Technical Information
Fuel & Lubricant Solutions

BASF
We create chemistry

OPPANOL® B grades

OPPANOL® B grades are used for producing adhesives, sealants, lubricating oils, coating compounds, and chewing gum.

The new OPPANOL® B BMBcert™ products complete BASF's OPPANOL® product family and are **the first Biomass Balanced polyisobutenes derived from 100% renewable feedstock and deliver measurable CO2 savings.** The certified products thus contribute to sustainable development by saving fossil resources and reducing greenhouse gas emissions.

This unique solution enables customers to differentiate their products from competition and helps towards achieving their sustainability goals. All of that without compromising on performance and quality.

Chemical composition

medium molecular weight polyisobutenes

Properties

Product range

OPPANOL® B	10 SFN	11 SFN	12 SFN	13 SFN	14 SFN	15 SFN
	10 N		12 N			15 N
Stabilizer [ppm] (average BHT concentration)	no	no	no	no	no	no
	500		500			500
Specification on delivery						
Staudinger index J_0 [cm^3/g]	27.5 – 31.2	30.7 – 36.0	34.5 – 39.0	39.0 – 43.0	42.5 – 46.4	45.9 – 51.6

OPPANOL® B grades can be supplied without stabilizer (antioxidant BHT). Stabilizer-free grades are named SFN.

The Staudinger Index J_0 [cm^3/g] is calculated from the flow time at 20 °C for the solution through the Capillary of an Ubbelohde viscometer.

$$J_0 = \frac{\eta\, sp}{c(1 + 0,31 * \eta\, sp)}$$

(Schulz-Blaschke-equation)

$$\eta\, sp = \frac{t}{t_0} - 1$$

(specific viscosity)

$t = running\ time\ of\ Oppanol\ solution;$ applying Hagenbach-Couette correction
$t_0 = running\ time\ of\ isooctane,$ applying Hagenbach-Couette correction
$c = Concentration\ of\ Oppanol\ solution\ in\ g/cm^3$

Typical characteristics

OPPANOL® B	10 SFN	11 SFN	12 SFN	13 SFN	14 SFN	15 SFN
	10 N		12 N			15 N
Average molecular weight M_V (viscosity average)	40 000	47 000	55 000	65 000	73 000	85 000
Average molecular weight M_W (weight average) Expressed in equivalents of PS	53 000	65 000	70 000	88 000	101 000	108 000
Average molecular weight distribution M_W/M_n	3.2	3.2	3.2	3.2	3.2	3.2
Volatiles 105 °C 2 h [%]	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25
Density at 23 °C [g/cm³] DIN EN ISO 1183-3	0.91					
Fluorine [ppm]	< 5					
Chlorine [ppm]	< 5					
Ash content [ppm]	< 100					
Appearance	transparent to slightly turbid					
Color	colorless to slightly yellow					

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The viscosity average molecular weight is calculated according to the formula

$$M_V = \sqrt[0,65]{\frac{J_0 * 10^2}{3,06}}$$

Typical properties

OPPANOL® B	10 SFN	11 SFN	12 SFN	13 SFN	14 SFN	15 SFN
	10 N		12 N			15 N
Glass transition temperature [°C] DSC	- 64					
Specific heat [kJ/(kg*K)]	2.0					
Heat conductivity [W/(m*K)]	0.19					
Relative Permittivity (100 Hz, 1 mm, RT) IEC 60250	2.7					
Specific resistance [Ωcm] IEC 60093	10^{16}					
Shear viscosity	details upon request					

