



INVENTING PRODUCTIVITY GAIN FOR YOU



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Pasquick™ Polyaspartic Technology Change the Coatings Game

Desmodur® Desmophen®



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Desmodur® Desmophen™



INVENTING VISIONS FOR YOU

As your leading partner for polyurethane chemistry, we know you are competing in increasingly challenging environments: Your customers are becoming more and more demanding in their expectations for the quality, durability, sustainability and aesthetics of products. And they have more choices. For you this means that cost pressure is rising – while innovation cycles are becoming faster and faster.

Helping you to turn this challenge into your competitive advantage is the goal that drives our daily work. We call it: INVENTING FOR YOU. But what exactly are the basic values underlying this promise? What principles enable us to improve your productivity, drive sustainability, ensure reliability and co-create future-proof businesses? First and foremost, we are curious. Because only if we listen closely to you and ask the right questions can we respond to your individual needs with new, creative and unexpected solutions that make a real difference to you. That's why inventing for us always starts with thinking about your unmet business challenges. It requires an in-depth understanding of your needs along the whole value chain. To ensure that what we invent stands the test of time. Living up to this aspiration requires more than competencies – it calls for a corporate culture of being courageous. A culture that is defined and lived by dedicated people who cooperate to push the boundaries of invention founded on knowledge and experience. Our courage permeates our entire business – from partnerships to business models. This is also reflected in our colorful business philosophy. We appreciate partnerships that go beyond traditional black-and-white ways of acting and thinking. An attitude of openness that invites you to co-create new things – enabling you rather than just providing. We are optimistic and resourceful in finding solutions that inspire our customers and partners.

This set of fundamental values adds up to an unrivaled performance orientation to constantly strive for something better, be it through big or small changes. A true sense of business regardless of function. And a deep commitment to delivering our promise everyday. Anywhere. Again and again.

INVENTING FOR YOU.

What this means for our Coating, Adhesive & Specialty business

Quality & supply security

Our products are of outstanding quality and we offer supply security – worldwide.

Covestro, the world's leading manufacturer of aliphatic and aromatic poly-isocyanates, offers an extensive range of raw materials and services for the coatings and adhesives industry. This allows the very latest technology to be used extremely effectively for a variety of applications.

Our global setup enables you to increase your competitive advantage.

What we offer:

- A global network of research & development centers where our staff are dedicated to offering solutions for the coating and adhesive industry.
- A unique setup and worldwide network of state-of-the-art production sites ensuring short lead times and supply chain flexibility.
- Outstanding product quality through fulfilling the requirements of state-of-the-art quality, environmental and safety (HSEQ) as well as energy management standards; we are proud of having enjoyed ISO 9001, ISO 14001, ISO 18001 and ISO 50001 certifications for many years.

Covestro is your reliable partner for polyurethane chemistry.

Solutions to enhance your process efficiency

Nowadays, the quality demands made on industrial processes are very high. This is equally true of the cost-cutting requirements. However, both goals can be achieved by increasing process efficiency. At Covestro we have a wide range of solutions designed to enhance your process efficiency. Why not take advantage of our know-how? These solutions will benefit your bottom line.

Sustainability

Sustainability is at the heart of the Covestro strategy. We inspire innovation and drive growth through profitable products and technologies that benefit society and reduce the impact on the environment.

Our coatings, adhesives and specialty products and solutions contribute to sustainability through:

• Saving energy – fast and smart

Polyurethane systems represent a benchmark in productivity and process efficiency in many industries. We strive to further push the limits of efficiency by developing game-changing new solutions.

• Reducing waste

We offer solutions such as innovative 1K technologies that enable our value chain partners to use materials more efficiently and reduce waste.

• Cutting emissions

Bayhydur® and Desmodur® grades are key enablers for low-emission solutions in the coatings and adhesives industries – waterborne and high solids/solvent-free!

• Responsible management of natural resources

Highly durable PU-based coatings and adhesives significantly extend the lifetime of a coated product and thus help to prolong resource use.

• Closing the loop (circularity)

Through economically viable products made from biobased raw materials – with no deterioration in performance – we help our customers and value chain partners to reduce their carbon footprint and offer solutions that incorporate renewable building blocks.

