

# POLYVEST®

Designed Polymers by Adhesive Resins Product Line



POLYVEST®

# Welcome from the Adhesive Experts of Evonik

Discover our product portfolio designed for the Adhesives & Sealants Industry. Based on our different polymer backbone systems, we develop individual solutions according to your needs.

## YOUR BENEFITS – OUR VALUES

### Focus on customer orientation

We are a solution provider. Our mission is to create tailor-made solutions to ensure that every one of your projects is a success. That is why we are considered to be the first choice when it comes to solving your challenging tasks.

Thanks to our global presence we can respond promptly and make your individual wishes come true.

### Perfectly targeted expertise

With our team of adhesive experts and our dedicated sales force, you can be assured that we offer a wealth of expertise.

We do not only provide you with capabilities spanning from research and development through to logistics, but we can also offer you valuable market knowledge and in-depth technical expertise. That is why our know-how is spot-on, every time.

### Absolute reliability

Any good business partnership is based on reliability. There is nothing more valuable than knowing that your business partner will be there for you. We take this to heart and offer you excellent product quality, security of supply and our continuous drive to make your challenges our own – this way we help you overcome any obstacle along the way.

### Profiting from future orientation

Improving performance and efficiency can only be accomplished if you constantly stay ahead. That is why we identify future trends as early as possible, collaborating with you to develop innovative solutions. Our foresight is valued by customers and partners alike, because they know that we always keep an eye on the future to guarantee long lasting success.

## YOUR MARKETS – OUR FOCUS

We offer custom-made Adhesive & Sealant solutions for a broad spectrum of industries. If you don't find your line of business here, just talk to us. Our team will gladly help you accomplish your project.

- Automotive
- Construction
- Packaging
- Electronics
- Processing Aides
- Product Assembly

## YOUR SOLUTIONS – OUR BRANDS

**DYNACOLL®**  
Polyester-Polyols, Copolyesters, Polyacrylates

**VESTOPLAST®**  
Amorphous Poly-Alpha-Olefines

**VESTOWAX®**  
Fischer-Tropsch-Waxes

**POLYVEST®**  
Liquid Polybutadienes

**DEGALAN®**  
Methacrylate Binders for Heat Seal Lacquers

## Our Product Range

DYNACOLL®

VESTOPLAST®

VESTOWAX®

**POLYVEST®**

With our **POLYVEST®** grades, we offer a range of stereospecific, low-viscous and unsaponifiable liquid polybutadienes of different chemical composition. They are used in a broad field of adhesive and sealant applications.

DEGALAN®



**LIQUID POLYBUTADIENES**

With POLYVEST®, Evonik’s Adhesive Resins Product Line offers a range of stereospecific, low viscous and unsaponifiable liquid polybutadienes of different chemical composition. Based on their characteristic microstructure all POLYVEST® grades exhibit an excellent reactivity and could be used for a broad field of applications. The unsaturated polymer backbone of all POLYVEST® grades offers the opportunity for various crosslinking options like sulfur curing and oxidative drying. In addition the functional moieties of POLYVEST® HT and POLYVEST® MA make further options for crosslinking and polymer modification feasible.

**Product benefits**

- Low viscosity
- Excellent chemical resistance to acids and bases
- High water resistance
- Excellent electrical insulation properties
- Low temperature flexibility
- Low moisture and oxygen permeability

**POLYVEST®** - non-functionalized liquid polybutadienes

**POLYVEST® MA** - maleic anhydride-functionalized liquid polybutadienes

**POLYVEST® HT** - hydroxyl-terminated liquid polybutadienes

**Further information**

- **Storage**  
POLYVEST® products are stable for at least 1 year with exclusion of air, light and moisture and at storage temperatures below 25 °C.
- **Safety and Handling**  
POLYVEST® products react with atmospheric oxygen to form peroxides and undergo crosslinking in its presence. Thus POLYVEST® products are packed and delivered under a blanket of inert gas (nitrogen). When handling, prevent any exposure of the products to atmospheric oxygen. Opened containers should be blanketed with inert gas again and closed tightly. Please refer to our Material Safety Data Sheets.

**Analytical methods**

- **Viscosity**  
Determination according to DIN EN ISO 3219.
- **Acid Number**  
Determination according to DIN EN ISO 2114.
- **Hydroxyl Number**  
Determination according to DIN 53 240-2.
- **Peroxide Number**  
Determination according to DGF-method: C-VI-6a (84).
- **Iodine Number**  
Determination according to DIN 53 241.