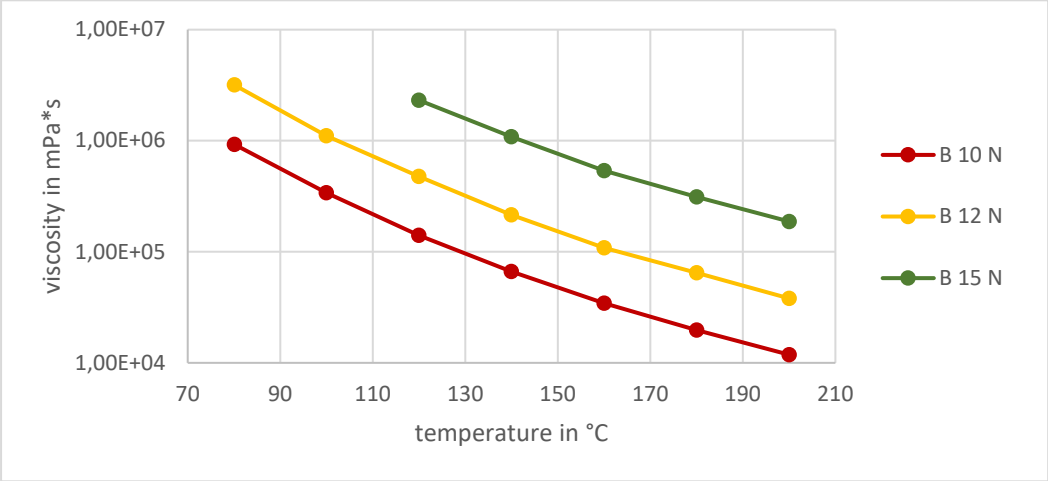
OPPANOL® B grades can be supplied without stabilizer (antioxidant BHT). Stabilizer-free grades are named SFN.

OPPANOL®	Molecular weight (M_W)	Barrier	Cohesion	Adhesion	Viscosity	Elasticity
B 10	50 000					
B 12	75 000					
B 15	100 000					
N 50*	500 000					
N 80*	1 000 000					
N 100*	1 500 000					
N 150*	3 000 000					

** For more information of OPPANOL® N grade properties, please refer to TI of OPPANOL® N*

Viscosity

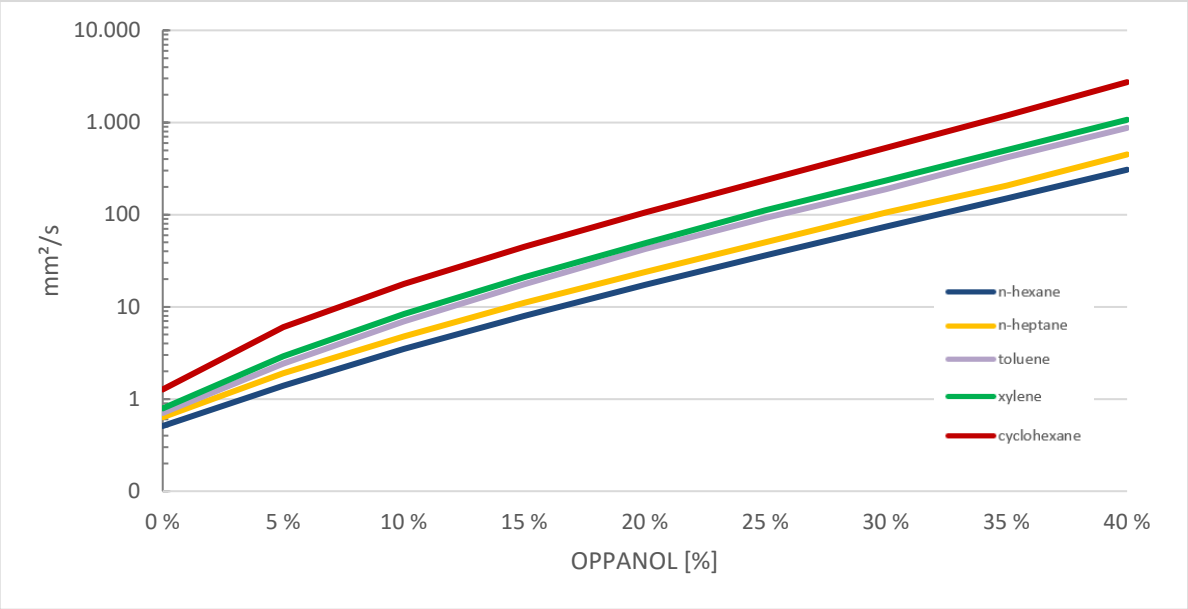
The curves for the viscosity against temperature of OPPANOL® B grades are shown below. These figures were measured at low rates of shear, because the OPPANOL® B grades display Newtonian flow at low shear. The pronounced pseudoplasticity of these products at high rates of shear entails that their viscosity would be expected to be substantially lower at high rates of shear.