What we do

As a world-leading polymer and material science company, we inspire innovation and drive growth through profitable products and technologies that benefit society and reduce the impact on the environment.

Who does all this?

It's our people! And the way we work together as one global team following a set of six elementary principles – value creation, sustainability, innovation, focus on people, safety and fair play. This is our formula for success.

Pasquick™ polyaspartic technology – the game-changing benefits

Pasquick™ is the brand name for the polyaspartic technology from Covestro.

Nowadays, machine manufacturers, owners of commercial or industrial premises, car refinishing shops and other relevant decision-makers want coatings that can speed up the painting operation while at the same time deliver the high performance known from 2K PUR coatings. Without sacrificing performance, Pasquick™ polyaspartic coating technology offers greater productivity for applications in car refinishing, construction, protective and industrial coatings. Whether for cars, bridges, stadiums, large buildings, flooring or architectural elements, Pasquick™ technology brings cost savings in application and enables normal operation to be resumed in the shortest possible time. That is why Pasquick™ polyaspartic technology can indeed change the coatings game.

Increased productivity and cost efficiency

The main benefit of Pasquick™ based coatings is that they significantly increase productivity in the application process. This gain in productivity over conventional coating technologies can be achieved thanks to two properties of polyaspartic coatings:

- Significantly faster drying times at ambient temperature than conventional 2K PUR coatings, which allows a faster return to service or earlier handling of the coated parts.
- For high film build applications, a much greater film thickness in a single operation is possible, which in practice means one layer can be saved.

This increased efficiency is particularly important in a chain of operations where the coating process can often act as a bottleneck. The two benefits of rapid drying and reduced number of coats significantly boost productivity.

Energy costs and CO₂ savings

The unique reactivity of aspartics with aliphatic polyisocyanates makes their reaction kinetics more independent of temperature than is the case with conventional 2K coating technologies. In practice, that means that no oven is required to obtain fast cure properties.

Especially in high throughput paint shops for car refinishing, polyaspartic coatings contribute significantly to reducing energy costs and CO₂ emissions – both factors of increasing importance.

From ultra-high solid to solvent-free

Increasingly strict legislation demanding reductions in volatile organic solvents necessitates the use of low-solvent coating materials. In the case of OEM coatings for plant and machinery this is particularly relevant when conventional coating materials have to be replaced. However, many low-solvent or solvent-free coating materials require an investment in new equipment and/or modifications to the production process. Since this is often impossible or simply too expensive, coating materials that can be used with existing equipment are of particular interest. Low-solvent coating materials, which (depending on the application) either have a VOC content of less than 250 g/l or are virtually solvent-free in their ready-to-use state, can be produced on a polyaspartics basis to comply with current legislative requirements, e.g. the EU VOC Directive.



Long-lasting performance

In general, the well-known positive attributes of aliphatic 2K polyurethane coatings are also found in 2K Pasquick™-based coatings, e.g. high gloss retention during weathering, adjustable flexibility through the polyisocyanate chosen, resistance to acids and alkali, high mechanical resistance (e.g. abrasion resistance and impact strength) and ease of repair. The key benefits that determine the success of Pasquick™ coatings are illustrated here:



Fig. 1: Key benefits in the success of polyaspartic coatings

Pasquick™ polyaspartic technology

Pasquick™ for industrial coatings/corrosion protection

Thanks to their high productivity, polyaspartics are already being used for a variety of metal coatings. One of the main applications is the OEM coating of steel parts for corrosion protection and industrial coating purposes.

Industrial coatings

In the field of industrial coatings, Pasquick™ technology is widely used for coating agricultural and construction machinery. The size and weight of such machines mean they are often unsuitable for forced drying at elevated temperatures. The two-coat system frequently used at present for such machines can be replaced by a one-coat polyaspartic topcoat.

