

OPPANOL[®] N grades

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

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[®] = registered trademark of BASF SE

Chemical composition high molecular weight polyisobutenes

Properties

Product range

OPPANOL [®] N	N 50 SF*	N 50	N 80	N 100	N 150
Stabilizer [ppm] (average BHT concentration)	no	500	500	500	500
Specification on delivery					
Staudinger index J ₀ [cm ³ /g]	128 – 150	128 – 150	178 – 236	241 – 294	416 – 479

* Stabilizer-free grades are named SF.

The Staudinger Index J₀ [cm³/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;

*t*₀ = running time of isooctane,

c = Concentration of Oppanol solution in g/cm³

applying Hagenbach-Couette correction

applying Hagenbach-Couette correction

Typical characteristics

OPPANOL® N	N 50 SF*	N 50	N 80	N 100	N 150
Average molecular weight M _v (viscosity average)	425 000	425 000	800 000	1 110 000	2 600 000
Average molecular weight M _w (weight average) Expressed in equivalents of PS	565 000	565 000	1 050 000	1 550 000	3 050 000
Average molecular weight distribution M _w /M _n	2.4	2.4	2.4	2.9	2.9
Volatiles 105 °C 2 h [%]	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Density at 23 °C [g/cm³] DIN EN ISO 1183-3	0.91				
Fluorine [ppm]	< 2				
Chlorine [ppm]	< 90				
Ash content [ppm]	< 200				
Appearance	transparent to turbid				
Color	white to pale amber				

* Stabilizer-free grades are named SF.

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® N	N 50 SF*	N 50	N 80	N 100	N 150	N 50 SF*
Glass transition temperature [°C]	- 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	See figure 1, more details upon request					

* Stabilizer-free grades are named SF.

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® B grade properties, please refer to TI of OPPANOL® B

Viscosity

The OPPANOL® N grades are rubber like and high-viscous thermoplastic polymers. Viscosity increases with increasing molecular weight.

The curves of the shear viscosity at 100 °C of OPPANOL® N grades are shown below.