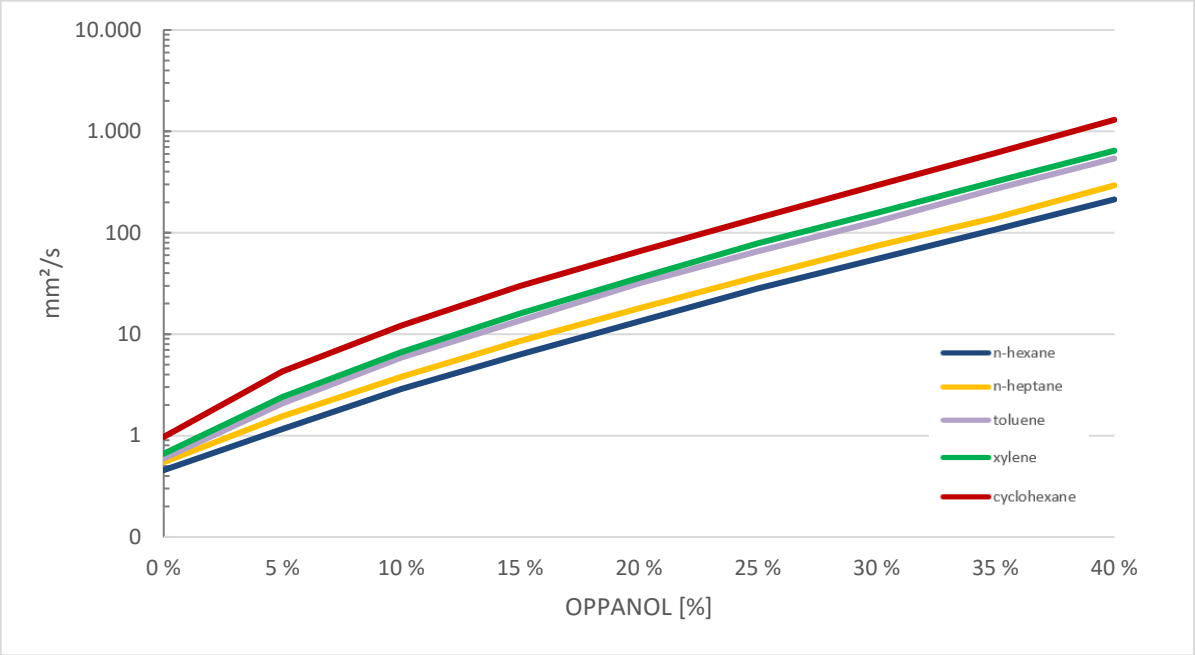
Viscosity against temperature measured in the Brookfield method

Solubility

The OPPANOL® B grades are soluble in aliphatic, aromatic, cyclic, and halogenated hydrocarbons. Their tendency to swell on solvation with alcohols, ethers, esters, and ketones increases with the length of the hydrocarbon chain. The viscosity of solutions of OPPANOL® B grades differ according to the solvent in question and its solvation behavior.



Example: OPPANOL® B 12 N - kinematic viscosity (mm²/s) in different solvents at 20 °C



Example: OPPANOL® B 12 N - kinematic viscosity (mm²/s) in different solvents at 38 °C

Chemical resistance

OPPANOL® B grades are resistant to aqueous acids and alkaline solutions. Exceptions are concentrated sulfuric and nitric acid, which cause degradation of the polymer chain.

Stabilizer

The OPPANOL® portfolio includes stabilized and non-stabilized grades. In order to prevent the polymer from oxidation, stabilized grades contain an average of approximately 500 ppm 2,6-di-tert-butyl-4-methylphenol (BHT). Non-stabilized grades are usually used for food applications like chewing gum, which give formulators additional freedom in composing their recipes. Stabilized grades are also suitable for food applications if the total BHT of the final product is not exceeding regulatory levels.

