

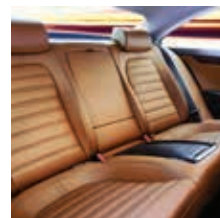


We create chemistry

# Polyurethane Raw Materials

North America

Isocyanates and Polyols



# Welcome to BASF's Polyurethane Raw Materials in North America



The basic polyurethane chemicals division of BASF provides manufacturers of polyurethane products with a broad catalog of raw materials, innovations, and technical expertise to help our customers advance their technologies in a diverse set of applications across various industries. With facilities in Geismar, LA and Wyandotte, MI, we supply aromatic isocyanates and an array of polyether polyols (conventional and graft) as well as polyester polyols to many of the major users of polyurethane raw materials, and through a comprehensive network of distributors. Our customers use these building blocks to formulate products in coatings, adhesives, sealants, elastomer (CASE) applications, as well as molded and slab-stock flexible foams, binders for engineered wood products (OSB, MDF, and PB), and polyisocyanurate insulation boards.

For more information, please visit our website at [www.polyurethanes.basf.us](http://www.polyurethanes.basf.us).

## **Commitment to Customers**

**Continuously investing in our plants, supply chain, and technical expertise to better meet the needs of customers and support the safe handling of polyurethane chemicals.**

With our long-lasting involvement in the polyurethane industry, BASF knows the requirements of the customers inside out. Our goals are simple: delivering the products that you need when you need them; finding the answers to your challenges; and ensuring the competitiveness of our offering.

To do so, we have built the best team of experts, backed by BASF resources around the globe, and made it available at your doorstep to help you make the most of polyurethane chemistry. We are also launching new products, investing in digital technologies, modernizing our supply chain, and expanding our plants. All with one goal in mind: being the supplier of choice for our customers.





### **Innovation**

**Improving performance and productivity. Opening new opportunities for polyurethane materials.**

At BASF, we understand that innovation has always been a critical element for the growth and success of our customers. From TMI-based macromer technology, to liquid gel, and fast binder for engineered wood products, BASF has often pioneered solutions that contributed to the advancement of polyurethane technologies.

Today, our commitment to innovation is stronger than ever. Whether developing new products or inventing new processes, our technical team continues to explore the limits of isocyanate and polyol chemistries. Delivering those innovations with a robust level of technical support ensures fast and reliable implementation.



### **Quality**

**Meeting customers' expectations with cutting-edge technology and manufacturing expertise.**

At BASF, we understand that it is essential for our customers to use ingredients in their formulations that meet their specific requirements each and every time. We strive to manufacture our isocyanates and polyols to consistent standards, whatever the application. By leveraging our state-of-the-art technologies, in-depth expertise, and investments in process engineering, our highly skilled staff ensures that quality, together with safety, is core to our operations.



### **Health and Safety**

**Relentless commitment to the safe handling of polyurethane chemicals.**

At BASF, we commit significant resources and staff to promote the responsible use of our products along the entire value chain. We aim to ensure that each person transporting, storing or processing our isocyanates and polyols is fully aware of the risks and is properly trained for safe handling of these chemicals. Our health and safety activities begin in our laboratories and factories. Our commitment does not stop there. We offer training courses to familiarize customers and distributors with recommended procedures, both for normal operations and emergencies. We also provide personalized assistance to help with the introduction of new products, conversions to polyurethane technologies, or with other specific situations. Through our involvement in several industry associations, we are pooling our expertise on safe handling with other stakeholders, further enhancing the core knowledge and processes related to health and safety matters for the entire polyurethane industry.



### **Global Presence**

**Global presence with local expertise – We know what it means.**

With BASF, you benefit from a partner with an established presence in all regions, operating world-class plants at our “Verbund” sites in North America, Europe, and Asia. For our customers, this means access to a global pool of technical experts and to the latest global innovations in polyurethane chemicals. Since we know that a worldwide network means little without local support, our sales, customer care, and technical teams are available right here in North America to discuss your needs and provide solutions to help your business succeed.

## Isocyanates

Lupranate® isocyanates from BASF are utilized across a large range of applications and industries. Products include monomeric and polymeric methylene diphenyl isocyanate (MDI), toluene diisocyanate (TDI), specialized blends, modified MDI, and MDI prepolymers.

