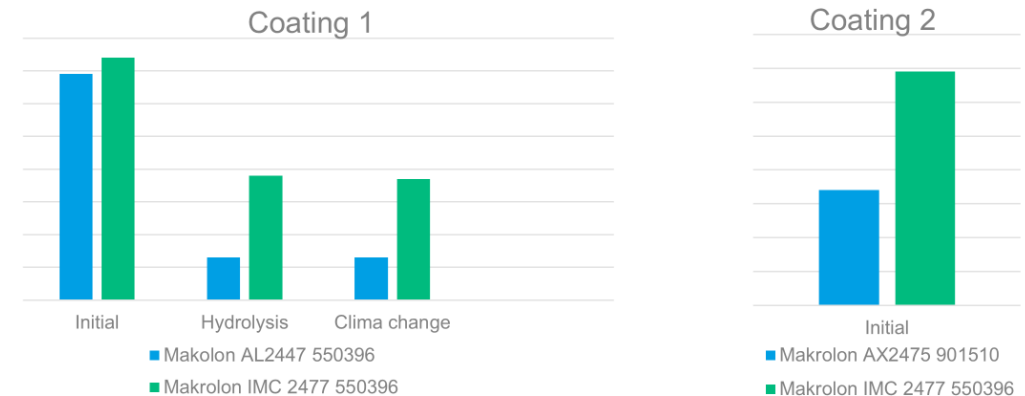


- Modified polycarbonate for the Direct Coating / In-mold Coating process
- Optimized for adhesion to PUR coating systems
- Tailored raw material and additive packages
- Suitable for interior and exterior automotive application
- Besides transparent formulations, the material is also available in translucent, IR-transparent and colored formulations
- Selected light-fast colorants also for exterior
- Holistic customer service package

Makrolon® IMC

Optimization of adhesion by adjusting Polycarbonate

- Post-processing of the components is easier (e.g. milling, cutting, stamping)
- Adhesion confirmed with partners



Important: Adhesion is influenced not only by the substrate but also by the coating system!

Polycarbonates in the Electric Vehicle Platform



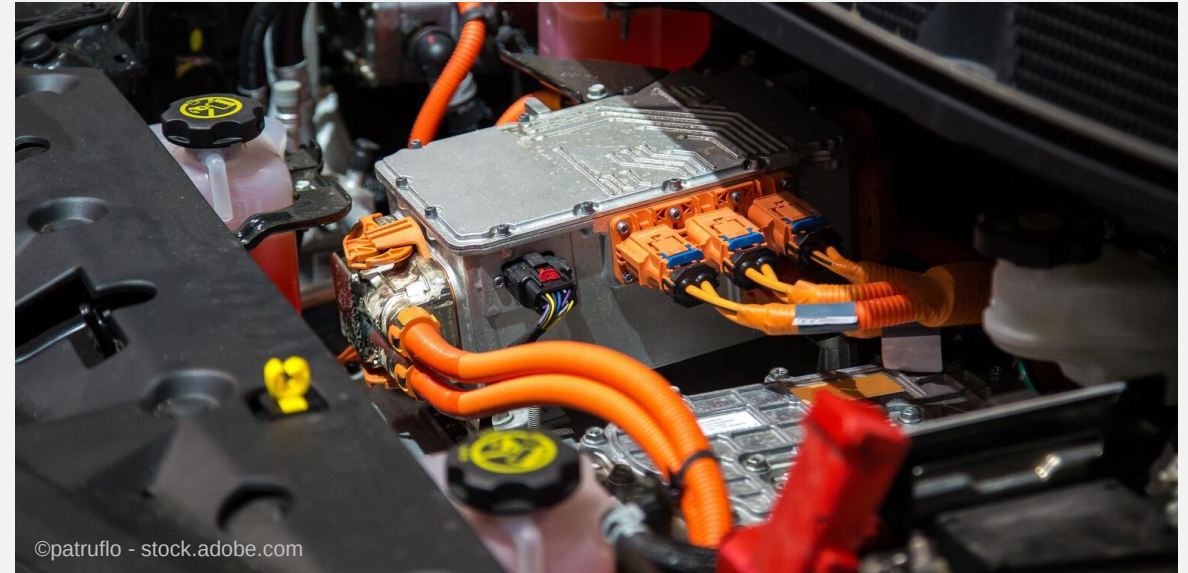
The electrification trend changes the requirements for plastics used “under the hood”