For outdoor applications, the addition of UV stabilizers like UV absorbers or steric hindered amines is recommended.

Quality control

The above-listed data represent average values at the time of going to press of this Technical Information. They are intended as a guide to facilitate handling and cannot be regarded as specified data. Specified product data are issued as a separate product specification.

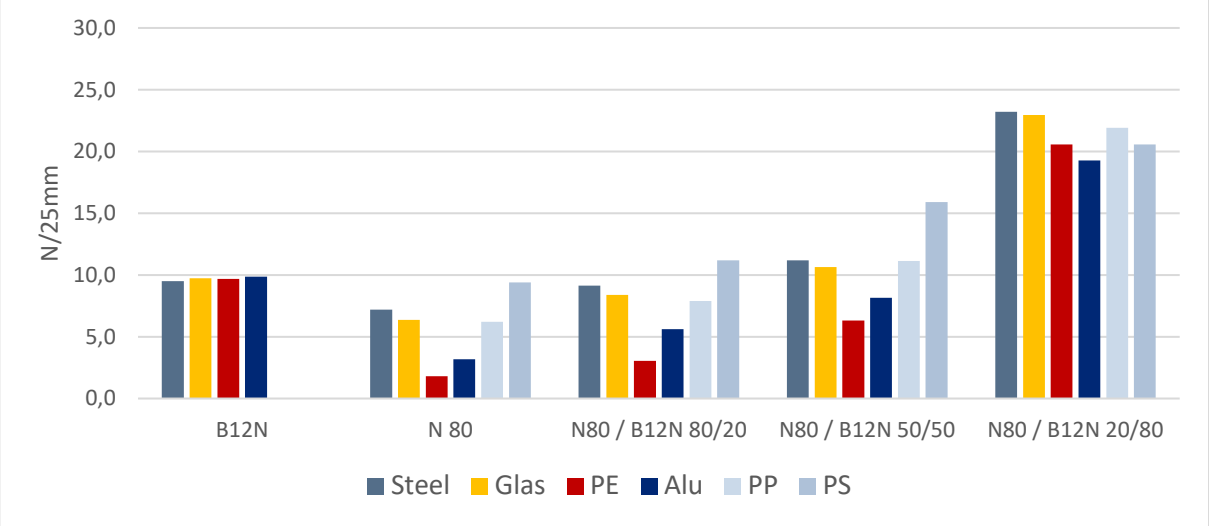
Applications

Sealants

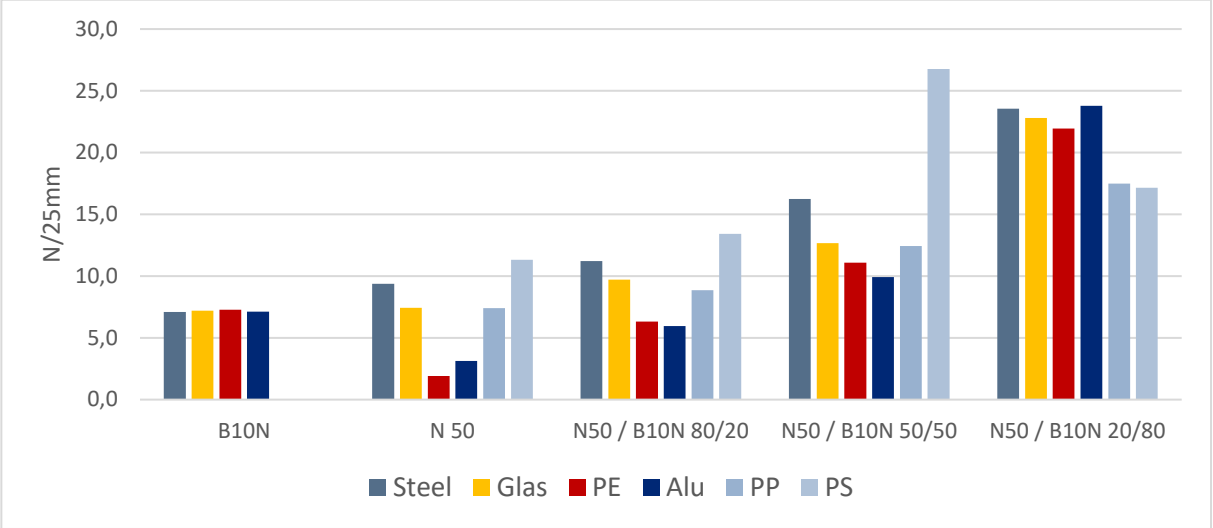
Together with fillers such as fine particles of soot, medium molecular weight OPPANOL® B grades work very well as sealants in double glazing windows or solar panels. Due to excellent gas barrier properties, OPPANOL® inhibits entering of water vapor inside double glazing windows through the sealant and at the same time it keeps the inert gas (Ar) between the glasses. It also prevents moisture from seeping into sensitive photovoltaic cells in solar panels to prevent corrosion. The OPPANOL® B grades can also be used in formulations for elastomeric sealants in combination with fillers, oils, and resins.