Product	NCO (%)	Nominal Functionality	Viscosity @ 25°C (cps)	Storage Temperature (°C)
<b>Monomeric MDI</b> Monomeric MDI or MMDI refers to the 4,4'- and 2,4'- isomers of diphenylmethane diisocyanate. Pure 4,4'-MDI is a crystalline solid at room temperature. At 45°C, pure 4,4'- MDI can be shipped and stored as a liquid for up to fifteen days.				
Lupranate M	33.5	2.0	Solid/Liquid	< 0 or 45
Lupranate MI	33.5	2.0	12	23 - 30
Lupranate MS	33.5	2.0	Solid/Liquid	< 0 or 45
Lupranate 253	33.0	2.0	16	30 - 40
Lupranate LP30	33.0	2.0	16	30 - 40
Lupranate LP27	32.4	2.0	17	30 - 35
Lupranate 227	32.1	2.0	15	20 - 35

**Isocyanates (cont.)**

<b>Product</b>	<b>NCO (%)</b>	<b>Nominal Functionality</b>	<b>Viscosity @ 25°C (cps)</b>	<b>Storage Temperature (°C)</b>
<b>Carbodiimide Modified MDI</b>				
BASF uses carbodiimide chemistry to modify and stabilize the monomeric diphenylmethane diisocyanate. The carbodiimide-modified MDIs are liquids that are stable and clear at room temperature.				
Lupranate 81	29.5	2.1	40	20 - 35
Lupranate MM103	29.5	2.2	40	25 - 35
Lupranate 5143	29.2	2.2	40	22 - 30
<b>Polymeric MDI</b>				
Polymeric MDI (PMDI) contains a mixture of polyaromatic isocyanates including 2-ring(MMDI), 3-ring, and higher species. As the amount of 3-ring and higher species increases, the functionality and viscosity of the PMDI will increase. PMDI is a brown, temperature-stable liquid.				
Lupranate M20	31.5	2.7	200	20 - 30
Lupranate M70L	31.0	3.0	700	20 - 30
<b>MDI Blends</b>				
Starting with a base of BASF Lupranate® PMDI and MMDI products, the following line of isocyanate blends and derivatives are created. They offer custom properties for your application needs.				
Lupranate 223	27.5	2.2	140	20 - 30
Lupranate 278	33.0	2.1	17	25 - 35
Lupranate 280	33.0	2.1	17	25 - 35
Lupranate 5440	32.7	2.4	50	25 - 35
Lupranate 241	32.6	2.3	26	25 - 35

**Isocyanates (cont.)**

<b>Product</b>	<b>NCO (%)</b>	<b>Nominal Functionality</b>	<b>Viscosity @ 25°C (cps)</b>	<b>Storage Temperature (°C)</b>
<b>MDI Blends (cont.)</b>				
Lupranate 5100	32.6	2.3	33	25 - 35
Lupranate 5350	32.6	2.3	29	20 - 35
Lupranate 5430	32.5	2.1	20	20 - 30
Lupranate 230	32.4	2.2	35	20 - 30
Lupranate 245	32.3	2.3	35	25 - 35
Lupranate TF2115	32.3	2.4	49	25 - 35
Lupranate 234	32.0	2.3	50	20 - 35
Lupranate 255	32.0	2.5	70	20 - 35
Lupranate 266	32.0	2.5	66	15 - 35
Lupranate 78	32.0	2.3	65	15 - 30
Lupranate M10	32.0	2.3	70	20 - 35
Lupranate 5400	31.8	2.4	66	15 - 35
Lupranate 5390	31.7	2.6	120	20 - 35

**Isocyanates (cont.)**

<b>Product</b>	<b>NCO (%)</b>	<b>Nominal Functionality</b>	<b>Viscosity @ 25°C (cps)</b>	<b>Storage Temperature (°C)</b>
<b>MDI Blends (cont.)</b>				
Lupranate 277	31.0	2.8	350	20 - 30
Lupranate 5270	30.6	2.0	15	20 - 35
<b>MDI Prepolymers</b> A prepolymer results from the reaction of excess MMDI with a hydroxyl terminated resin.				
Lupranate 233	25.4	2.3	175	20 - 30
Lupranate 5040	26.3	2.1	140	25 - 35
Lupranate 5090	23.0	2.1	650	20 - 30
Lupranate MP102	23.0	2.0	700	25 - 35
Lupranate 5050	21.5	2.1	335	25 - 35
Lupranate 5380	19.8	2.3	525	20 - 35
Lupranate 5030	18.9	2.0	1,130	25 - 35
Lupranate 5340	18.0	2.1	880	20 - 35
Lupranate 5370	16.5	ND	6,100	20 - 35



