



BOOSTING SUSTAINABILITY IN POLYMERS

VELVETOL® – 100% bio-based 1,3-polypropanediol

VELVETOL® is a family of polyether polyols derived entirely from renewable raw materials. Excellent performance and easy handling make it an ideal replacement for fossil-based alternatives, helping you achieve your sustainability targets in polymers.



POLYMER PRODUCERS' CHALLENGE

Sustainability has become a pivotal driver of corporate behavior and consumer demand.

Political frameworks like the EU Green Deal or the UN's Sustainable Development Goals are paving the way for innovative solutions through renewable feedstock, recyclability, climate-friendly processes and other means. The polymer industry, still largely fossil-based, has a particularly urgent need for sustainable raw materials.



FULLY BIO-BASED SOLUTION

A solution to this challenge is VELVETOL®, a family of 100% renewable, high-performance polyols. It is produced from renewably sourced 1,3-propanediol and is fully compatible with fossil-based materials.

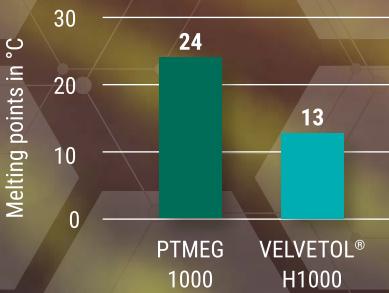
- VELVETOL® is your sustainable polyol of choice, delivering
- consistent quality,
 - high versatility, enabling a broad range of applications and
 - performance on par with, or superior to, PTMEG.



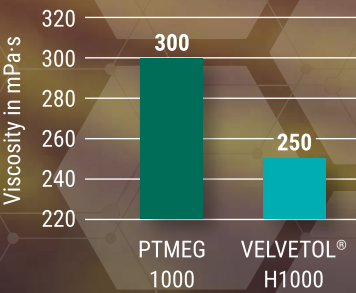
SUSTAINABLE PROCESSING

Additional energy and CO₂ savings can be achieved in processing due to the material's lower melting point and viscosity.

Melting points of polyols
MW: 1000 g/Mol



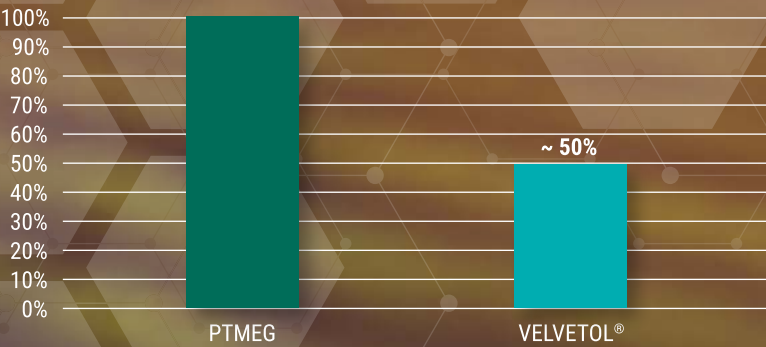
Viscosity @ 40°C
Mw: 1000 g/mol



CLIMATE-FRIENDLY OPTION

The global warming potential related to synthesizing VELVETOL® is only half of that associated with PTMEG. This has been established by an ISO 14,000-compliant life cycle analysis.

Global Warming Potential



Life Cycle Assessment by ifu Institut für Umweltinformatik Hamburg GmbH (2020)

ALL-ROUND TALENT

A VERSATILE, HIGH-PERFORMING BUILDING BLOCK DERIVED FROM NATURE

VELVETOL® is made by polymerization of bio-propanediol derived from renewable feedstock. By enabling excellent properties in key applications, often outperforming traditional PTMEG or PPG, it serves as a sustainable building block for the synthesis of polyurethane, co-polyetheramides and co-poly-etherester elastomers as well as surfactants and a number of other products.



- Spandex
- Apparel & Footwear
- Wearables
- Synthetic Leather
- Adhesives & Sealants
- Binders
- Coatings
- Flooring
- Wheels
- Surfactants
- Construction
- Vibration Dampening Materials
- Automotive
- Cosmetics
- Inks



PERFORMANCE IN THERMOPLASTIC POLYURETHANE ELASTOMERS (TPU)

SUPERIOR PROCESSING AND PERFORMANCE

Velvetol is an ideal building block for the production of ether-based thermo-plastic polyurethane elastomers (TPU). Higher melt-flow at lower energy use enables more efficient and sustainable production processes, such as in additive manufacturing and injection molding.