Adhesives

The OPPANOL® B grades can be used alone or in combination with the high molecular weight OPPANOL® N grades to achieve requirements.



Example: FTM 1 Peel adhesion measurement of OPPANOL® B 12 N / OPPANOL® N 80 on various substrates



Example: FTM 1 Peel adhesion measurement of OPPANOL® B 10 N / OPPANOL® N 50 on various substrates

Chewing gum

The stabilizer free OPPANOL® B grades were especially developed to produce chewing gum base. It allows all chewing base manufacturers to stabilize their products in conformance with the pertinent local legislation. Based on their softness, elasticity and acceptance for fillers, OPPANOL® B grades are particular essential ingredient of chewing gum and are mainly responsible for the long-lasting flavor and balanced texture.

Stabilized grades are also suitable for chewing gum applications if the total BHT of the final product is not exceeding regulatory limits.

Food packaging

All OPPANOL® B grades meet the requirements of food contact regulations. For this reason, they are suitable for food packaging applications where an effective moisture barrier is needed to prevent food from drying and as an adhesive component in re-sealable food packaging.

Bitumen

The OPPANOL® B grades also have several beneficial effects when they are added to bitumen. Advantages are increased melt viscosity, a more pliable bitumen film, improved resistance to changes in temperature (e.g. in bridge construction), higher weathering resistance, better adhesion and very high water resistance.

Lubricants

OPPANOL® B grades can be used as additives for a variety of lubricants, including industrial oils, hydraulic fluids, shock-absorber fluids, transformer oils, and greases. They are used to increase the viscosity of lubricants and to make their viscosity less dependent on temperature. The relationship between viscosity and temperature is described by the viscosity index (VI). The OPPANOL® B grades cause an increase in VI.

Processing

Blending

There are two ways to blend OPPANOL®: Dissolving and Melting.

Dissolving: OPPANOL® B grades are soluble in aliphatic, aromatic, cyclic and halogenated hydrocarbons. They are swollen by alcohols, ethers, esters and ketones. The extent of swelling is increasing with the length of the hydrocarbon chain.

Melting: OPPANOL® B grades are thermoplastics and can be processed with conventional machinery used in the rubber industry, including kneaders, roll-mills and single- or twin-screw extruders. Sigma-bladed mixers are widely used and, depending on the viscosity range, even Banbury mixers.

A recommended temperature range for melting OPPANOL® B grades is 80-150 °C.

Formulation

OPPANOL® B grades are mostly used in formulations into which they provide their properties.

Formulations are stepwisely prepared melt- or solvent-based mixtures that include one or more OPPANOL® grades. They may contain fillers, pigments, stabilizers and other polymers (e.g. butyl rubber, hydrocarbon resins and others) that are compatible with polyisobutene.

Film formation

Diluted OPPANOL® B solutions can be processed into films using methods in the coating industry, such as solution casting, solution dipping, spraying, extrusion / slot-die coating and bar coating, followed by calendering, and other post-treatment for the final compounding and removal of the solvents.