**Discover our portfolio of liquid polybutadienes**

Product Range					
POLYVEST®	110	130	MA 75	EP* MA 120	HT
<b>Specifications</b>					
Viscosity at 20 °C [mPa s]	700 - 860	2,700 - 3,300	6,000 - 9,000	approx. 61,000 (23°C)	-
Viscosity at 30 °C [mPa s]	-	-	-	approx. 30,000	4,000 - 5,500
Acid Number [mg KOH/g]	≤ 0.3	≤ 0.3	70 - 90	approx. 130	-
Hydroxyl Number [mg KOH/g]	-	-	-	-	44 - 51
Peroxide Number [mval/kg]	≤ 10	≤ 10	-	-	-
<b>Typical Data</b>					
Supply Form	viscous liquid	viscous liquid	viscous liquid	viscous liquid	viscous liquid
Molecular Weight M <sub>n</sub> [g/mol]**	approx. 2,600	approx. 4,600	approx. 3,000	approx. 3,200	approx. 2,900***
Iodine No. [g Iod/100g]	420 - 480	420 - 480	380 - 420	380 - 420	420 - 440
Density at 20 °C [g/cm <sup>3</sup> ]	0.90 - 0.92	0.90 - 0.92	approx. 0.95	approx. 0.97	0.90 - 0.92
Gardner Color	≤ 1	≤ 4	≤ 2.5	≤ 2.5	≤ 1
Flash Point [°C]	approx. 180	approx. 200	approx. 300	> 300 (DIN ISO 2592)	approx. 215
Ignition Temperature [°C]	approx. 360	approx. 350	approx. 360	approx. 355	approx. 375
Pour Point [°C]	approx. -55	approx. -50	approx. -25	approx. -1	approx. -18
Tg [°C]	approx. -100	approx. -99	approx. -95	approx. -92	approx. -80

\* EP = Experimental Product  
 \*\* = Determination via GPC calibrated with polystyrene standard  
 \*\*\* = Determination via GPC calibrated with polybutadiene standard

- **Molecular Weight Mn**  
Determination via GPC according to DIN 55 627-1, calibrated with polystyrene standard. Determination via GPC calibrated with polybutadiene standard, (POLYVEST® HT).
- **Density at 20 °C**  
Determination according to DIN ISO 2811-1.
- **Flash Point**  
Determination according to DIN EN ISO 2719. Determination according to DIN ISO 2592 (POLYVEST® EP MA 120).

- **Gardner Color**  
Determination according to DIN EN ISO 4630-2.
- **Ignition Temperature**  
Determination according to DIN 51 794.
- **Pour Point**  
Determination according to DIN ISO 3016.
- **Glass Transition Temperature Tg**  
Determination according to DIN EN ISO 11 357-1.

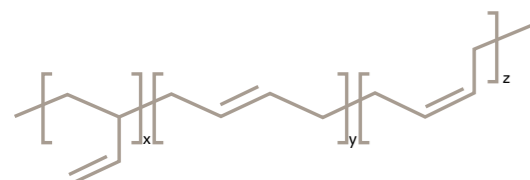
# POLYVEST®

## Liquid polybutadienes of different chemical composition

### POLYVEST® 110

is a stereospecific, low viscous and unsaponifiable liquid polybutadiene manufactured by Ziegler-Natta polymerization. Due to its microstructure and high 1,4-cis double bonds, the apolar and highly hydrophobic polybutadiene is a highly reactive and crosslinking binder providing benefits to broad fields of applications.

#### POLYVEST® 110



#### Microstructure

x = 1,2-vinyl double bonds [%]: ~ 1  
y = 1,4-trans double bonds [%]: ~24  
z = 1,4-cis double bonds [%]: ~75

### Typical properties (selected)

Viscosity @ 20°C [mPa s] 700 - 860  
Acid number [mg KOH/g] ≤ 0.3  
Peroxide number [mval/kg] ≤ 10  
Glass transition temperature [°C] -100

### Performance characteristics

- Excellent chemical resistance to acids and bases
- High water resistance
- Excellent electrical insulation properties
- Low temperature flexibility

### Packaging

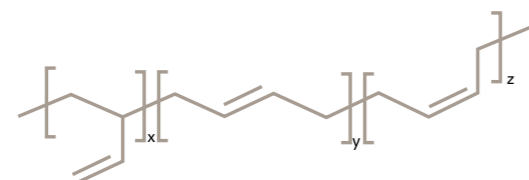
190 kg drums on pallet – bulk



### POLYVEST® 130

is a stereospecific, low viscous and unsaponifiable liquid polybutadiene manufactured by Ziegler-Natta polymerization with higher molecular weight. Due to its microstructure and high 1,4-cis double bonds, the apolar and highly hydrophobic polybutadiene is a highly reactive and crosslinking binder providing benefits to a broad field of applications.