TPU	MFR@170°C/5kg	E _a [kJ/mol]
PTMEG 2000	1.1	367.1
Velvetol H2000	14.9	232.2

MFR – melt mass-flow rate; E_a – energy activation.

Velvetol in TPU allows outstanding mechanical properties, with improved elongation and vibration dampening properties over a broad temperature range and lower shore hardnesses.

TPU	TS _b [MPa]	E _b [%]	H [°ShD]
PTMEG 2000	32.7	680	40.7
Velvetol H2000	32.2	780	28.2

TS_b – tensile strength; E_b – elongation at break; H – hardness.

Benefits in TPU

- Improved processing
- Decreased shore hardness
- Excellent mechanical properties (tensile strength > 35MPa)
- Excellent abrasion resistance (abrasion < 40mm³)
- High flexibility at low temperatures (T_g < -30°C)
- High bio-content (up to 75%)

Biomass /
Starch

Fermentation →

Bio-
Propanediol

Polymerization →

VELVETOL®
MW: 250 –
2700 g/mol

PERFORMANCE IN POLYURETHANE DISPERSIONS (PUD)

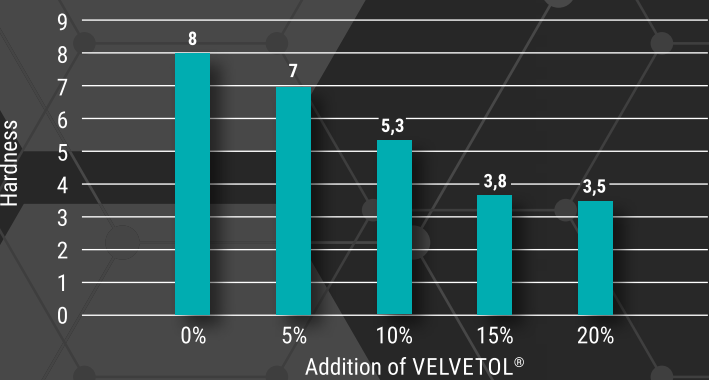
A SOFTER TOUCH

Utilizing VELVETOL® in high-solid-content PUDs for synthetic leather leads to outstanding flexibility at low temperatures and higher smoothness over a broad temperature range compared to standard systems. Abrasion resistance of coatings can also improve significantly.

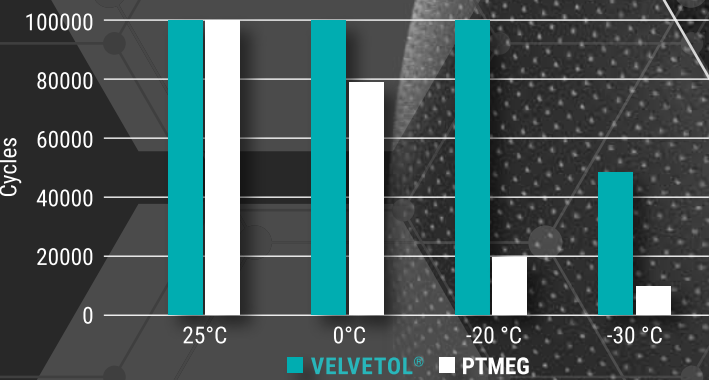
Polyurethane Dispersions (PUDs)

Polyol	VELVETOL®	PTMEG	AA-PDO	Sb-PDO	AA-BDO	AA-HDO
Sample	H2000	PTMEG-2000	AA/PDO-2000	Sb/PDO-2000	AA/BDO-2000	AA-HDO-2000
MEK (30 min)	Pass	Pass	Pass	Pass	Pass	Pass
-20 °C (100,000 cycles)	Pass	Pass	Slight damage	Pass	Crack	Pass
Taber abrasion (H22 1 kg), cycles	10000	7500	850	2100	700	1700
Solid content, %	38.9	39.7	40.6	40.7	40.6	40.1

Adding VELVETOL® leads to a softer hand feeling in microfiber leather (BLC)



Bally flex testing: VELVETOL® improves flexibility at low temperatures significantly



- Benefits in PUD**
- Less dye and pigment required
 - Enhanced flexibility at low temperatures
 - Enhanced adhesion
 - Enhanced abrasion resistance
 - Enhanced softness in microfiber leather

EXCELLENT DYNAMICS

VELVETOL® is a highly sustainable alternative to fossil-based materials in hot-cast elastomer systems, delivering excellent properties in terms of processability, dynamics and flexibility.