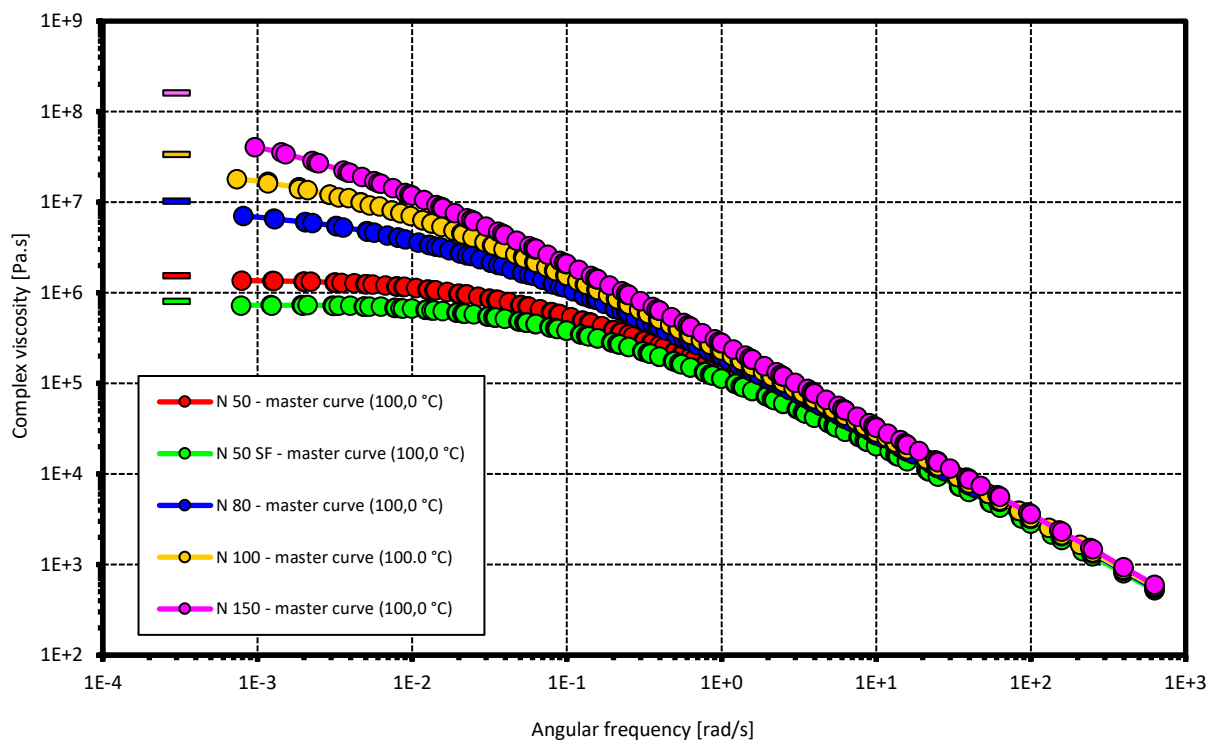
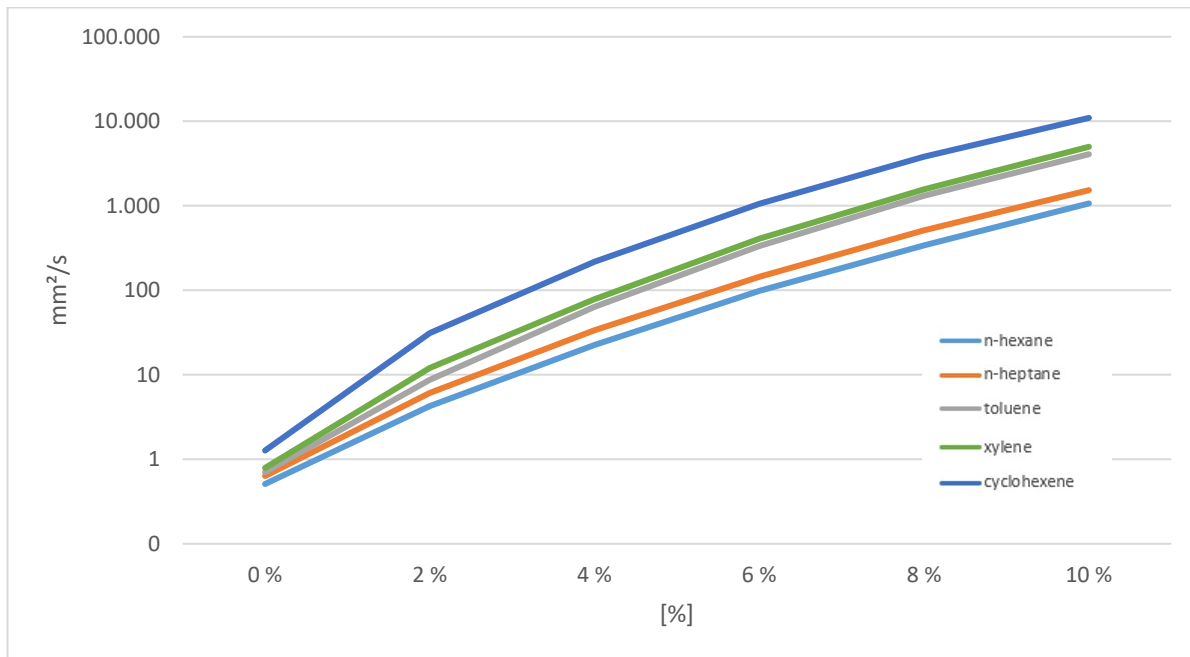