#### POLYVEST® 130



#### Microstructure

x = 1,2-vinyl double bonds [%]: ~ 1  
y = 1,4-trans double bonds [%]: ~22  
z = 1,4-cis double bonds [%]: ~77

### Typical properties (selected)

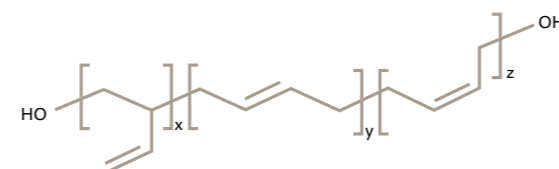
Viscosity @ 20°C [mPa s] 2,700 - 3,300  
Acid number [mg KOH/g] ≤ 0.3  
Peroxide number [mval/kg] ≤ 10  
Glass transition temperature [°C] -99

- Good compatibility with hydrocarbon resins, rosin resins and zinc resonates
- Good solubility in aliphatic, aromatics and ethers

### POLYVEST® HT

is a liquid hydroxyl-terminated polybutadiene manufactured by radical polymerization. The polymer exhibits a highly hydrophobic polybutadiene backbone and primary hydroxyl groups that are accessible for precise chemical modification. With a hydroxyl functionality of approx. 2.4, POLYVEST® HT is used as polyol component in various adhesive and sealant applications.

#### POLYVEST® HT



#### Microstructure

x = 1,2-vinyl double bonds [%]: ~22  
y = 1,4-trans double bonds [%]: ~58  
z = 1,4-cis double bonds [%]: ~20

### Typical properties (selected)

Viscosity @ 30°C [mPa s] 4,000 - 5,500  
Hydroxyl number [mg KOH/g] 44 - 51  
Hydroxyl number [meq/g] 0.78 - 0.91  
Molecular weight Mn [g/mol] ~ 2,900  
Polydispersity index PDI 2.3  
Hydroxyl functionality ~2.4  
Glass transition temperature [°C] -80

### Performance characteristics

- Excellent chemical resistance to acids and bases
- High water resistance
- Excellent electrical insulation properties
- Low temperature flexibility
- Low moisture and gas permeability
- Good compatibility with hydrocarbon resins, rosin resins, zinc resonates, polyethers and polyetherpolyols
- Good solubility in aliphatic, aromatics and ethers

### Export regulations

POLYVEST® HT is subject to export control measures by German Export Control Authorities. An approval by that organization may be required for export.

### Packaging

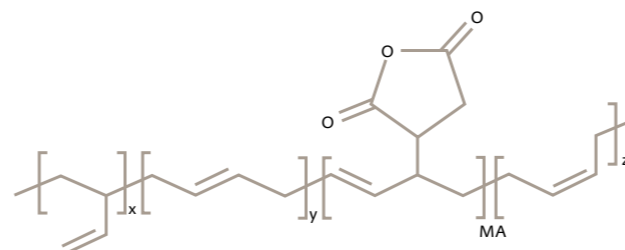
HT: 180 kg drums on pallet - 850 kg IBC – bulk  
MA 75: 180 kg drums on pallet - 900 kg IBC - bulk



### POLYVEST® MA 75

is a maleic anhydride functionalized adduct of a low molecular weight 1,4-cis liquid polybutadiene which has succinic anhydride groups randomly distributed along the polymer chains. This makes the originally apolar polybutadiene more polar and accessible for various chemical reactions. Further maleic anhydride functionalized adducts differing in maleic anhydride content and viscosity may be available, e.g. POLYVEST® EP MA 120.

