



Desmophen® Desmodur®

Pasquick® polyaspartic technology.
Change the coatings game.





Desmodur® Desmophen

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Building a circular future, together

The demand for more circular solutions is rising at a faster pace than ever before as the world collectively strives to tackle today's global challenges. Climate change, population growth, urbanization, digitalization and mobility are pushing players from every sector to find more sustainable solutions and lay the foundations for climate neutrality by driving a Circular Economy. The challenge is not only to create these circular solutions but also to maintain quality, durability and productivity.

Innovation is key to satisfying these demands and creating added value for customers, society and the environment by turning targets into realities. At Covestro, our long-standing expertise in aliphatic and aromatic polyisocyanates and more sustainable resins goes hand in hand with our purpose to constantly push boundaries in the search for future-oriented solutions. Through joint solutions, alternative raw materials, innovative recycling, and harnessing renewable energy, we're enabling coatings and adhesives producers to meet the circular challenge, here and now.

We're expanding our portfolio to include bio-based or recycled raw materials in coatings, adhesives, and specialty areas from cosmetics to textiles to 3D printing. Thanks to our mass balancing approach, we're helping close the loop by gradually replacing fossil fuels with ISCC-certified renewable resources. Our drop-in solutions ensure the high quality, consistent performance and easy processing that keep your production running smoothly. And we're constantly working to provide the global support, facilities and supply chain security you need to forge yet more circular innovations in infrastructure, automotive, furniture and more.

Material solutions can help turn circular targets into realities. Let's make the world a brighter place, together.



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 delivering the high performance known from 2K PUR coatings. Without sacrificing performance, **Pasquick®** polyaspartic coating technology offers greater productivity for applications in car refinishing, construction, and protective and industrial coatings. Whether for cars, rail vehicles, 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 allow 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 or in railway paint shops, **Pasquick®** polyaspartic coatings contribute significantly to reducing energy costs and CO₂ emissions – both factors of increasing importance.

From ultra-high solids to near-zero VOC

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 near-zero VOC 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 nearly 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.

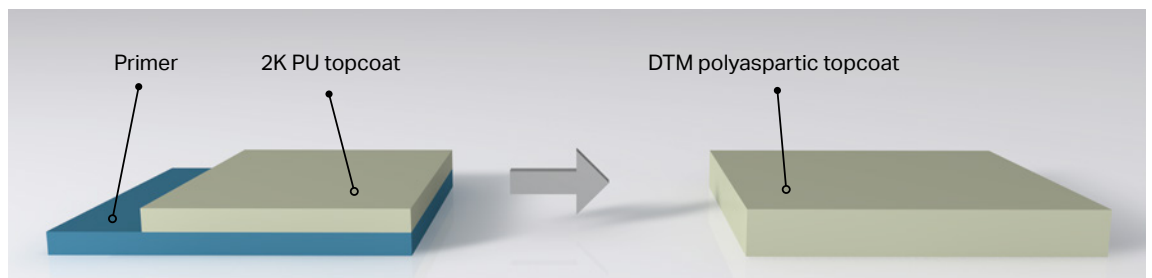


Fig. 2: Replacement of the primer by a direct-to-metal polyaspartic topcoat

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.