Internal combustion engines (ICE)



- Typically no use of polycarbonates

As the electrification accelerates



- Electric vehicles are increasingly becoming “computers on wheels”
- Polycarbonate is a core in the EE industry, thus a natural fit as dimensionally stable, inherent flame retardant, and lowest tolerances material for electrified vehicle packaging

Electrifying mobility with Covestro

Let's rethink traditional solutions together.

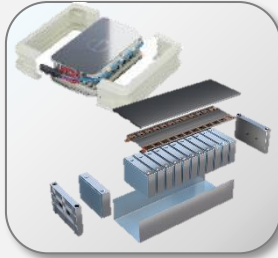


Battery packaging

Bayblend® FR, Makrolon®

Makrolon® TC, Bayblend® FR CTI¹

Low warpage, stable across temperature and low carbon footprint
Module housings, covers, cell carriers



Power electronics

Makrolon® FR CTI, Makrolon® TC

Bayblend® FR CTI¹

Low warpage, precision molding, stable across temperature w/o GF
Housings, brackets, heat sinks...



Sensors

Makrolon® AX ST

Excellent sensor transparency

LiDAR covers

Bayblend®, Makroblend®

Excellent and homogeneous dielectric properties (DK & Df)

RADAR housings



Control units

Bayblend® FR,

Makrolon® (TC)

Dimensional stable, heat resistant and ductile
Electronic housings, covers, plugs and sockets



V2X connectivity

Makrolon®, Bayblend®, Makroblend®

Excellent signal transmission due to amorphous structure
5G antenna integration...

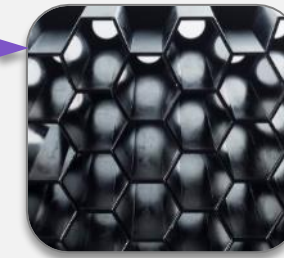


Charging units

Makrolon®, Bayblend® FR

Makrolon® & Bayblend® FR CTI¹

Excellent low temperature ductility, design freedom, high durability
Displays, charging status indicators, housings...



Crash absorbers

Makroblend®

Best energy absorption in limited installation space vs. GF plastics
Protection of batteries, power electronics and others



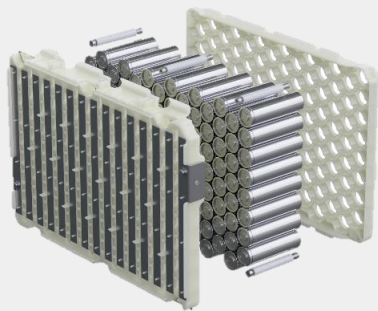
Materials For Batteries & Electronics

Let's rethink traditional solutions together.