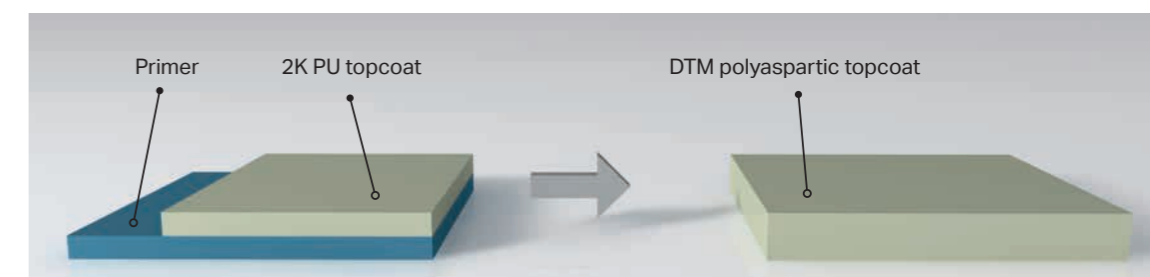


Fig. 2: Replacement of the primer by a direct-to-metal polyaspartic topcoat

Corrosion protection

In the case of the three coats frequently applied for heavy-duty corrosion protection, e.g. on bridges and wind turbines, the intermediate coat can be replaced by a Pasquick™ topcoat (see figure below).

The main applications for Pasquick™ topcoats are in the field of OEM coatings. Numerous practical examples in the past have demonstrated the suitability of Pasquick™ technology for heavy-duty corrosion protection.

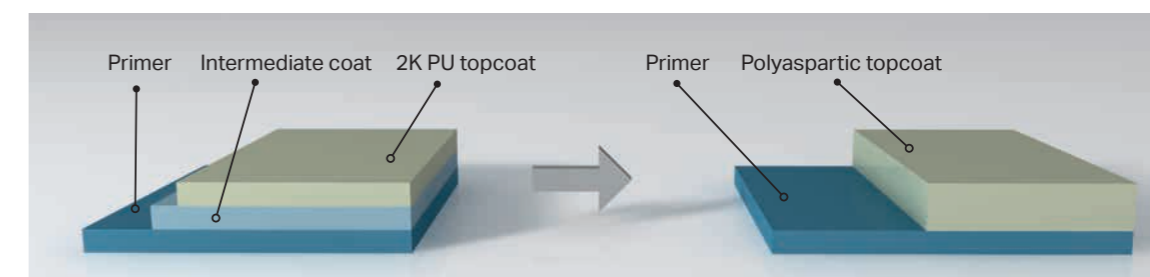


Fig. 3: Replacement of the intermediate coat by a polyaspartic topcoat





Gel coats, pore fillers and surfacers for fiber-reinforced plastics

Wind turbines have to withstand extremely rugged conditions over long periods. For several years now, polyaspartics-based gel coats, pore fillers and fine surfacers have been used for coating rotor blades made of glass fiber-reinforced composites to prolong the working lives of wind turbines. These reactive systems can be applied by rolling (gel coats), brushing (pore fillers) or knifing (surfacer) at high film thicknesses, and are mainly used to fill the pores and smooth surfaces of rotor blades. The high efficiency of these polyaspartic systems means that an entire paint system can be applied in a single working day thanks to the high film thickness and high curing reactivity (fast drying and sandability). Through the combination of high flexibility and hardness, these systems show good adhesion to the substrate and constitute a good substrate for the final finish, the 2K polyurethane topcoat.

Polyaspartic systems for automotive and large vehicle repairs

In a world of increasing mobility and a rapidly growing number of vehicles on the road, accidents happen. When they happen, whether a car needs a little touch up or a complete overhaul, polyaspartic systems for automotive refinish coatings and a professional application will make it look like new again. The high competitive pressure in the automotive repair business drives the industry's efforts towards a continuous improvement of the painting process. For manufacturers of repair coatings systems who are looking for efficiency improvements in the whole repair process, polyaspartic-based systems offer substantial savings in both cycle times and energy consumption while fulfilling the end users' high quality requirements. Furthermore, these systems make a bodyshop's workflow more flexible, because they enable fast drying by oven curing, infrared, or even at ambient temperatures.

