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<sup>1</sup> Please see the "Guidance on Use of Covestro Products in a Medical Application" document.  
Edition: 2022 · Printed in The Netherlands

# Polyurethanes for Textile Coatings.

Impranil® Impraperm® Imprafix®



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**Impranil® Impraperm® Imprafix®**



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 of constantly pushing 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 like textiles coatings. 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.**

# Committed to more sustainable coated textiles

## Our expertise in textile coatings

As the inventor of polyurethane chemistry and with more than 80 years of experience in research and innovation, Covestro helps our industry partners to set themselves apart from the competition.

The global textile coatings team is dedicated to address the ever-growing requirements from global markets for functional and less environmentally impactful textile materials.

We offer a broad range of high-quality water based polyurethane (PU) coating materials tailor-made for various textile applications. We also develop new partially bio-based and partially bio-degradable PU dispersions that lead the trend.

We continuously invest in product and application development such as textile coatings, textile printing and PU synthetics. Our team offers new textile material development services to integrate value chain players in a collaborative union and brings values to our partners.

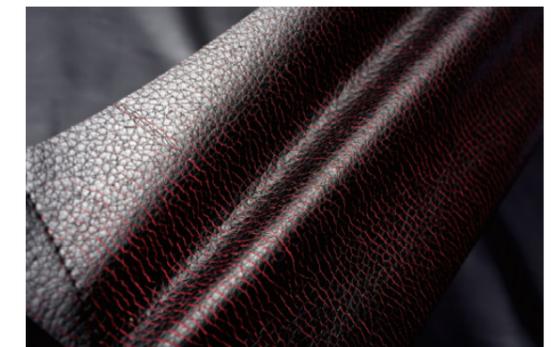
Covestro has been a **bluesign**<sup>®</sup> systems partner since 2014, which signifies our continuous goal of increasing the range of certified substances that customers in the textile industry can use to achieve production operations that are compatible with both people and environment.



## PU synthetics: soft yet highly durable

PU is the technology inside synthetic materials of the highest quality: soft and natural-feeling yet exceptionally durable. PU is also often used to provide a suitable finish to PVC synthetic materials. Waterborne PU dispersions from Covestro enable manufacturers to produce PU synthetic materials using a more environmentally compatible process than the traditional solvent borne process, while still retaining the combination of touch and durability for which PU synthetics are renowned.

Traditionally, there are two key processes used in the manufacture of PU synthetics: the coagulation or wet process and the transfer coating or dry process. The coagulation process yields a base that mimics a genuine leather look and feel. The transfer coating process is used to produce a skin layer that provides color, texture and resistance properties. Traditionally, solvent borne PU resins are used for both processes.



Covestro has developed a comprehensive range of waterborne PU dispersions that enable coagulation and coating processes to be carried out without using solvents, providing PU synthetics and synthetic bases with the same performance as solvent borne PU. It also enhances the designability of the finished products, thereby offering more diverse and appealing outlook. In addition, when using waterborne PU dispersions, depending on the combination of processes used, energy consumption can be reduced by at least 50 percent and water consumption by up to 95 percent compared with solvent borne PU used in traditional processes.

## Textile coating and printing: PU brings magic to materials

Polyurethane (PU) coating and printing technologies play an essential role in transforming many of the fabrics that we use every single day. Applied in layers, multi-talented PU offers a pleasing touch and outstanding functionalities including improved waterproof performance, breathability and durability, allowing consumers to enjoy enhanced performance from their textile products including auto interiors, clothing, shoes and furniture.

Our innovations not only fulfill a functional and decorative role in a diverse range of applications, but are also more responsible. Our products are manufactured using production processes that are state-of-the-art with respect to the impact on people and the environment. Sustainable coating materials are increasingly demanded in the market, so our coatings offer your business a real benefit.

Covestro's more eco-friendly material option is waterborne PU, also known as polyurethane dispersion (PUD). This solution is capturing a lot of industry attention due to its unique capacity to combine high performance with high flexibility.

The high-tech waterborne PU technology for textile coatings and printing is essential to enabling more eco-friendly PU coated fabrics. They can be manufactured entirely without solvents and with higher resource efficiency, making an important contribution to industry sustainability as a whole and enabling the acceleration of technologies such as digital textile printing.

## INSQIN®: Enabling a new era of material

**INSQIN®** waterborne PU technology enables an entirely new level of material sustainability for textiles. By enabling waterborne material manufacturing processes, **INSQIN®** brings increased workplace hygiene, eliminates risks of environmental pollution and drastically reduces the consumption of water and energy.