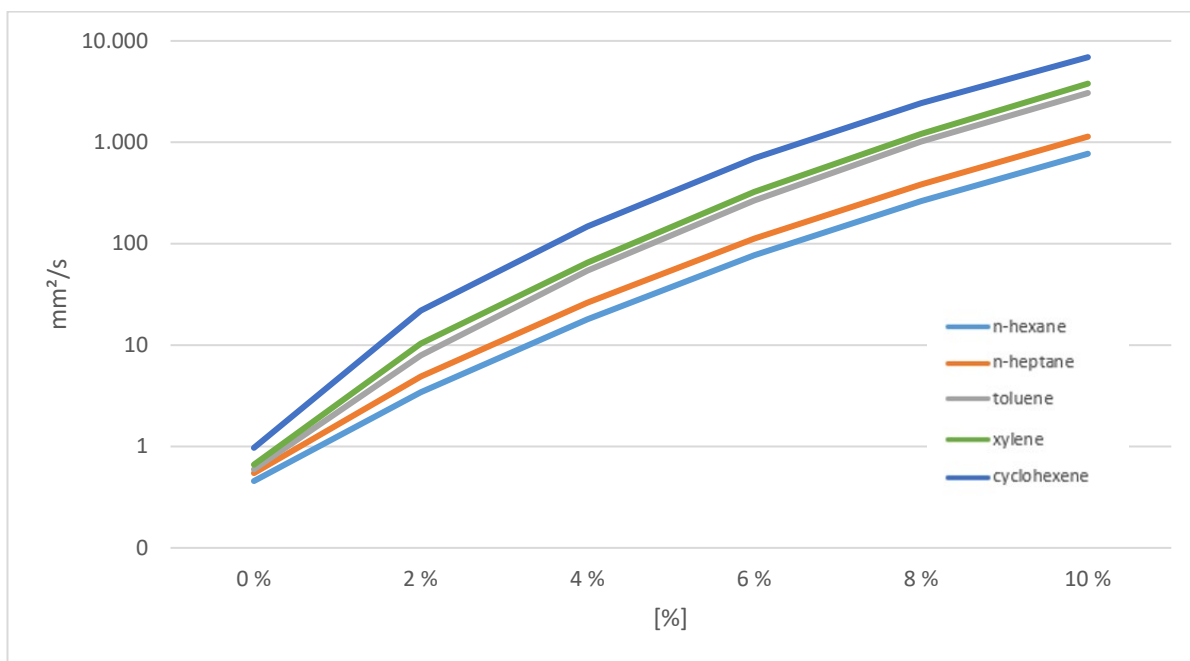
Figure 1: Shear viscosity at 100 °C of OPPANOL® N grades

Solubility

The OPPANOL® N 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® N grades differ according to the solvent in question and its solvation behavior.



Example: OPPANOL® N 80 – kinematic viscosity (mm²/s) in different solvents at 20 °C



Example: OPPANOL® N 80 – kinematic viscosity (mm²/s) in different solvents at 38 °C

Chemical resistance

OPPANOL® N 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**

The OPPANOL® N grades can be used in formulations for elastomeric sealants in combination with fillers, oils, and resins.