- **Knifing putty:** Low-odor knifing putties based on highly reactive polyaspartics and low-viscosity polyisocyanates can be formulated for a quick repair process and offer the benefits of easy application, rapid dry sandability, and good adhesion to metal.
- **Primer surfacers:** Combinations of polyaspartics with reactive thinners (aldimines), low-viscosity polyisocyanates, and a minimum amount of solvent for spray application are used to formulate very high-solid primer surfacers or fillers (VOC < 250 g/l). Such systems are characterized by rapid dry sandability, good adhesion to a wide range of metal substrates, and excellent corrosion protection.
- **Clear coats:** Very high-solid clear coats based on aspartics and reactive thinners in combination with special low viscosity polyisocyanates offer the benefits of very fast drying times at ambient temperatures, good chemical resistance and a highly brilliant finish that reduces the time and effort needed for polishing.



By using a repair coating system based on polyaspartic technology, it is possible not only to reduce solvent content and save up to 80% of energy costs, but also to make the whole repair process far more efficient, resulting in a significant increase in throughput. Desmophen® NH-based refinish coatings systems are essentially time in a can!

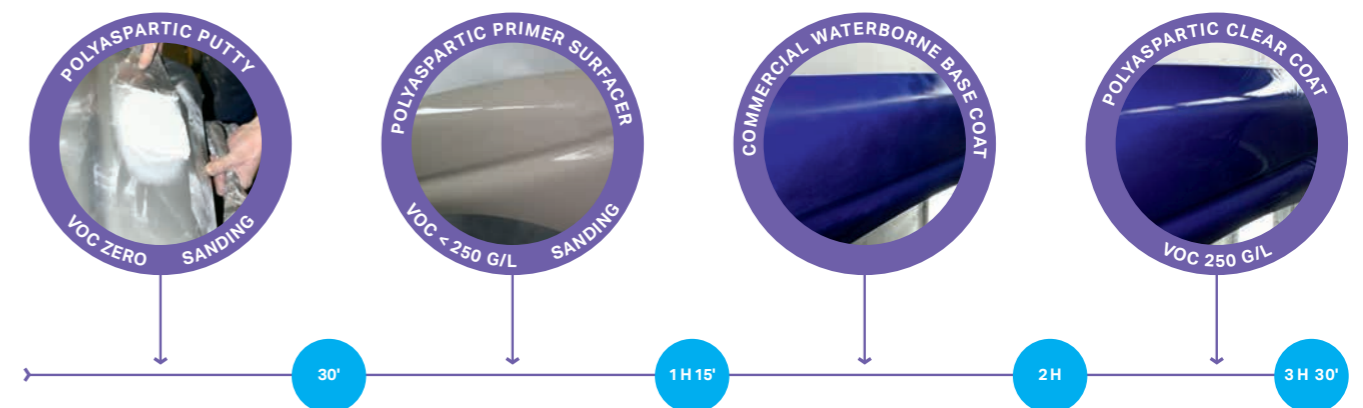
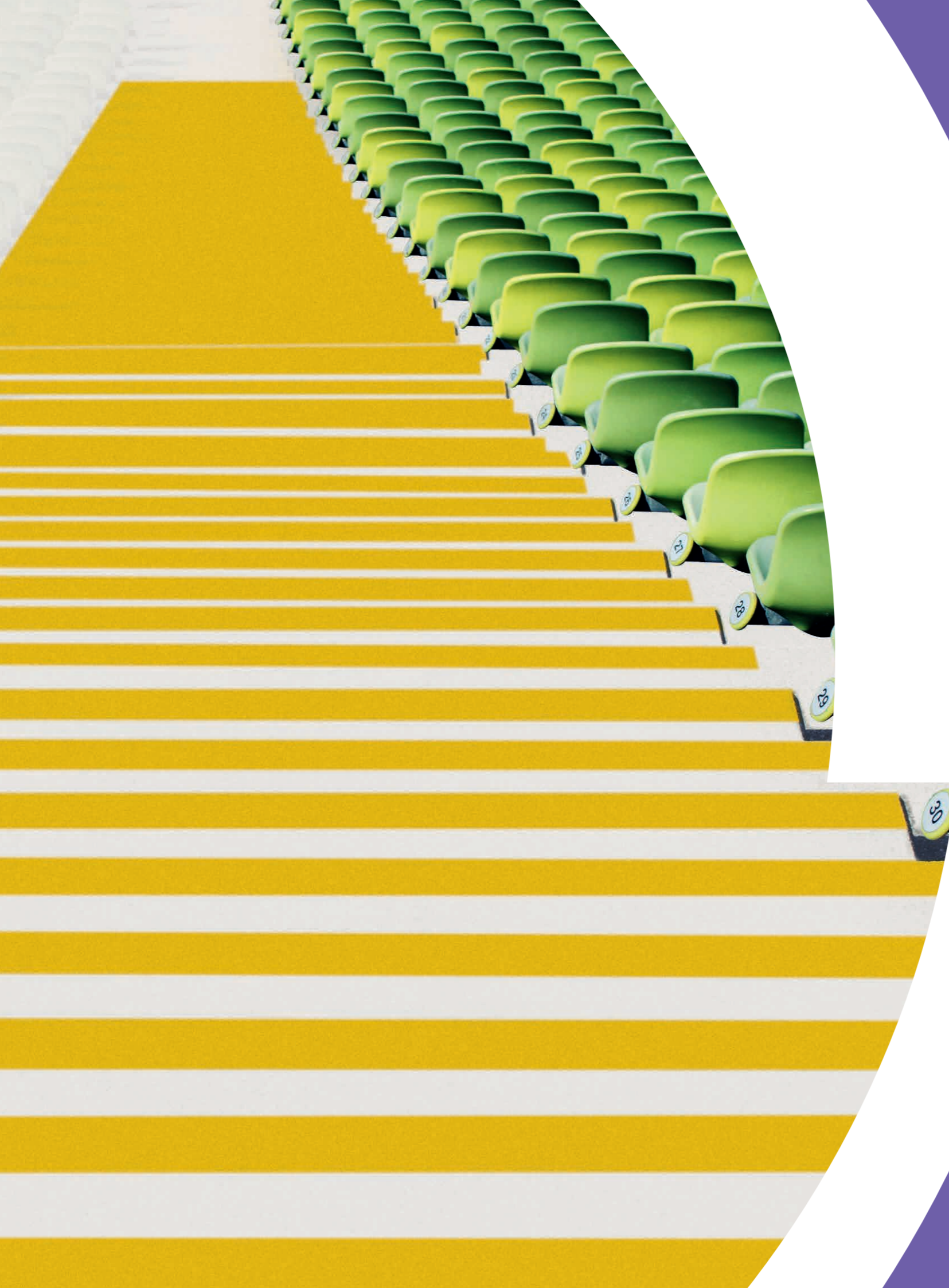