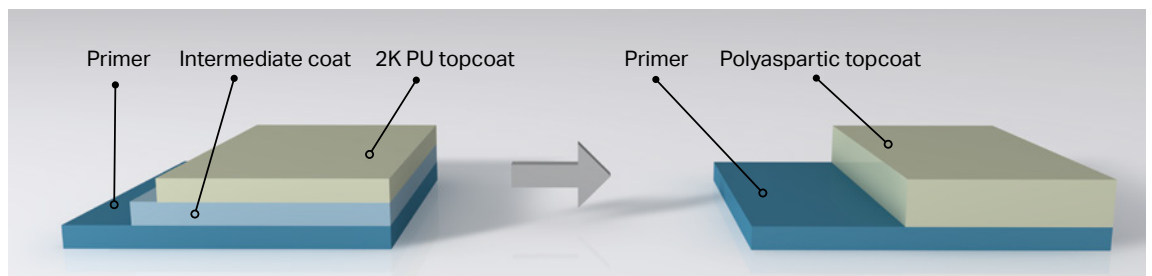


Fig. 3: Replacement of the intermediate coat by a polyaspartic topcoat



Coating systems and leading edge protection for wind turbine blades

Wind turbines have to withstand extremely rugged conditions over long periods of time. For several years now, **Pasquick®-based** gel coats, pore fillers, putties, primers and pigmented top coats have been used for coating rotor blades made of glass fiber-reinforced composites to prolong the working lives of wind turbines. These reactive 2K systems can be applied by rolling, brushing, knifing or spray-coating, even at high film thicknesses. They are used to fill pores, smooth the surface, and protect the rotor blades against weathering. To prevent rain erosion, special coatings for leading edge protection (LEP) have been developed. The great 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, fast drying/curing, and early sandability. Through the unique combination of high flexibility and hardness, these systems display good adhesion to the substrate and protect the rotor blades against atmospheric exposure, such as UV light and rain, to ensure long working lives for wind turbines.

Pasquick® for automotive refinish and transportation coatings

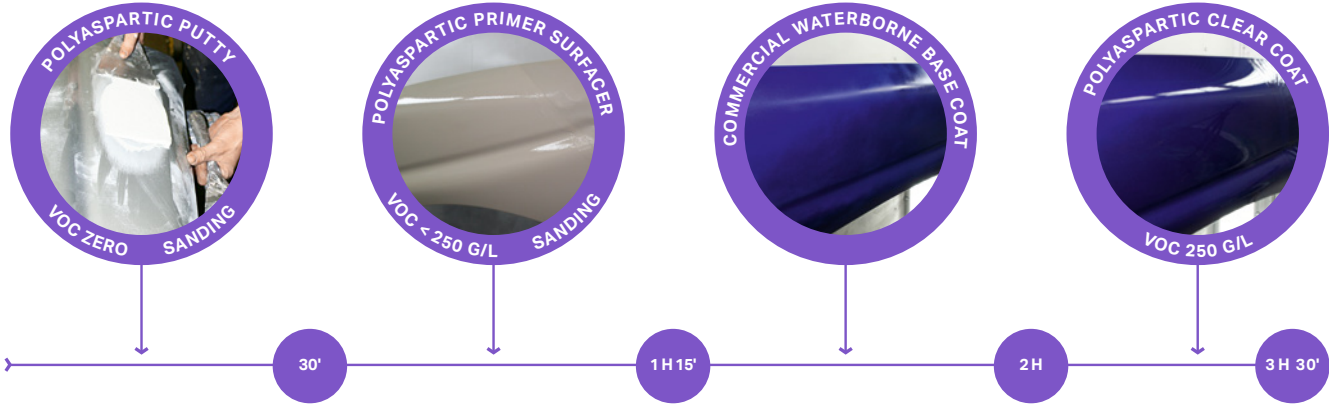
In a world of increasing mobility and a rapidly growing number of vehicles on the road, accidents happen. When they happen, whether a car needs a little touch up or a complete overhaul, polyaspartic systems for automotive refinish coatings and a professional application can make it look like new again. 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 coating systems who are looking to improve throughput 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. Additionally, rail vehicle manufacturers benefit from cost and energy savings thanks to **Pasquick®-based** very fast ambient curing systems.

- **Clear coats:** Very high-solid clear coats based on aspartics 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.
- **Primer surfacers:** Combinations of polyaspartics with, 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.
- **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.