#### POLYVEST® MA 75



### Typical properties (selected)

Viscosity @ 20°C [mPa s] 6,000 - 9,000  
Acid number [mg KOH/g] 70 - 90  
Glass transition temperature [°C] -95

### Performance characteristics

- Excellent chemical resistance to acids and bases
- High water resistance
- Excellent electrical insulation properties
- Low temperature flexibility
- Good compatibility with long-oil Alkyd resins, rosin resins and zinc resonates
- Good solubility in aliphatic, aromatics and ethers

### Compatibility of POLYVEST® grades with binders and resins

POLYVEST®		110	130	MA 75	EP MA 120	HT
Acrylate resins	Methacrylates	-	-	-	-	-
	OH-acrylates	o	-	o	o	-
Alkyd resins	short-oil	-	-	-	-	-
	medium-oil	o	-	o	o	-
	long-oil	o	-	+	+	o
Carbamic acid resins	-	-	-	-	-	
Cellulose esters	-	-	-	-	-	
Epoxy resins, low molecular weight	-	-	o	o	-	
Glycerol resin esters	-	-	o	o	-	
Hydrocarbon resins	+	+	o	o	+	
Ketone resins	o	o	o	o	o	
Melamine resins	-	-	o	o	-	
Nitrocellulose	-	-	-	-	-	
Phthalate resins	-	-	-	-	-	
Resols, unplasticized	-	-	-	-	-	
Rosin esters	+	+	+	+	+	
Rosin-modified phenolic resins	-	-	-	-	-	
Saturated polyesters	-	o	-	-	-	
Styrene-alkyd resins	-	-	-	-	-	
Urea resins, unplasticized resins	-	-	o	o	-	
Zinc resins	+	+	+	+	+	

### Solubility of POLYVEST® grades

POLYVEST®		110	130	MA 75	EP MA 120	HT
Alcohols	-	-	-	o	o	-
Aliphatic hydrocarbons	+	+	+	+	+	+
Aromatic hydrocarbons	+	+	+	+	+	+
Esters	o	o	o	o	o	o
Ethers	+	+	+	+	+	+
Glycol ethers	-	-	-	-	-	-
Ketones	o	o	o	o	o	o

+ compatible / soluble    o limited compatibility / solubility    - incompatible / insoluble

The compatibility results represent 40 wt.% of the binder/resin with POLYVEST®.

The solubility reflects adding 90 and 50 wt.% of solvent to 10 and 50 wt.% POLYVEST®.

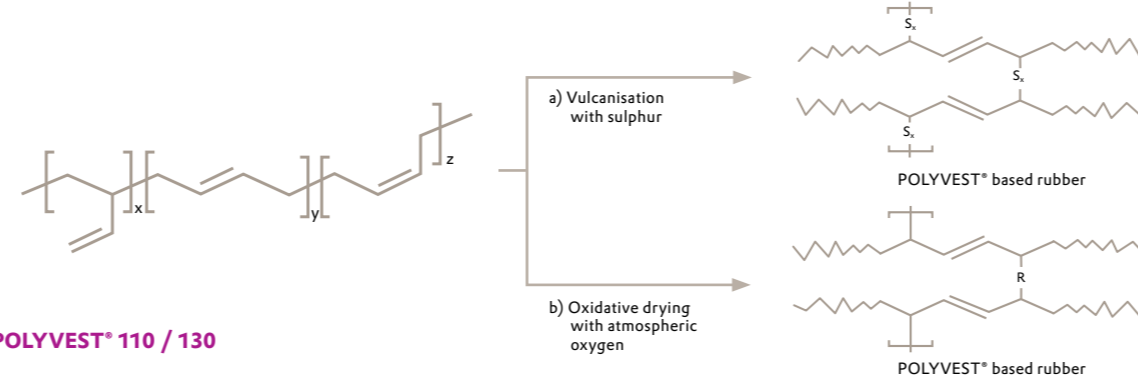
This information is based on our best knowledge and experience. We recommend conducting your own tests and experiments prior to use.