Fig. 4: Efficiency of polyaspartic systems for automotive and large vehicle repairs

ROOM TEMPERATURE, 50% RH



Construction industry

In the construction industry polyaspartic coatings have long been in use in many application areas, such as topcoats (e.g., for polyurea, self-leveling floor coatings, parking decks or garages), stone carpets (e.g., as a binder for colored sand, decorative mortars or terrazzo), waterproofing (e.g., balcony, terrace or access balconies) or sealants (pourable joint sealants). Each field of application has its own individual requirements, which can be met with the wide range of formulation possibilities offered by our Pasquick™ technology toolbox. Furthermore, our technology allows formulations that fulfill the demanding requirements of indoor air regulations (AgBB). What they all have in common is the need for speed to allow normal work to be resumed as quickly as possible, making project and cost efficiency possible without compromising longevity.

Topcoats

- **Polyurea self-leveling floor coats and parking decks:** Most common floor coatings are based on aromatics (= yellowing binders). Standard 2K polyurethane topcoat technology can add color

stability to the system but with a curing time of approx. 8–16 hours, the application no longer enjoys the advantage of weather tolerance. Polyaspartic coatings are a logical supplement to fast-setting polyurea technology. When applied by roller or 1K airless spray equipment, a polyaspartic topcoat allows a 2-hour curing time with a pot life of approx. 30 min. Consequently, the complete waterproof coating system is virtually weather-independent.