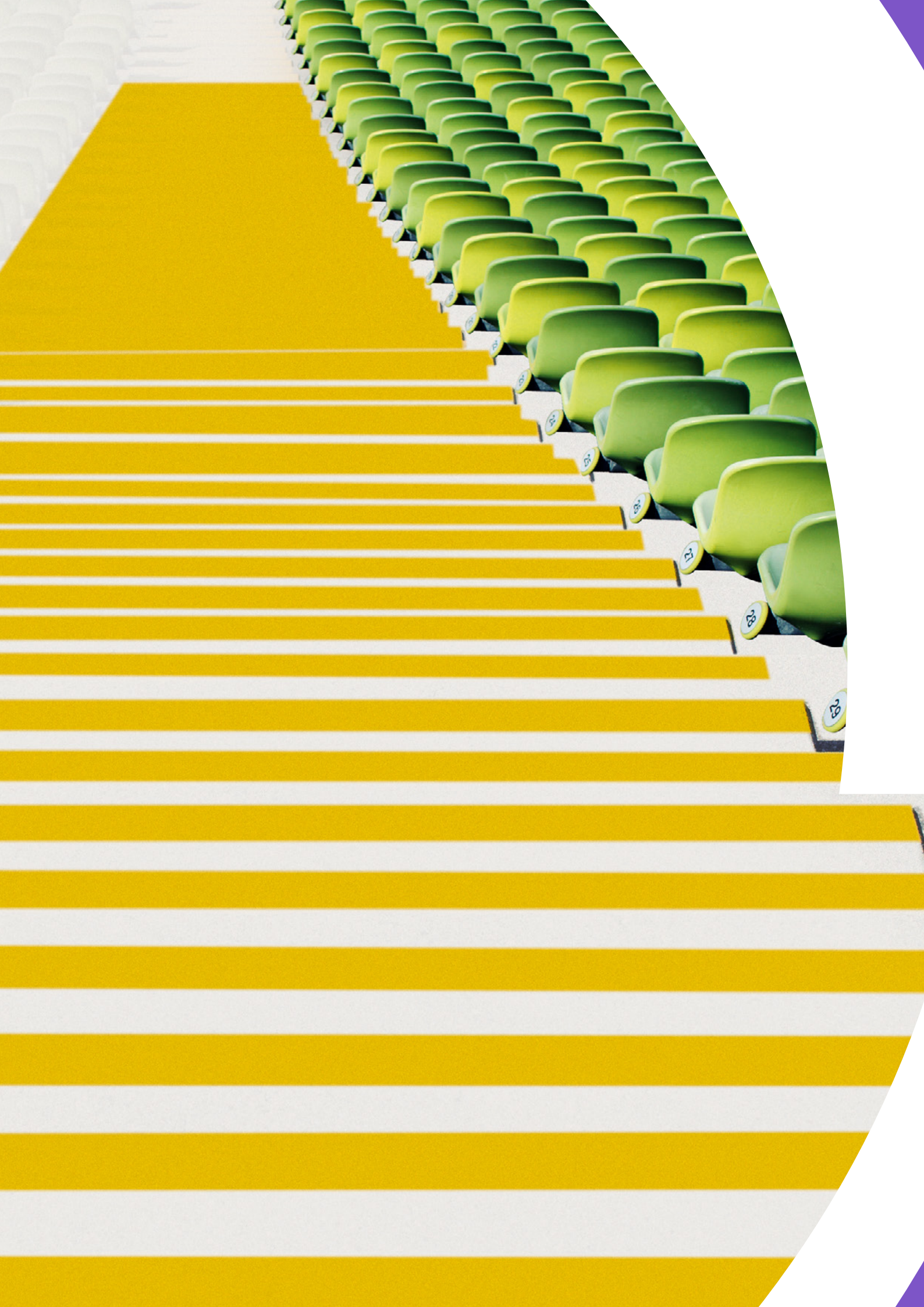
By using a repair coating system based on **Pasquick®** polyaspartic technology, it is possible not only to reduce solvent content and save up to 80% of energy costs, but also to make the whole repair process far more efficient, resulting in a significant increase in throughput.

Desmophen® NH-based refinish coating systems are essentially speed in a can!



ROOM TEMPERATURE, 50% RH

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



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 solvent-borne 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 polyaspartics coating systems are now state-of-the-art (see figure below).