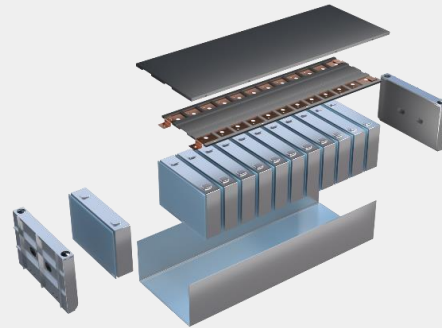
Cylindrical cells

Cell holders, busbar holders, cell contacting systems



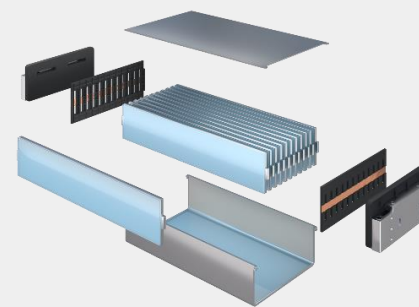
Prismatic cells

Insulation plate, top/bottom plates, end plates, cell contacting systems



Pouch cells

Cell frames, top/bottom plates, busbar carriers



Independent of cell type

Battery parts, electronics housings, large-size part



Source:
Alta Motors 2018

Source:
BMZ GmbH 2018

Low warpage, stable across temperature, low carbon footprint

Bayblend® FR, Bayblend® T, Makrolon® FR

Heat dissipation for
extended lifetime

Makrolon® TC

Improved foam
adhesion

Makroblend®

Electrical safety

Bayblend® CTI

Precise molding

Bayblend® T

Stable high modulus

Bayblend® GF

Flame retardant

Bayblend® F

Makrolon® FR

Electrical safety

Bayblend® CTI

Makrolon® CTI

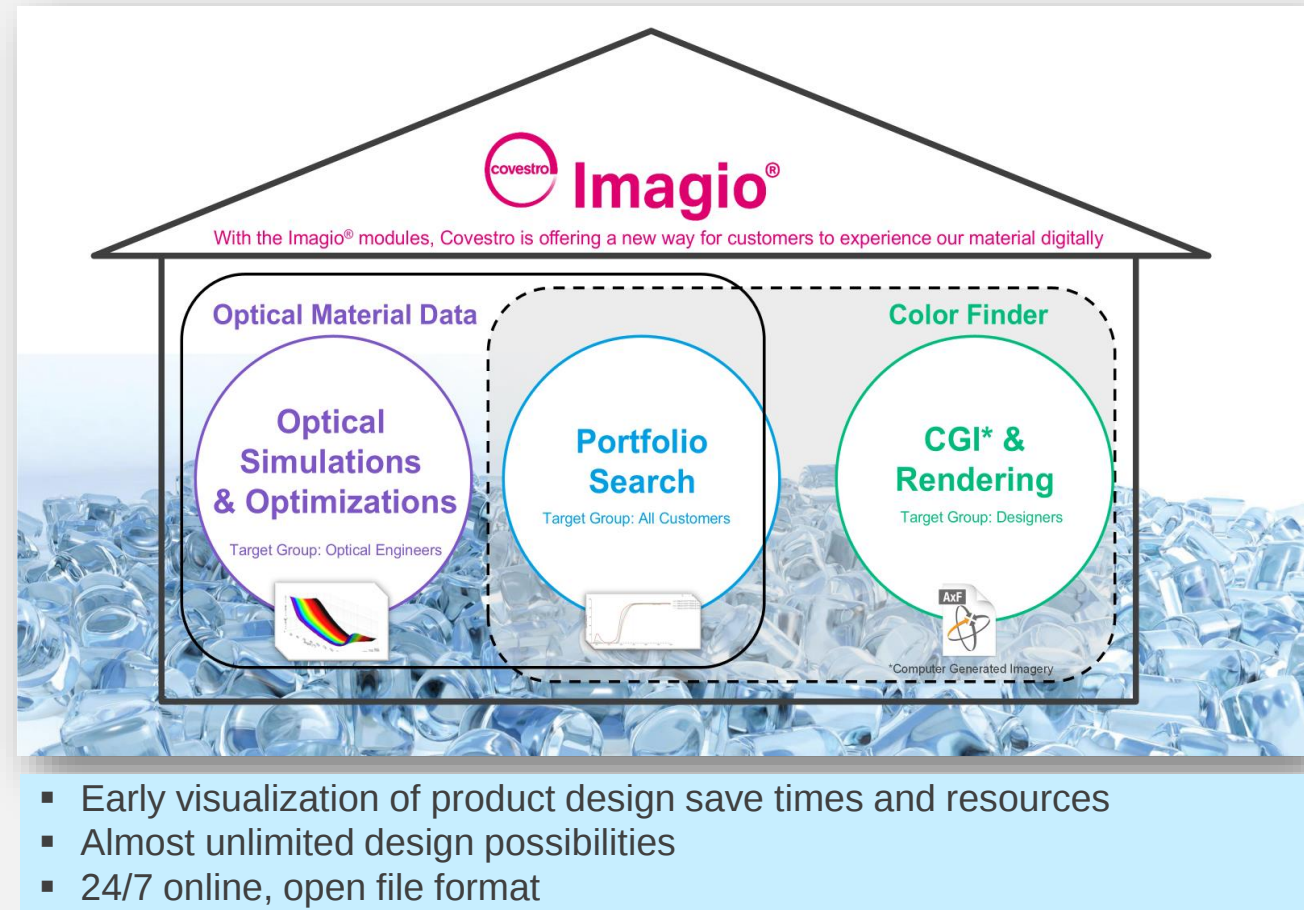
Highly ductile

Makroblend® UT



Imagio® CQ