Equipment

For the processing of the OPPANOL® B grades, the following equipment can be used: **Kneaders** which can vary in the chamber size (often adjusted to PIB weight), rotor types, torque, speed, etc.; **Extruders** which can vary the screw types, the alloy, with or without vacuum, etc.; **Mixers**; **Calenders** (for final compounds).

Remark: Starting material should be the high viscosity component with stepwise addition of the lower viscosity component. Mixing time should be adjusted accordingly.

The higher the molecular weight the higher the risk of degradation. The addition of stabilizers is recommended for the SFN grades depending on the processing conditions.

Safety

General

When using this product, the information and advice given in our Safety Data Sheet should be observed. Due attention should also be given to the precautions necessary for handling chemicals.

In particular, the place of work must be well ventilated if large quantities are being processed, the skin should be protected, and safety glasses should be worn at all times.

Safety Data Sheets

Safety Data Sheets have been compiled for all OPPANOL® B grades that contain up-to-date information on all questions relevant to safety.

Labelling

According to all the data at our disposal, all OPPANOL® B grades are not dangerous substances or preparations as defined in the Globally Harmonized System of Classification and Labelling of Chemicals (GHS).

Industrial hygiene

According to our experience and information, OPPANOL® B grades do not exert any harmful effects on health, provided they are used for the purpose for which they are intended and processed in accordance with current industrial practice.

Certificates

The OPPANOL® B grades are certified and manufactured according to following quality standards: ISO 9001, Food Safety System Certification (FSSC 22000 including Food GMP), Hazard Analysis and Critical Control Points (HACCP), Halal and Kosher. Additional quality programs, industry standards and guidelines are applied to ensure product quality, safety, security and supply of the products according to various industry needs. Certificates and statements for OPPANOL® B grades regarding regional-, country- and industry-specific requirements are available upon request.

Shelf life

Storage at ambient temperatures and protection from light and moisture provided a shelf life (‘best before’ date) of two years from the date of production for all grades packed in boxes. The ‘best before’ date for grades packed in drums is three years from the date of production. Damage to packaging must be strictly avoided while in storage or during handling.

Note

The declaration and information given herein is exclusively provided for our customers and the respective competent authorities.

It is not intended for publication either in printed or electronic form (e.g. via Internet) by any third party. Neither partial nor full publication is allowed without the prior written permission of BASF.

The data indicated above are the results of our investigations, correspond to the state-of-the-art and are based on our current knowledge and experience. The data refer to the state of the laws at the date of issue.

BASF produces a wide variety of high quality polyisobutenes marketed by BASF under the trademark OPPANOL® that satisfy the manifold requirements of our customers, including products that may meet the specifications for use in food, medical, pharmaceutical or cosmetics applications.

BASF has proven expertise in supporting and working with our customers in the innovative use and application of our materials.

However, BASF has not designed or tested its OPPANOL® grades with respect to special requirements related to their use in medical devices (defined in the European, US or other local medical device legislation), pharmaceuticals and cosmetics.

In view of the many factors that may affect the processing and use of our OPPANOL®, the data in this publication do not relieve processors of the responsibility to carry out their own inspections and tests, neither do these data imply any guarantee of certain properties, nor the suitability of the product for a specific purpose.

Any descriptions, drawings, photographs, data, proportions, weights etc. given herein may change without prior notice and do not constitute the agreed contractual quality of the product. It is the responsibility of the recipient to ensure that all proprietary rights, laws and legislation are observed.

BASF does not recommend the use of or claim the suitability of OPPANOL® in a specific application and, therefore, the decision to use OPPANOL® is solely at the customer's own risk. It is the responsibility of the customer to determine whether their manufacturing process and the end application using OPPANOL® is safe, lawful and technically suitable for the intended use. BASF extends no warranties or guarantees, express or implied, concerning the suitability of OPPANOL® for any specific application, especially for a possible use in medical, pharmaceutical or cosmetics applications. Moreover, BASF does never supply its OPPANOL® products for the manufacture of implants.

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