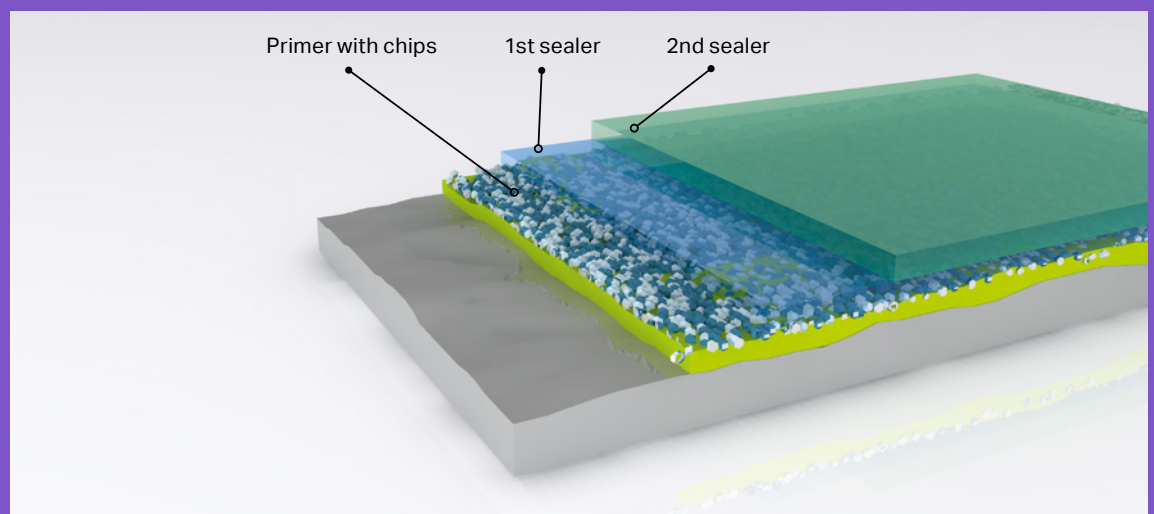
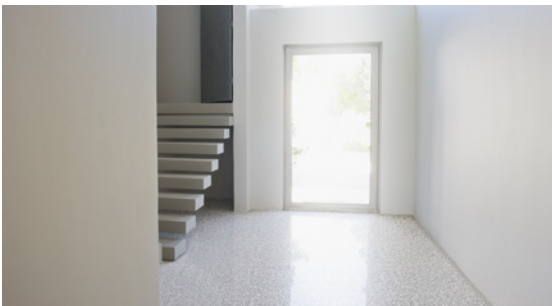


Fig. 5: Fast-setting garage coating system



- **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 8h 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 near-zero VOC 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).

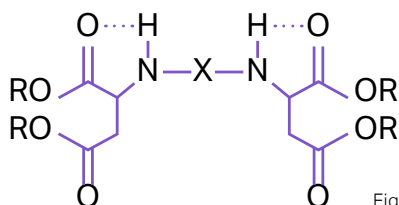


Fig. 6: General structure of aspartics

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	VISCOSITY		COMMENTS	
	SOLID CONTENT [%]	@ 25°C [mPa · s]			
	AMINE NUMBER APPROX. [mgKOH/g]	EQUIVALENT WEIGHT APPROX.			
Desmophen® NH 1220	100	244	90	234	High reactive binder or co-resin for fast-setting very high solids to near-zero VOC 2K PU coatings (putty elastomers, spray-applied aliphatic polyurea).
Desmophen® NH 1420	100	201	1,450	276	Standard, moderate reactive Pasquick® resin or co-resin for very high solids to near-zero VOC 2K PU coatings (floor coatings, corrosion protection topcoats, ACE & commercial vehicles, general industrial refinish coatings), indoor air quality-compliant.
Desmophen® NH 1422	100	201	1,450	276	Performance similar to NH 1420 with longer potlife in clear coat formulations.
Desmophen® NH 1423 LF	100	206	1,500	274	Performance similar to NH 1420, improved industrial hygiene due to significantly reduced fumaric acid diethylester content (< 0.1 wt.-%). Better color stability in clearcoat applications, better gloss retention in topcoats and improved application robustness.
Desmophen® NH 1720	100	190	100	295	Reactive diluent for very high solids to near-zero VOC 2K PU coatings (floor coatings, corrosion protection topcoats, ACE & commercial vehicles, general industrial coatings), indoor air quality compliant.
Desmophen® NH 1723 LF	100	195	80	290	Performance similar to NH 1720, improved industrial hygiene due to significantly reduced fumaric acid diethylester content (< 0.1 wt.-%).
Desmophen® NH 1520	100	191	1,400	290	Low-reactive Pasquick® resin or co-resin for very high solids to near-zero VOC 2K PU coatings.
Desmophen® NH 1523 LF	100	200	2,000	280	Performance similar to NH 1520, improved industrial hygiene due to significantly reduced fumaric acid diethylester content (< 0.1 wt.-%). Better color stability in clearcoat applications and improved application robustness.
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).