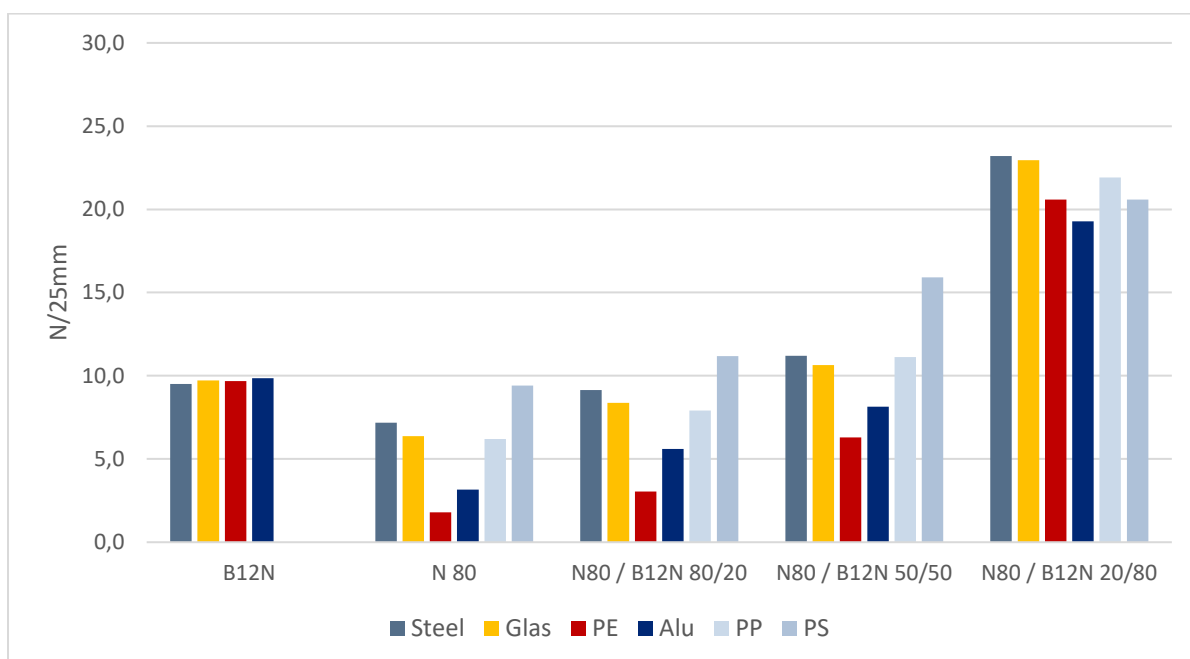
Due to excellent gas barrier properties, OPPANOL® inhibits entering of water. It prevents moisture from seeping into sensitive parts to prevent corrosion.

Adhesives

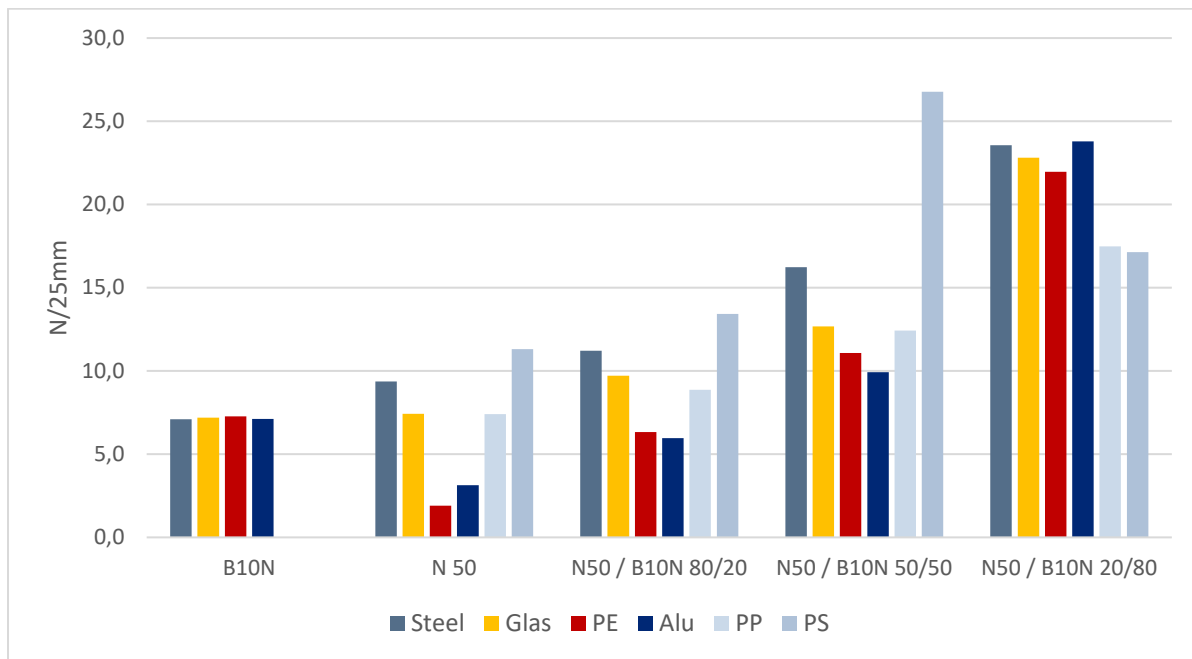
The OPPANOL® N grades, can be used alone or in combination with the medium molecular weight OPPANOL® B grades to achieve requirements.