**Isocyanates (cont.)**

<b>Product</b>	<b>NCO (%)</b>	<b>Nominal Functionality</b>	<b>Viscosity @ 25°C (cps)</b>	<b>Storage Temperature (°C)</b>
<b>MDI Prepolymers (cont.)</b>				
Lupranate 275	15.9	2.1	560	25 - 35
Lupranate 5080	15.9	2.0	330	20 - 30
Lupranate 5060	15.5	2.0	1,000	25 - 35
Lupranate 5230	14.1	2.0	1,450	20 - 30
Lupranate 5070	13.0	2.0	3,360	25 - 35
Lupranate 5020	9.5	2.0	2,500	25 - 35
Lupranate 5310	8.0	2.0	2,700	20 - 35
<b>Aliphatic Prepolymers</b>				
Aliphatic prepolymers are based on 4,4'-HMDI. They offer improved UV resistance and high hardness when used in cast elastomer applications.				
Lupranate 5570	25.8 - 27	2.0	450	30 - 40
<b>TDI and TDI Blends</b>				
Lupranate® T80 is a mixture of 80% 2,4-isomer and 20% 2,6-isomer of toluene diisocyanate (TDI).				
Lupranate T80 Type I	48.2	2.0	3	16 - 32
Lupranate T80 Type II	48.2	2.0	3	16 - 32
Lupranate 8020	44.5	2.1	15	16 - 29

## Polyether Polyols

The Pluracol® polyol portfolio offers a diverse range of polyether polyols including conventional and graft polyols with the following typical values. The Pluracol graft series are polyether products containing dispersed particles of co-polymerized styrene and acrylonitrile, or SAN particles. These products offer property improvements for certain applications such as flexible foam and urethane elastomers.

Product	Nominal Functionality	OH Number (avg.)	Nominal Molecular Weight (g/mole)	Viscosity @ 25°C (cps)	Acid No. (max)	Na & K ppm (max)	Structure (*capped)	Typical Use
<b>Diols</b>								
Pluracol P410R	2	260	400	73	0.015	10	PO	CASE
Pluracol P710R	2	145	700	139	0.015	5	PO	CASE
Pluracol 1010	2	107	1,000	150	0.040	5	PO	CASE
Pluracol 2010	2	56	2,000	250	0.025	5	PO	CASE
Pluracol 1044	2	29	4,000	790	0.010	5	PO	CASE
Pluracol 1062	2	29	4,000	840	0.010	5	PO/EO*	Molded
Pluracol 628	2	25	3,850	1,500	0.010	5	PO/EO*	Molded

## Polyols (cont.)

Product	Nominal Functionality	OH Number (avg.)	Nominal Molecular Weight (g/mole)	Viscosity @ 25°C (cps)	Acid No. (max)	Na & K ppm (max)	Structure (*capped)	Typical Use
<b>Triols</b>								
Pluracol 858	3	935	180	1,360	0.010	70	PO	Rigid
Pluracol 1158	3	920	183	3,400	0.100	130	EO	Rigid
Pluracol 1016	3	505	330	291	N/A	N/A	PO/EO*	Rigid
Pluracol TP440	3	398	400	600	0.030	20	PO	CASE
Pluracol GP430	3	398	400	360	0.010	10	PO	CASE
Pluracol GP730	3	230	700	270	0.045	10	PO	CASE
Pluracol 1070	3	170	1,000	262	0.015	12	PO/EO	Molded
Pluracol 2009	3	170	1,000	258	0.035	12	PO/EO*	Molded
Pluracol 1135i	3	112	1,500	305	0.010	5	PO	CASE
Pluracol 726	3	57.5	3,000	420	0.015	5	PO	CASE
Pluracol 2086	3	57	2,800	503	0.010	5	PO/EO*	Slab

## Polyols (cont.)

Product	Nominal Functionality	OH Number (avg.)	Nominal Molecular Weight (g/mole)	Viscosity @ 25°C (cps)	Acid No. (max)	Na & K ppm (max)	Structure (*capped)	Typical Use
<b>Triols (cont.)</b>								
Pluracol 4156	3	56	3,000	582	N/A	N/A	PO/EO	Slab
Pluracol 1538	3	56	3,000	700	0.010	5	PO/EO*	Slab
Pluracol 2019/1	3	47	3,500	576	0.010	5	PO/EO	Slab
Pluracol 593	3	46	3,650	1,340	0.010	5	PO/EO*	Slab
Pluracol 816	3	35	4,800	900	0.010	5	PO/EO*	Molded
Pluracol 1421	3	35	4,800	900	0.030	5	PO/EO*	CASE
Pluracol 945	3	35	4,800	850	0.010	5	PO/EO*	Molded
Pluracol 2097	3	35	4,800	840	0.010	5	PO/EO*	Molded
Pluracol 1603	3	31	5,400	1,200	0.060	11	PO/EO*	Molded
Pluracol 2090	3	28	4,800	1,150	0.010	5	PO/EO*	Molded