- **Fast-setting garage coating system:** Painting small areas like a private garage (up to 150 m²) using a conventional coating system is a time-consuming and labor-intensive business. A curing time of between 8–16 hours with the common solventborne 2K technology means that contractors can only apply one coat per day and have to come to the site at least three times. With polyaspartic coating technology, a 3-coat system can be applied with a roller within a day, saving significant labor costs and hassle for the owner. In addition, ultra-low VOC and indoor air quality compliant polyaspartic coating systems are now state of the art (see figure below).

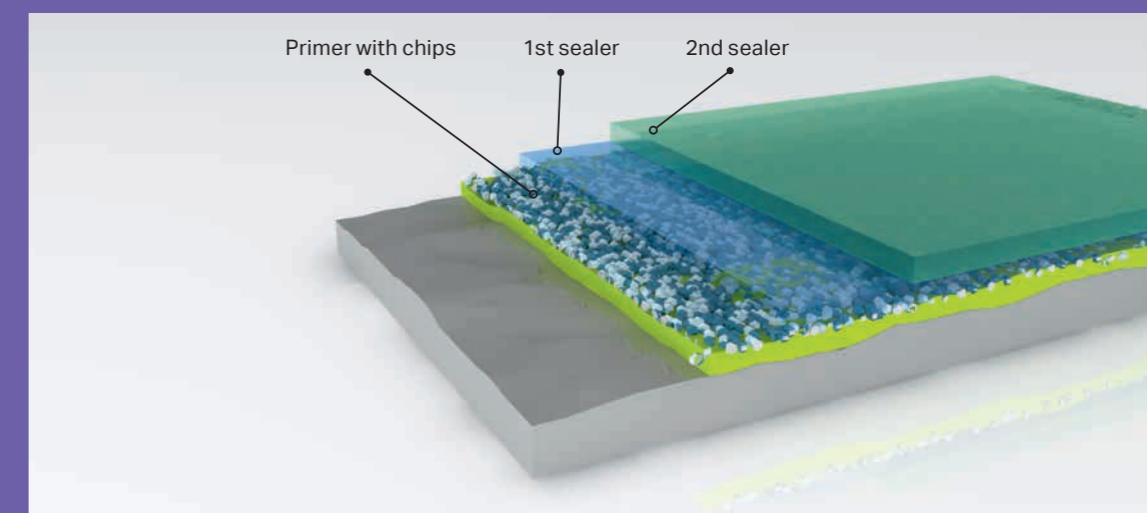
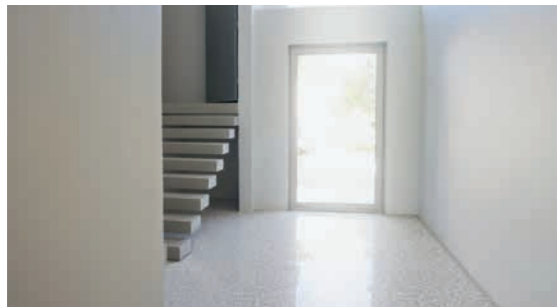


Fig. 5: Fast-setting garage coating system



- **Highly decorative photo flooring:** In the past, laying highly decorative seamless flooring was a big job requiring a great deal of time-consuming preparation followed by artistic painting with many small paint cans and brushes. Since 2–4 m²/h for the actual picture was normal, an entire floor could take 5–7 days, even for small shop-in-shop areas. But now polyaspartic coating photo floor technology has introduced a kind of “pre-fab” work routine to the world of floor coatings. The floor picture is printed on fabric and applied in a lamination process on site. Normal working can resume on the decorative flooring within eight hours so that a shop owner, for example, will have the work done overnight.
- **Concrete sealers for stamped and/or stained concrete:** Stamped and/or stained concrete can be protected against soiling and given greater abrasion resistance by a clear coat. Conventional sealers are solvent-based or, in the case of waterborne 1K paints, no longer comply with requirements such as durability, abrasion, etc. Polyaspartic clear coats not only provide long-lasting performance, they are also ultra-low VOC and indoor air quality compliant, making them the first choice for indoor applications.
- **Stone carpet binders:** Seamless stone carpets are another decorative flooring alternative. Mosaic or terrazzo-like decorative flooring can be produced through a mixture of natural stones or colored quartz sand (for which polyaspartics can also be used) and a reactive binder. The fast-curing properties and brilliance of polyaspartic coatings are a major advantage in this field.