**INSQIN®** also enables totally new possibilities in performance, design, comfort and even the manufacturing of textile-based articles. By offering these aspects as well as game-changing more sustainable materials, we help our customers address not only their sustainability commitments, but their product and manufacturing innovation goals.

For manufacturers our state-of-the-art pilot coating facilities allow much of the material development to happen with a minimal stoppage in production.

We also work directly with brand owners to realize the maximum innovative potential of our technology by developing materials in parallel with their product development, enabling inspiration to develop new technologies and promoting the supply chain transparency sought by the industry.



# Impranil® polyurethane dispersions for textile applications

Product	Category	Resin Type	Polyol Type	Non-Volatile Content [%] (DIN EN ISO 3251)	Hydrolytic Stability* (Weeks) (DIN EN 12280-3)	Light-fastness (DIN EN ISO 105-B02)	100% Modulus [MPa] (DIN 53504)	Tensile Strength [MPa] (DIN 53504)	Elongation at Break [%] (DIN 53504)	Melting range [°C] (Kofler heating table)
Impranil® DAH	Dispersion	Aromatic	Polyether	35	4	4	1	10	750	150-170
Impranil® DL 1016	Dispersion	Aliphatic	Polyester	50	4	7	2.4	30	750	170-180
Impranil® DL 1030	Dispersion	Anionic/non-ionic aliphatic	Polyester	29-31	1****	-	0.5****	1.2****	>1000****	-
Impranil® DL 1068	Dispersion	Aliphatic	Polyether	50	>10	7	1.55	21	1050	210-230
Impranil® DL 1116	Dispersion	Aliphatic	Polyester	60	2	7	1.4	25	1000	210-220
Impranil® DL 1380	Dispersion	Aliphatic	Polyester	60	1	7	1.2	25	1200	210-220
Impranil® DL 1537	Dispersion	Aliphatic	Polyester	60	2	7	2	15	850	200-210
Impranil® DL 1554	Dispersion	Aliphatic	Polyester	60	2	7	3	26	750	200-220
Impranil® DL 2077	Dispersion	Aliphatic	Polycarbonate	35	>10	7	20-25	25-30	150-200	220-230
Impranil® DL 2611	Dispersion	Aliphatic	Polyester	40	3	7	18	40	130	200-220
Impranil® DL 2772	Dispersion	Aliphatic	Polyester	40	1	7	2.5	40	800	175-200
Impranil® DL 3040	Dispersion	Aliphatic	Polyester	40	1	7	5	40	800	175-200
Impranil® DL 519	Dispersion	Aliphatic	Polyester	40	1	7	7	40	550	180-200
Impranil® DLC-F	Dispersion	Aliphatic	Polycarbonate	40	3	7	6	50	360	215-225
Impranil® DLC-T	Dispersion	Aliphatic	Polyester/Polycarbonate	35	>5	7	5.5	6	500	150-160
Impranil® DLH	Dispersion	Aliphatic	Polyester	40	3	7	4.2	50	850	165-175
Impranil® DLI	Dispersion	Aliphatic	Polyester	50	3	7	2	37	950	175-200
Impranil® DLN W 50	Dispersion	Aliphatic	Polyester	50	1	7	1.7	35	950	175-200
Impranil® DLN-SD	Dispersion	Aliphatic	Polyester	40	1	7	1.7	35	950	175-200
Impranil® DLP	Dispersion	Aliphatic	Polyester	50	2	7	0.9	10	1100	200-220
Impranil® DLP-R	Dispersion	Aliphatic	Polyester	50	2	7	0.9	10	1100	200-220
Impranil® DLS	Dispersion	Aliphatic	Polyester	50	2	7	2.5	30	850	170-180
Impranil® DLU	Dispersion	Aliphatic	Polyether/Polycarbonate	60	>10	7	2	30	700	200-230
Impranil® DLV/1	Dispersion	Aliphatic	Polyether/Polycarbonate	40	>10	7	1.7	25	750	200-220
Impranil® CQ DL 519	Dispersion	Aliphatic	Partially biobased Polyester**	40	1	7	9	40	450	180-200
Impranil® CQ DL 1878	Dispersion	Aliphatic	Partially biobased Polyester**	50	-	7	1.7	12	800	220-240
Impranil® CQ DLS/1	Dispersion	Aliphatic	Partially biobased Polyester**	50	-	7	2.5	30	800	170-180
Impranil® DL 1885/1	Dispersion	Aliphatic	Polyester/Polycarbonate	40	8	7	5.4	26	400	~90
Impranil® DLU/1***	Dispersion	Aliphatic	Polyether/Polycarbonate	60	>10	7	2-3	30	900	215-230
Impranil® DL 1343	Dispersion	Aliphatic	Polyether	40	>10	7	2.2	19.7	827	-
Impranil® DL 1109	Dispersion	Aliphatic	Polyester	41	-	7	1.8	12.5	1100	-
Impranil® DL 1701	Dispersion	Aliphatic	Polyester	40	-	7	5	25	400	180
Impranil® DL 1007	Dispersion	Aliphatic	Polyester	37	-	7	8	20	400	-