The well-balanced combination of adhesion and removability makes the use of OPPANOL® valuable for protective films (for example applied on new cars when shipped to the dealership).

It is removable without leaving a trace and tack to almost all surfaces.



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



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

Chewing gum

The stabilizer free OPPANOL® N 50 SF was 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 elasticity and acceptance for fillers, OPPANOL® N grades are particularly 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® N 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.

Roofing

Weatherability, combined with maximum moisture protection and elasticity at low temperatures, make OPPANOL® N grades valuable for membranes used in flat roofs.

Cold flow enables self-healing process of the roofing membranes.

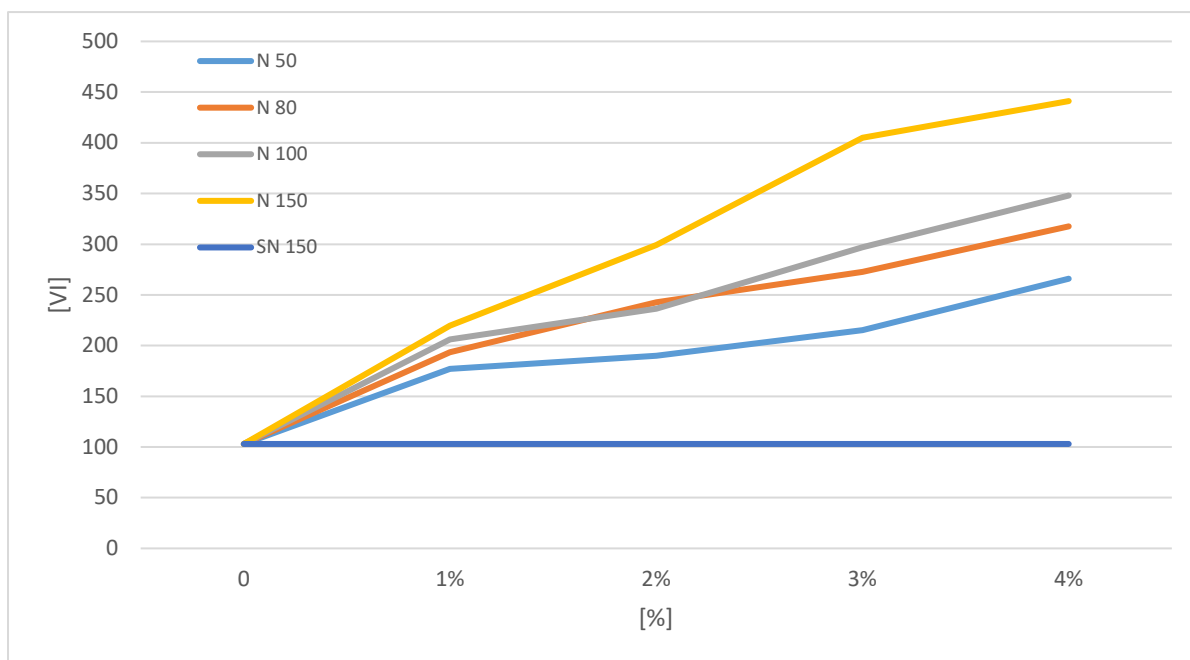
PIB do not shrink over long time periods compared to PVC foils and do not require harmful plasticizers in the application.