New ways of supporting customers in product development - more speed from design to series production



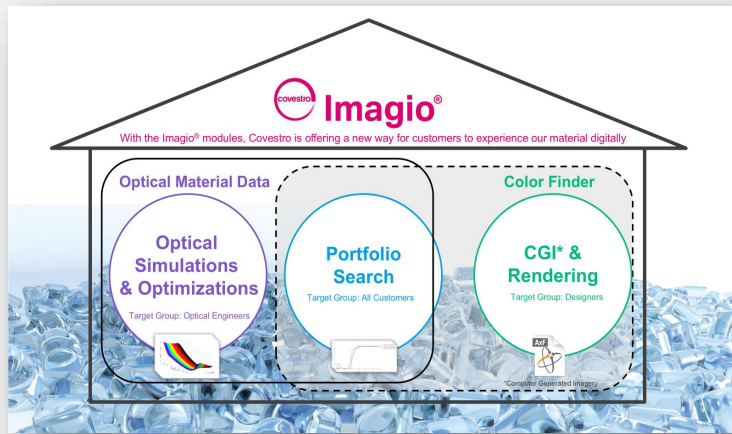
<https://solutions.covestro.com> / [Digital sampling with Imagio®](#) | Covestro

Imagio® CQ

AxF files for photorealistic materials in your rendering software



The backbone of the digital solution is the Total Appearance Capture (TAC™) technology from X-Rite / PANTONE®, which captures optical properties such as color, gloss, transparency, translucency or surface texture of a specific material sample using an optical appearance measurement device. The data is stored in a special data format called **AxF** which can be used in popular rendering software tools like Autodesk® VRED®, Dassault Systèmes® DeltaGen®, Luxion® Keyshot®, NVIDIA® Iray® or Chaos® V-Ray®. Contact our **Covestro material experts** which can provide you with the appropriate data for your visualization tool.