\*Based on crosslinked dry film

\*\*Calculated minimum content of carbon derived from bio-based raw materials. Confirmed by 14C-Measurements according to ASTM D 6866: 2008

\*\*\*Only available in APAC region

\*\*\*\*These values provide general information and are not part of the product specification.

## Impraperm® for waterproof and water vapor transmission (WVT) textile coatings

Product	Category	Resin Type	Backbone	Solids [%]	Hydrolytic Stability* (Weeks) (DIN EN 12280-3)	Light-fastness (DIN EN ISO 105-B02)	100% Modulus [MPa] (DIN 53504)	Tensile Strength [MPa] (DIN 53504)	Elongation at Break [%] (DIN 53504)	Melting range [°C] (Kofler heating table)
<b>Impraperm® DL 5249</b>	Dispersion	Aliphatic	Polyester	32	2	7	3.2	22	620	240
<b>Impraperm® DL 5310/1</b>	Dispersion	Aliphatic	Polycarbonate/Polyether	30	8	7	2.1	5.2	460	172

## Impranil® polyurethane solutions, high solids and granules for textile applications

Product	Category	Resin Type	Backbone	Solids [%]	Solvents	Light-fastness (DIN EN ISO 105-B02)	100% Modulus [MPa] (DIN 53504)	Tensile Strength [MPa] (DIN 53504)	Elongation at Break [%] (DIN 53504)	Melting range [°C] (Kofler heating table)
<b>Impranil® EWN-13 sol. A</b>	Solution	Aromatic	Polyether	35	Dimethylformamide / Toluene / Methyllethylketone	5	3	15	700	150-160
<b>Impranil® C</b>	Granule	Aromatic	Polyester	100	-	4	4	45	400	-
<b>Impranil® C sol.</b>	Solution	Aromatic	Polyester	30	Ethylacetate	4	4	45	400	-
<b>Impranil® ELH-A/1 sol.</b>	Solution	Aliphatic	Polycarbonate	30	Toluene / Isopropanol / 1-Methoxypropanol-2	7	7-8	50	400	190-200
<b>Impranil® 43031 sol.</b>	Solution	Aliphatic	Polyester	25	Toluene / Isopropanol / 1-Methoxypropanol-2	7	30	35	175	<200
<b>Impranil® 2610</b>	Solution	Aliphatic	Polycarbonate	30	1-Methoxypropylacetate / Isopropanol-Butyrolacton / 1-Methoxypropanol-2	7	6-7	50	300	190-200
<b>Impranil® HS-62</b>	High Solid (Bl iso)	Aromatic	Polyether	98	1-Methoxypropylacetate-2	2	2	8	660	200-210
<b>Impranil® HS-80</b>	High Solid (Bl iso)	Aromatic	Polyether	90	1-Methoxypropylacetate-2	3	4.5	25	450	200-220
<b>Impranil® HS-130</b>	High Solid (Bl iso)	Aromatic	Polyether	100	-	2-3	10	25	400	>150