Bitumen

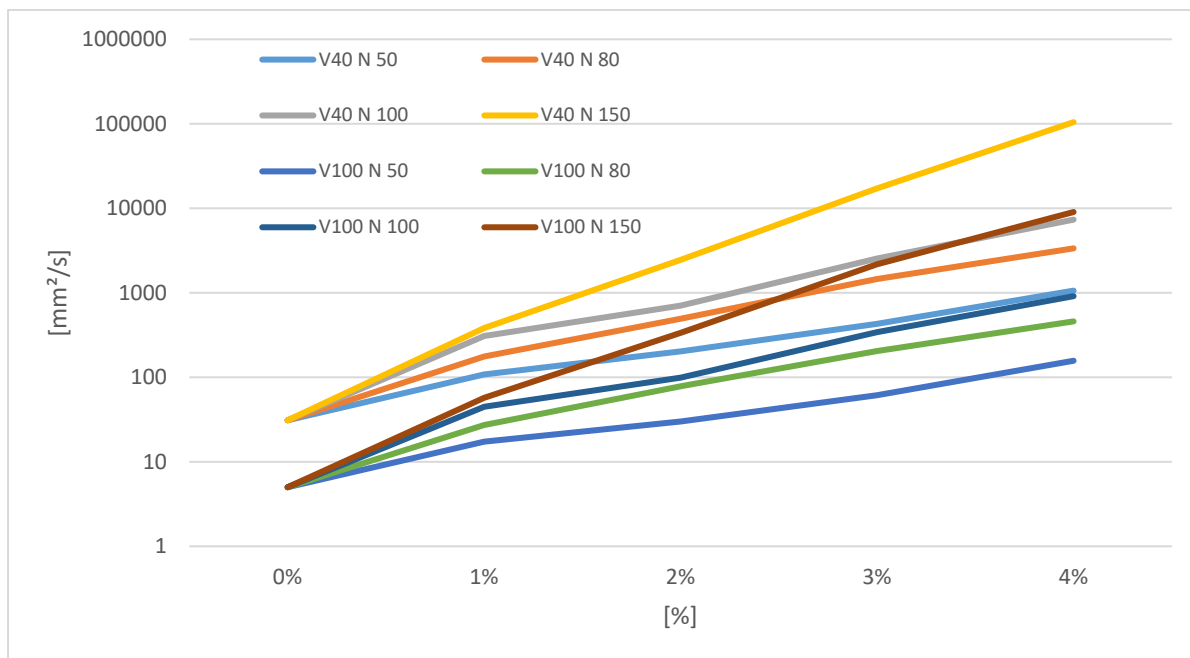
The OPPANOL® N grades also have several beneficial effects when they are added to bitumen. Advantages are increased melt viscosity, a more pliable bitumen film, improved resistance to changes in temperature (e.g. in bridge construction), higher weathering resistance, better adhesion and very high water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

Lubricants

OPPANOL® N 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® N grades cause an increase in VI.



OPPANOL® N – Viscosity Index in SN 150 base oil



OPPANOL® N – kinematic viscosity at 40°C and 100°C (V40 and V100) [mm²/s] in SN 150 base oil

Processing

Blending

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

Dissolving: OPPANOL® N 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® N 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.

Formulation

OPPANOL® N 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® N 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 calendaring, and other post-treatment for the final compounding and removal of the solvents.

Equipment

For the processing of the OPPANOL® N 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 OPPANOL® N 50 SF grade 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® N grades that contain up-to-date information on all questions relevant to safety.

Labelling

According to all the data at our disposal, all OPPANOL® N 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® N 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® N grades are certified and manufactured according to following quality standards: ISO 9001, ISO 14001, Food Safety Modernization Act (FSMA), Hazard Analysis and Risk-Based Preventive Controls (HARPC), self-assessed Good Manufacturing Practice (GMP), 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® N grades regarding regional-, country- and industry-specific requirements are available upon request.

Packaging

20 kg (44.1 lb) bales in Easy-Peel PE film (green) or in Dispersible PE film (transparent).

Shelf life

Storage at ambient temperatures and protection from light and moisture provided a shelf life ('best before' date) of three years from the date of production for all grades. 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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BASF SE

Fuel and Lubricant Solutions
67056 Ludwigshafen, Germany
www.basf.com/fuel-lubricant-solutions