## Polyols (cont.)

Product	Nominal Functionality	OH Number (avg.)	Nominal Molecular Weight (g/mole)	Viscosity @ 25°C (cps)	Acid No. (max)	Na & K ppm (max)	Structure (*capped)	Typical Use
<b>Triols (cont.)</b>								
Pluracol 1026	3	27.5	6,000	1,329	0.010	5	PO/EO*	Molded
Pluracol 220	3	26.6	4,500	1,300	0.035	5	PO/EO*	CASE
Pluracol 2100	3	25	6,500	1,370	0.015	5	PO/EO*	Slab
Pluracol 380	3	25	6,500	1,370	0.010	5	PO/EO*	Molded
<b>Quadrol +</b>								
Quadrol® PM	4	770	292	56,000	N/A	N/A	PO	Rigid
Pluracol PEP450	4	555	400	2,000	0.060	15	PO	CASE
Pluracol 922	4	500	445	17,000	N/A	N/A	PO/EO	Rigid
Pluracol PEP550	4	450	500	1,600	0.060	15	PO	CASE
Pluracol 1578	4	395	550	18,600	N/A	15	PO/EO	Rigid
Pluracol 736	4	390	575	14,500	N/A	N/A	PO	Rigid

**Polyols (cont.)**

Product	Nominal Functionality	OH Number (avg.)	Nominal Molecular Weight (g/mole)	Viscosity @ 25°C (cps)	Acid No. (max)	Na & K ppm (max)	Structure (*capped)	Typical Use
<b>Quadrol + (cont.)</b>								
Pluracol SG-360	4	362.5	700	3,500	N/A	N/A	PO	Rigid
Pluracol 1168	4	300	740	1,800	N/A	N/A	PO/EO	Rigid
Pluracol SG-470	5.5	470	665	35,000	N/A	N/A	PO	Rigid

Product	Nominal Functionality	OH Value	SAN Solids (%)	Viscosity @ 25°C (cps)	Typical Use
<b>Graft Polyols</b>					
Pluracol 1528FF	3	19	45	5,800	Molded
Pluracol 4600	3	29	45	4,200	Slab
Pluracol 4650	3	29	45	4,200	Slab
Pluracol 5132	3	22	32	3,240	Slab
Pluracol 5250	3	28	50	5,820	Slab

## Polyester Polyols

The Lupraphen® polyol portfolio offers polyester polyols for CASE and footwear applications. These polyols are optimized for mechanical properties and hydrolysis resistance of the final product.

Product	Nominal Functionality	OH Number (avg.)	Nominal Molecular Weight (g/mole)	Viscosity @ 60°C (cps)	Acid No. (max)	Typical Use
<b>Polyester Polyols</b>						
Lupraphen 1602/1	2	44	2,500	1,425	0.500	CASE
Lupraphen 1606/1	2.5	52	2,700	20,500	1.400	CASE
Lupraphen 1608/1	2	55	2,000	1,075	0.900	CASE
Lupraphen 1608/2	2	55	2,000	1,075	0.300	CASE
Lupraphen 1609/1	2	55	2,000	1,285	0.700	CASE
Lupraphen 1612/1	2	55	2,000	1,100	0.700	CASE
Lupraphen 1613/1	2	55	2,000	1,025	0.700	CASE
Lupraphen 1801/1	2	110	1,000	255	1.000	CASE
Lupraphen 1802/1	2	110	1,000	333	0.700	CASE
Lupraphen 1803/1	2	110	1,000	355	0.700	CASE
Lupraphen 1804/1	2	150.5	750	190	0.700	CASE
Lupraphen 2605/1	2.8	59	2,600	20,500	1.400	CASE



We create chemistry

## About BASF

BASF Corporation, headquartered in Florham Park, New Jersey, is the North American affiliate of BASF SE, Ludwigshafen, Germany. BASF has more than 20,000 employees in North America and had sales of around \$20 billion in 2018. For more information about BASF's North American operations, visit [www.basf.com](http://www.basf.com).

At BASF, we create chemistry for a sustainable future. We combine economic success with environmental protection and social responsibility. The approximately 122,000 employees in the BASF Group work on contributing to the success of our customers in nearly all sectors and almost every country in the world. Our portfolio is organized into six segments: Chemicals, Materials, Industrial Solutions, Surface Technologies, Nutrition & Care and Agricultural Solutions. BASF generated sales of around €63 billion in 2018. BASF shares are traded on the stock exchanges in Frankfurt (BAS), London (BFA) and Zurich (BAS). Further information at [www.basf.com](http://www.basf.com).

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