## Imprafix® and other crosslinking agents / catalyst / additives

Product	Solids [%]	Solvents	Remarks
Imprafix® 2794	40	Water	Blocked isocyanate agent with low deblocking temperature
Imprafix® IO 3025	100	-	Non-blocked ISO, aliphatic
Imprafix® IO 3388	45	Water	MEKO blocked ISO Crosslinker dispersion, aliphatic
Impranil® S 3000	30	Water	Aqueous anionic colloidal solution of amorphous silicon dioxide
Imprafix® TH sol.	75	Ethylacetate	Isocyanate crosslinking agent, aromatic
Imprafix® TRL sol.	60	Butylacetate	Isocyanate crosslinking agent, aromatic/aliphatic
Imprafix® SO 2582	4	Ethylacetate	Accelerator for Imprafix® TH and TRL
Imprafix® HS-C	100	-	Crosslinking agent for Impranil® HS-series
Impranil® AC 2346	40	Ethylacetate	Acrylate additive for Impraperm® 43153
Desmodur® N 3900	100	-	Isocyanate crosslinking agent, aliphatic, for waterborne dispersions and solventborne PU
Bayhydur® 3100	100	-	Isocyanate crosslinking agent, aliphatic, for waterborne dispersions
Desmoderm® Additive Z	75	1-Methoxypropylacetat-2/ Xylol 1:1	Isocyanate crosslinking agent, aliphatic
Desmodur® DN	100	-	Isocyanate crosslinking agent, aliphatic, for waterborne dispersions
Bayhydur® 302	100	-	Aliphatic Crosslinker for polyurethanes
Desmodur® 2802	40	Water	Hydrophilically modified polyfunctional carbodiimide

# INSQIN® material toolbox adds value to digital textile printing - Make every drop count!

Product	Category	Resin type	Backbone	Solid content DIN EN ISO 3251[%]	pH DIN ISO 976[-]	Tensile strength DIN EN 53504 [MPa]	Elongation DIN EN 5350[%]	Modulus DIN EN 53504[MPa]	Tg[°C]	Typical viscosity <sup>1</sup> DIN EN ISO 2555 23°C, 30rpm); <sup>2</sup> DIN EN ISO 3219/A.3 (23 °C, 40 1/s) [mPas]	Typical mean particle size[nm]	Properties
<b>Impraperm® DL 5310/1</b>	Primer	Nonionic aliphatic	PC/PET	30	6 - 8	5	460	2.5		< 1000 <sup>2</sup>	< 100	Good adhesion Soft handle Good transparency in supply form
<b>Impranil® DL 1602</b>	Binder	Anionic aliphatic	PC	35	6 - 9	50	600	3.8	-32	< 1000 <sup>1</sup>	< 85	Excellent filterability* and good jetting performance Excellent resolubility and long open times Good transparency in supply form Excellent crocking fastness
<b>Impranil® DL 1606</b>	Binder	Anionic aliphatic	PC	35 - 37	6 - 9	49	580	3.8	-32	< 1000 <sup>1</sup>	< 85	Anti-sagging properties Applicable for all colors including white Excellent filterability* and good jetting performance Excellent resolubility and long open times Good transparency in supply form Excellent crocking fastness
<b>Impranil® DL 1620</b>	Binder	Anionic aliphatic	PES/PC	35	7 - 9	18	450	6	-45	< 100 <sup>2</sup>	< 100	Excellent filterability* and good jetting performance Good transparency in supply form
<b>Impranil® DL 1623</b>	Binder	Aliphatic	PET	33	6 - 9	27	480	6.4		< 200 <sup>2</sup>	< 100	Excellent adhesion with different textile substrates Excellent filterability* and good jetting performance Good transparency in supply form
<b>Impranil® DL 1618</b>	Binder	Anionic aliphatic	PES	50	7 - 9	6	1160	1	-4	< 250 <sup>2</sup>	< 300	Excellent adhesion with different textile substrates Especially suitable for white ink layer
<b>Impranil® DLN-SD</b>	Binder	Anionic aliphatic	PES	40	5 - 8	35	950	1.7	-40	< 500 <sup>1</sup>	< 250	Soft and dry hand Especially suitable to be used in compounds
<b>Impranil® DLC-F</b>	Finish	Anionic aliphatic	PC	40	6 - 9	50	360	6	-33	< 2000 <sup>1</sup>	< 160	Excellent hydrolysis resistance Excellent chemical resistance Very good resistance to salty water Very good abrasion and scratch resistance Very dry handle
<b>Impranil® DL 2611</b>	Finish	Anionic aliphatic	PES	40	6 - 9	40	130	18	-33	< 1000 <sup>1</sup>	< 200	Can provide gloss effect Good hydrolysis and abrasion resistance Dry handle
<b>Imprafix® 2794</b>	Crosslinker	Aliphatic	-	38	6 - 9	-	-	-	-	< 100 <sup>1</sup>	< 100	Improved reactivity and thermostability Substantial improvement of resistance such as washing, scratch and hydrolysis Absence of pot-life reduces waste and increases flexibility Suitable in combination with primer, binder and finish

Note: Typical values do not indicate any specification and may differ from COA of individual batches  
\*Filterability evaluated with internal test method (5 µm and 1.2 µm PP membrane filter)