TDI-MOCA-cured hot-cast polyurethanes

Polyol	VELVETOL®	PTMEG
	H2000	2000
NC0, %	3.58	3.47
Soft segment, %	76.9	77.0
Pot life, min	13.5	16
Demold time, min	75	120
Hardness	87A	88A
100% 200% 300% Modules, psi	1080 1620 2228	926 1639 -
Tensile strength, psi	4051	3027
Elongation, %	650	475
Split tear (D1938), pli	130	92
Die C tear, pli	307	241
Ball rebound, %	70	71
Compression set, %	26	22

- Benefits in PU Elastomer**
- Improved overall toughness
 - Enhanced elongation
 - Improved split tear strength
 - Higher compression set
 - Outstanding dynamic properties
 - Improved flexibility at -30°C

VELVETOL® – SPECIFICATIONS

PROPERTIES	UNITS	H250	H500	H1000	H2000	H2700
Content	%	100	100	100	100	100
Molecular weight	Dalton	200 – 300	400 – 600	900 – 1100	1900 – 2100	2600 – 2800
Hydroxyl number	mg KOH/g	370 – 550	280 – 187	125 – 102	59.1 – 53.4	43.2 – 40.1
Controlled polymerization rate (alkalinity)	meqKOH/30 kg ppm	-2.0 – +2.0 ≤ 5	-2.0 – +2.0 ≤ 5	-2.0 – +2.0 ≤ 5	-2.0 – +2.0 ≤ 5	-2.0 – +2.0 ≤ 5
Acid number	ppm	≤ 0.05	≤ 0.05	≤ 0.05	≤ 0.05	≤ 0.05
Na metal content	mg KOH/g	≤ 10	≤ 10	≤ 10	≤ 10	≤ 10
Peroxide content	ppm	≤ 5	≤ 10	≤ 10	≤ 10	≤ 10
Water	ppm	≤ 500	≤ 500	≤ 500	≤ 500	≤ 500
Color	max 50	max 50	max 50	max 50	max 50	max 120
Viscosity [40°C]	mPa·s	40 – 60	90 – 120	200 – 300	750 – 900	1550 – 1850
Density [40°C]	g/ml	1.03	1.020	1.018	1.016	1.016
Melting point	°C	≤ 0	0 – 5	12 – 14	16 – 18	22 – 25

All grades include a bio-based stabilizer.



IMPORTANT!

The information provided in this Technical Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.



CONDITIONS FOR SAFE STORAGE, INCLUDING ANY INCOMPATIBILITIES:

Keep containers tightly closed in a cool, well-ventilated place. Store in original container and keep them away from heat and sources of ignition. Keep under nitrogen. Also keep away from food, drink and animal feedstuffs.

FREIGHT CLASSIFICATION:

Not a dangerous substance or mixture according to the Globally Harmonised System (GHS)

GUIDELINE:

Before usage, please keep the drum sealed and stored at ambient temperature (5–25°C). For usage, it is recommended to work under a nitrogen atmosphere. If you need to use VELVETOL® molten, please do so at temperatures below 70°C and under a nitrogen atmosphere.

Once open, please keep the remaining VELVETOL® in the drum under nitrogen and be sure that the drum is sealed again properly.

WARRANTY:

The minimum shelf life is two years, given that the aforementioned storage conditions are observed.

PACKAGING:

- 1 kg bottles
- 10 kg pails
- 180 kg drums
- Tank container

Made in Germany

VELVETOL® is produced at WeylChem's Allessa plant in Frankfurt, Germany, applying the highest sustainability and safety standards.

**Let's discuss how to make your PU product more sustainable:
VELVETOL@allessa.com**

This data sheet does not constitute any representation or warranty and may not be treated as an offer to supply Product. We would be pleased to provide you a binding offer to supply Product meeting your individual needs and requirements.

Allessa GmbH
Alt Fechenheim 34
60386 Frankfurt / Main, Germany
velvetol@allessa.com
Europe: +49 69 506 820 2223
US: +1 803 420 1014
www.weylchem.com