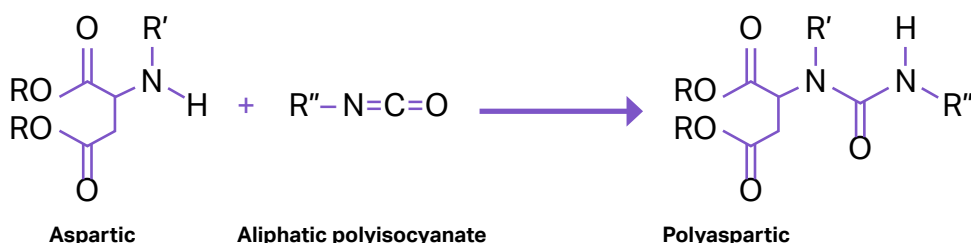


Fig. 7: Reaction of aspartics with aliphatic polyisocyanate to give polyaspartics

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	NCO CONTENT		FUNCTIONALITY		COMMENTS
	APPROX. [%]	ON SUPPLY FORM	ON SUPPLY FORM	APPROX.	APPROX.	
		VISCOSITY AT 23°C APPROX. [mPa · s]	EQUIVALENT WEIGHT APPROX.			
Desmodur® N 100	100	10,000	22.0	190	3.8	Basic Pasquick® coatings hardener for solvent-borne, weather-stable and nonyellowing topcoats.
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 3200	100	2,500	23.0	185	3.5	Lower viscosity than Desmodur® N 100 .
Desmodur® ultra N 3300	100	3,000	21.8	195	3.5	Outstanding weather stability and gloss retention, for non-yellowing topcoats
Desmodur® ultra N 3390 BA/SN	90 in BA/SN	550	19.6	215	3.5	Special supply form of Desmodur® ultra N 3300 . Other supply forms also available.
Desmodur® ultra N 3600	100	1,200	23.0	185	3.2	Low-viscosity crosslinker for lightfast coatings; standard hardener for Pasquick® coatings.
Desmodur® ultra N 3790	90 BA	1,800	17.8	235	4.1	Best compromise to realize early resistance and high appearance for refinish clear coats based on polyaspartics.
Desmodur® ultra N 3800	100	6,000	11.0	380	3.8	Pasquick® coatings hardener to improve impact resistance and deliver moderate flexibility.
Desmodur® ultra N 3900	100	730	23.5	180	3.2	Low-viscosity crosslinker for Pasquick® coatings (very high solids to near-zero VOC), especially for floor coatings.
Desmodur® NZ 486 BA	86 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® N 31000	100	500	23.0	185	3.0	Low-viscosity crosslinker for Pasquick® coatings (very high solids to near-zero VOC), especially for floor coatings.
Desmodur® ultra N 31100	100	500	20.0	215	2.5	Low-viscosity crosslinker for Pasquick® coatings (very high solids 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 30700	100	1,350	11.0	380	2.2	Low-viscosity, highly flexible crosslinker for Pasquick® coatings, e.g. waterproofing membranes, flexible floor coatings, leading edge protection.
Desmodur® 2873	100	450	12.3	341	2.0	Silane modified crosslinker with improved adhesion for direct-to-metal applications.
Desmodur® CQ ultra N 7300	100	9,500	21.5	195	3.7	Contains approx. 71% renewable carbon, outstanding weather stability and gloss retention, non-yellowing.

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!





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¹Please see the "Guidance on Use of Covestro Products in a Medical Application" document.
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