Decorative waterproofing for outdoor applications

Balconies, roof gardens, loggias and access balconies are exposed to sunlight and weathering. What's more, they are often subject to significant mechanical stresses. Flexible decorative polyaspartic waterproofing membranes are the product of choice as they can be formulated as 100% solids and fast-drying coatings. The resulting membranes are lightfast and resistant to moisture, display moderate chemical resistance properties, and have crack-bridging properties to prevent water penetrating into the building, even at low temperatures.

Pourable joint sealants

Pourable joint sealants based on polyaspartic technology offer some unique advantages over other technologies. By choosing the right products, the UV and color stability of the sealant can be dramatically improved. Polyaspartic joint

sealants also have the unique ability of curing at low temperatures. In addition, the use of plasticizers can be eliminated in some formulations. Apart from their good working-to-curing time ratio, polyaspartic sealants, once cured, offer better physical properties than conventional pourable sealants.

In tune with market drivers

Concerted efforts to enhance effectiveness and efficiency are more important than ever while the quality and environmental compatibility of coatings remain crucial success factors. Polyaspartic coatings are fully in tune with these market drivers, with their use in different industrial and construction applications demonstrating the key benefits polyaspartic coatings bring. So it is hardly surprising that they are now being used in more and more fields of application, e.g. in-mold coatings.



Polyaspartics chemistry – and our portfolio

Aspartics are sterically hindered secondary diamines (see figure below).

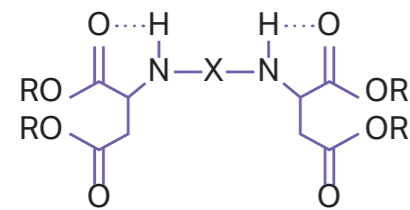


Fig. 6: General structure of aspartics

General structure of aspartics

The reactivity of aspartics with polyisocyanates can be influenced through the choice of the rest X (see fig. left), which enables the parameters of pot life and drying time to be specifically adjusted in a broad range (see the table below).

Our aspartics portfolio	SUPPLY FORM SOLID CONTENT [%]	AMINE NUMBER APPROX. [mgKOH/g]	VISCOSITY @ 25°C [MPa · s]	EQUIVALENT WEIGHT APPROX.	COMMENTS
	Desmophen® NH 1220	100	244	90	
Desmophen® NH 1420	100	201	1,450	276	Standard, moderate reactive Pasquick™ resin or co-resin for very high-solid to 100% solids 2K PU coatings (floor coatings, corrosion protection topcoats, ACE & commercial vehicles, general industrial coatings), indoor air quality compliant.
Desmophen® NH 1422	100	201	1,450	276	A Desmophen® NH 1420 type with prolonged pot life.
Desmophen® NH 2850 XP	100	190	100	295	Reactive diluent for very high-solids to 100% solids 2K PU coatings (floor coatings, corrosion protection topcoats, ACE & commercial vehicles, general industrial coatings), indoor air quality compliant.
Desmophen® NH 1520	100	191	1,400	290	Low-reactive Pasquick™ resin or co-resin for very high-solid to 100% solids 2K PU coatings (corrosion protection topcoats).
Desmophen® NH 1521	90 BA	172	160	326	90% supply form of Desmophen NH 1520.

Aspartics react with aliphatic polyisocyanates to form polyaspartics (see figure below).