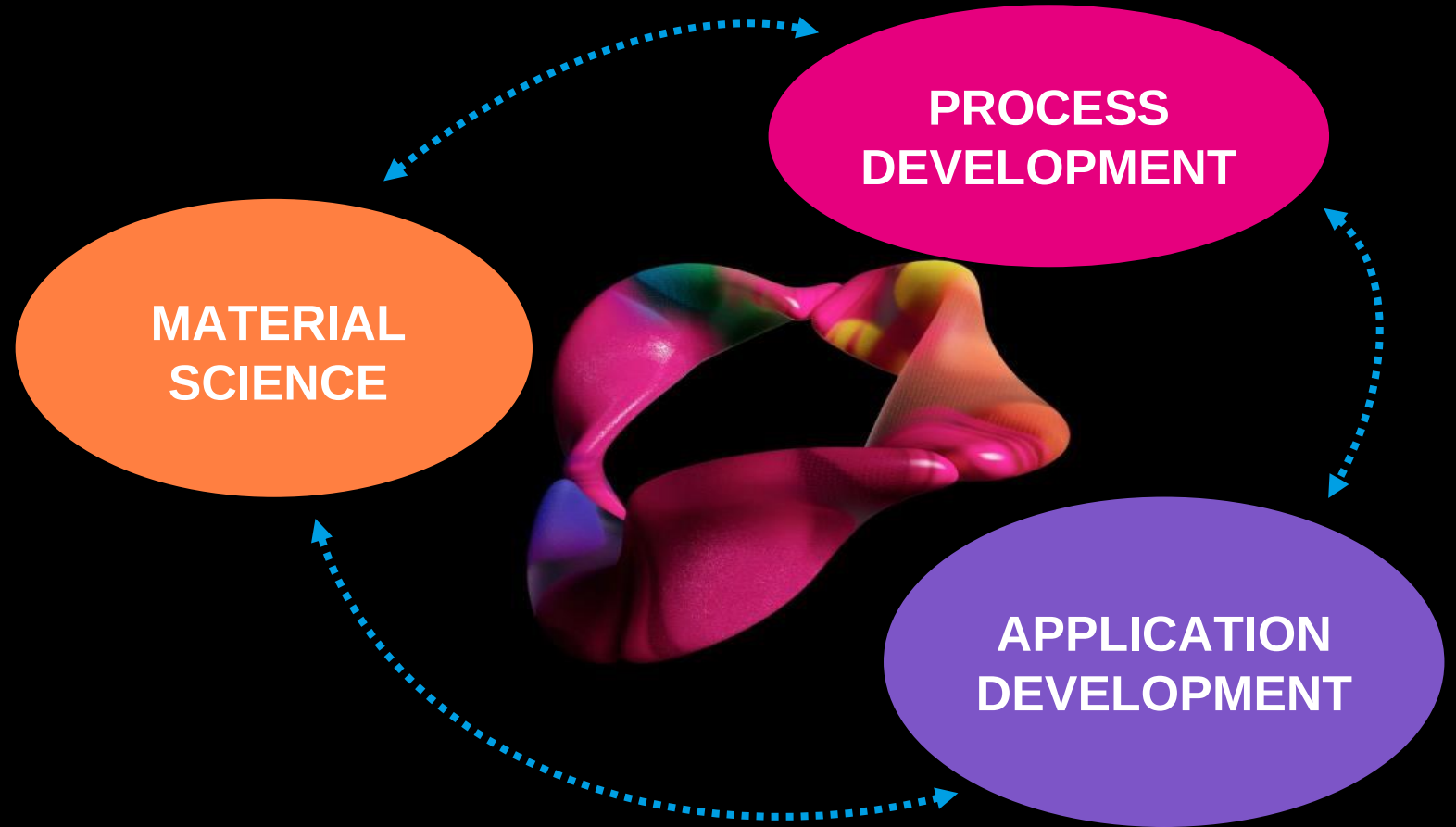


The simulation and development of optical illumination systems is an area with very specific requirements. The Imagio® CQ family has now been extended by a module called Imagio® **Optical Material Data** which can be accessed after registration. The target group are experts in the field of development and simulation of optical components, i.e. automotive headlights and interior lighting as well as general lighting. On the one hand it is possible to specifically search for optical material properties in our polycarbonate portfolio, on the other hand Covestro provides the necessary data for optical simulation programs like Ansys® Speos, Synopsys® LightTools® or customers' in-house optical simulation solutions.

K2025

We simply put it in three words:

The Material Effect



By fusing premium materials with specialized expertise, we bridge laboratory and industrial scale development. This powerful combination of material science, process- and application-development enables breakthrough performance. It's not just about what our materials are – it's about what Covestro enables you to achieve.



Thank you.

Contact QR code



Forward-looking statements

This presentation may contain forward-looking statements based on current assumptions and forecasts made by Covestro AG.

Various known and unknown risks, uncertainties and other factors could lead to material differences between the actual future results, financial situation, development or performance of the company and the estimates given here. These factors include those discussed in Covestro's public reports which are available on the Covestro website at www.covestro.com.

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