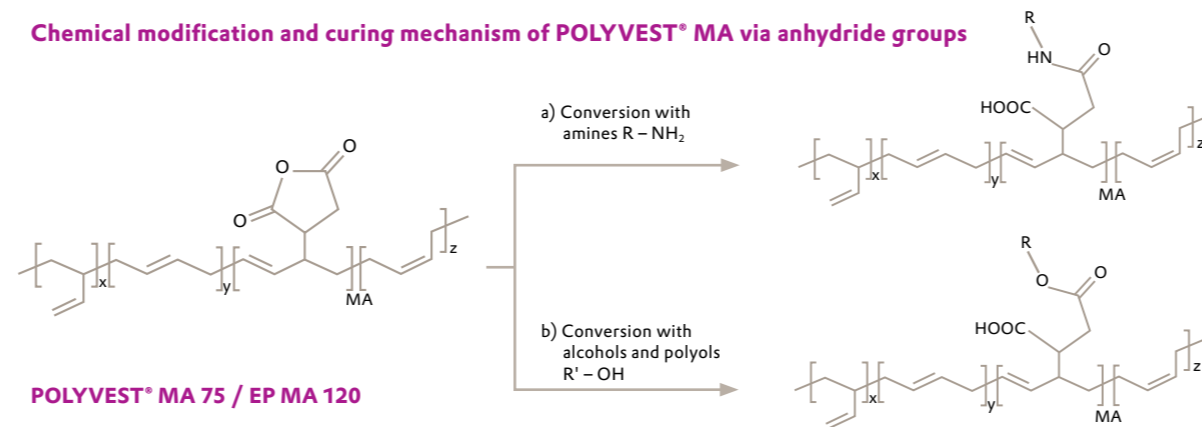
### Curing and chemical modification of POLYVEST® grades

POLYVEST®	110	130	MA 75	EP MA 120	HT
<b>Curing via</b>					
Sulphur vulcanisation	•	•	•	•	•
Oxidative drying	•	•	•	•	•
<b>Curing and modification via reaction with</b>					
Amines			•	•	
Carboxylic acids or anhydrides					•
Polyols			•	•	
Isocyanates					•

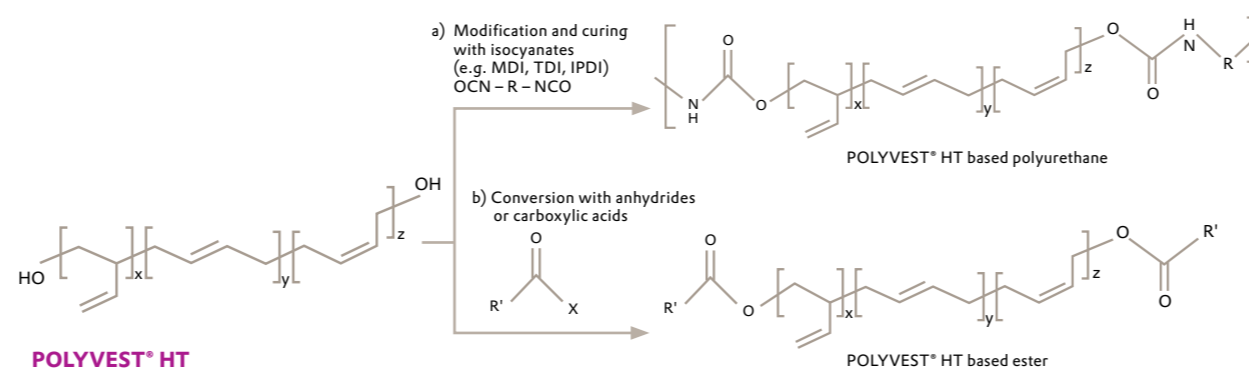
#### Curing mechanism of POLYVEST® grades via reaction of polymer backbone