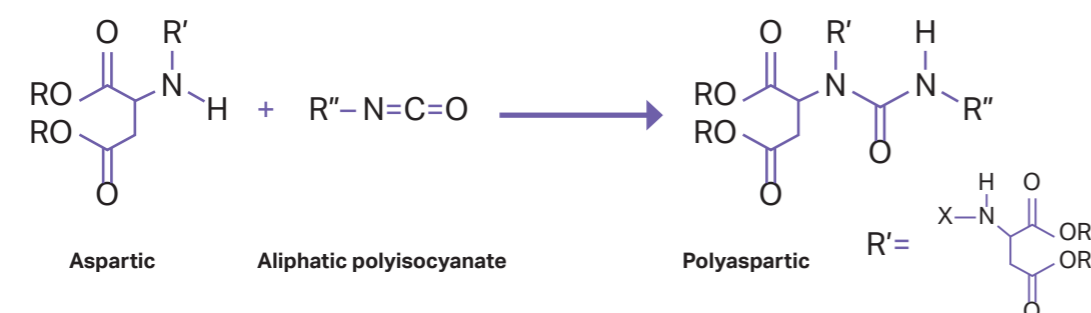


Fig. 7: Reaction of aspartics with aliphatic polyisocyanate to give polyaspartics

The choice of polyisocyanate, which depends on the factors influences the properties of the polyaspartics:

- Desired VOC content
- Application
- Mechanical properties
- Adhesion to the substrate

Aliphatic polyisocyanates as co-reactants for aspartics	SUPPLY FORM APPROX. [%]	NCO CONTENT ON SUPPLY FORM APPROX. [%]		FUNCTIONALITY APPROX.		COMMENTS
	VISCOSITY @ 23°C APPROX. [MPa · s]	EQUIVALENT WEIGHT APPROX.				
Desmodur® N 100	100	10,000	22.0	190	3.8	Basic Pasquick™ coatings hardener for solventborne, weather-stable and non-yellowing topcoats.
Desmodur® N 3200	100	2,500	23.0	185	3.5	Lower viscosity than Desmodur® N 100.
Desmodur® N 3580 BA	80 BA	500	15.4	273	> 5	Highly functional aliphatic polyisocyanate (HDI allophanate trimer); in combination with Desmophen® grades for the formulation of lightfast, weather-, chemical- and scratch-resistant polyurethane coatings systems.
Desmodur® N 3600	100	1,200	23.0	185	3.2	Low-viscosity crosslinker for lightfast coatings; standard hardener for Pasquick™ coatings.
Desmodur® N 3800	100	6,000	11.0	380	3.8	Pasquick™ coatings hardener to improve impact resistance and deliver moderate flexibility.
Desmodur® N 75 MPA/X	75 MPA/X	250	16.5	255	3.8	Special supply forms of Desmodur® N 100 for different applications; other supply forms available.
Desmodur® N 75 MPA	75 MPA	280	16.5	255	3.8	
Desmodur® N 75 BA	75 BA	160	16.5	255	3.8	
Desmodur® N 3900	100	730	23.5	180	3.2	Low-viscosity crosslinker for Pasquick™ coatings (very highsolids to near-zero VOC), especially for floor coatings.
Desmodur® XP 2763	80 BA	2,100	10.2	412	3.0	Crosslinker for Pasquick™ coatings; longer pot life and extended application window; reduced dependency on humidity with Pasquick™ coatings.
Desmodur® XP 2840	100	500	23.0	185	3.0	Low-viscosity crosslinker for Pasquick™ coatings (very highsolids to near-zero VOC), especially for floor coatings.
Desmodur® XP 2860	100	500	20.0	215	2.5	Low-viscosity crosslinker for Pasquick™ coatings (very highsolids to near-zero VOC), especially for floor coatings; very good combination of working and short curing time; preferred hardener for fast-setting 2K spray coatings.
Desmodur® E 2863 XP	100	1,350	11.0	380	2.2	Pasquick™ coatings hardener for waterproofing membranes and flexible floor coatings.

The wide variety of possible combinations enables the development of customized polyaspartic-based coating materials to meet a wide range of requirements.

Fast-lane access to polyurethane innovations

At Covestro innovation is in our DNA. Ever since Otto Bayer discovered polyurethanes in 1937, we have been driving polyurethane innovations in coatings and adhesives as well as in other application areas. As our partner you enjoy fast-lane access to polyurethane innovations, and can help us in developing the next generation of polyurethanes to meet the industry's upcoming challenges and needs. What can we offer you?

- Powerful know-how on both established and new polyisocyanates, as well as on new polyurethane hybrid technologies
- The prospect of new application technologies to enable efficient processes
- More sustainable, biomass- or CO₂-based materials that do not sacrifice high performance

Join us to shape the future!