#### Chemical modification and curing mechanism of POLYVEST® MA via anhydride groups



#### Chemical modification and curing mechanism of POLYVEST® HT via hydroxyl groups

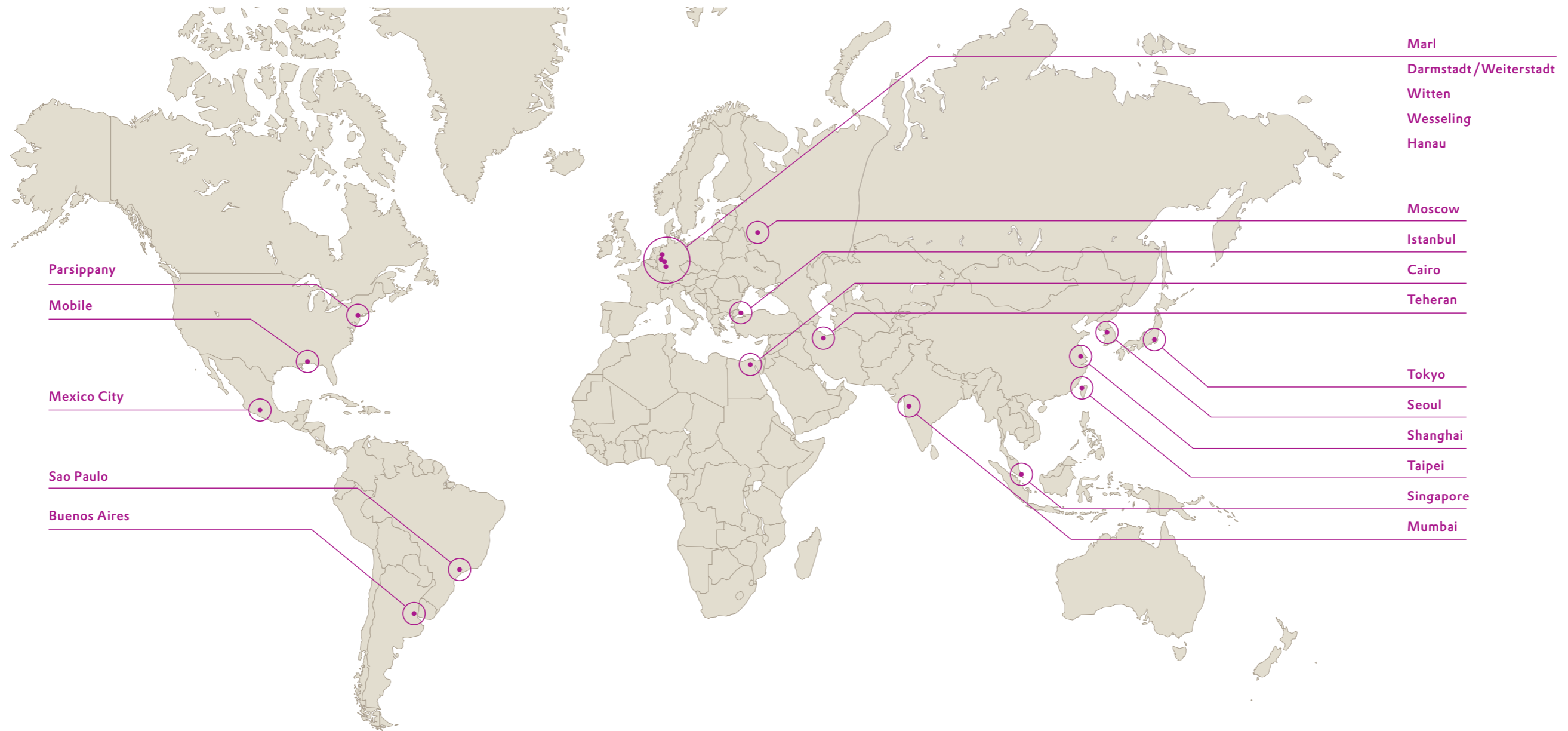


### POLYVEST® Applications

POLYVEST®	non-functionalized		MA-functionalized		hydroxyl-terminated
	110	130	MA 75	EP MA 120	HT
<b>Automotive</b>					
Adhesives and sealants	•	•	•	•	•
<b>Coatings</b>					
Air drying improver of vegetable oils	•	•			
Defoamers		•			
Impregnations	•				•
Modifier in resin systems	•	•			
<b>Construction</b>					
Adhesives and sealants					•
Binder for dusty and dry quartz sand	•	•			
Binder for soil stabilization	•				
Modifier of silicone sealants			•		
Insulated glass sealants					•
Joint sealants					•
Waterproof membranes and coatings					•
<b>Electronics</b>					
Electrical insulations and potting compounds	•		•	•	•
<b>Plastics</b>					
Cell opener for PU-Foam		•			
Release agents for PU-Foam	•	•			•
<b>Polymer Modification</b>					
Chlorinated rubbers	•	•			
Electrocoatings	•				
Waterborne, oxidative drying binders	•				
<b>Printing &amp; Inks</b>					
Offset printing inks	•	•			
Flexible printing plates	•	•			
<b>Rubber</b>					
Binder for recycled rubber compounds	•	•			•
Modifier in carbon black-filled EPDM compounds			•	•	
Modifier in silica-filled rubber compounds			•	•	
Plasticizer in rubber compounds / tires	•	•			
Polymeric chalk activator in EPDM compounds			•	•	

# Designed Polymers: Discover our global network

Find your regional contact:  
<http://evonik.com/adhesive-resins-contacts>



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