



Technical Information B-RI 17

# **TIXOGEL**

Rheological Additives for Organic Systems


# TIXOGEL Formulations – Products and Applications

## Advantages for your product:

- Easy handling
- No sagging
- No dripping
- Excellent storage stability
- No settling

## Advantages for your production processes:

- Easy to meter
- Easy to disperse
- Universally applicable

Non-polar  Polar											
Tixogel											
VP	MP	EZ 100	MP 100	UN	MPG	VZ	MP 250	MPZ	RHEOCIN	RHEOTHIX 240	GARAMITE 1958

## Systems

Acrylate resin systems	<input type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>				<input type="checkbox"/>			<input type="checkbox"/>
Alkyd resin systems	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>					<input type="checkbox"/>	
High-gloss, epoxy-resin paints (solvent-free)	<input type="checkbox"/>		<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>
High-gloss, epoxy-resin paints (solvent-containing)	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
1K Polyurethane resin systems	<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	
2K Polyurethane resin systems		<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Polyester resins and fillers					<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
High-gloss, silicon paints	<input type="checkbox"/>	<input checked="" type="checkbox"/>			<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>			
Vinyl resin systems		<input type="checkbox"/>			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>
Chlorinated/cyclized rubber paints	<input type="checkbox"/>	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
NC and NC-combination coatings					<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input type="checkbox"/>
Plastisols and plastigels	<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Printing inks (petroleum-based)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>							
Printing inks (vegetable-oil-based)					<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>			
Oil-based, high-gloss paints	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>					<input type="checkbox"/>	<input type="checkbox"/>
Bituminous coatings	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>				<input type="checkbox"/>	
Acid-curing systems	<input type="checkbox"/>	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input type="checkbox"/>			

## Areas of Application

Industrial coatings (general)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
High Solids	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>
Textured paints	<input type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input type="checkbox"/>		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Special-effect paints (e.g. hammer finish)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Baking coatings	<input type="checkbox"/>	<input checked="" type="checkbox"/>		<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>			
Automotive coatings	<input type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			<input type="checkbox"/>		<input type="checkbox"/>	<input checked="" type="checkbox"/>
Primers	<input type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Heavy duty coatings	<input type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Underbody protectants		<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Paints for road markings		<input checked="" type="checkbox"/>		<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Building paints	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>					<input type="checkbox"/>	<input type="checkbox"/>
Protective wood coatings	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>
Antifouling coatings	<input type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>		<input checked="" type="checkbox"/>			<input type="checkbox"/>
Marine paints	<input type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input type="checkbox"/>	<input checked="" type="checkbox"/>
Wash primers					<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
Zinc dust paints	<input type="checkbox"/>	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>					<input type="checkbox"/>	

## Special Applications

Adhesives					<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Construction adhesives			<input checked="" type="checkbox"/>				<input type="checkbox"/>	<input checked="" type="checkbox"/>		<input type="checkbox"/>	
Sealants	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Stains and paint removers	<input type="checkbox"/>	<input type="checkbox"/>			<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
Polishing agents	<input checked="" type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>						
Foundry washes	<input checked="" type="checkbox"/>	<input type="checkbox"/>					<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>		

☒ especially recommended    ☐ recommended

figure 1

# TIXOGEL – Mode of Action

TIXOGEL is a thixotropic agent based on a laminar silicate with a hydrophobic coating. Once TIXOGEL has been dispersed and is evenly distributed in a paint or solvent, its tiny platelets interact to form a structure similar to that of a house of cards – this is what produces the gelling effect.

## Thixotropy

Stirring destroys the card-house structure through a reversible process. Rapid stirring breaks down the card-house structure more quickly than does slow stirring. The gel will rebuild if allowed to stand for a period of time. In other words, the paint forms a gel during storage, which prevents it from settling. The paint however will become thinner upon stirring and can then be easily applied. The card-house structure slowly forms again after application, allowing the paint to level easily without sagging or dripping.

## Adding TIXOGEL to your product

TIXOGEL may be added in the following forms:

- As a powder
- As a traditional pregel in a solvent
- As a highly concentrated, pumpable pregel with a wetting agent as an activator

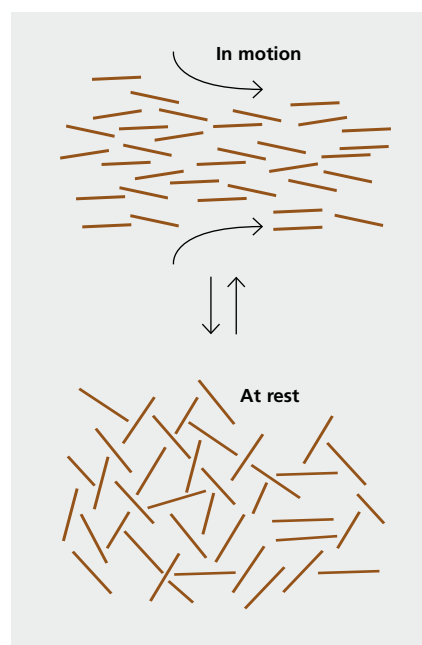


figure 2

## Typical Viscosity Curve of a System Containing TIXOGEL

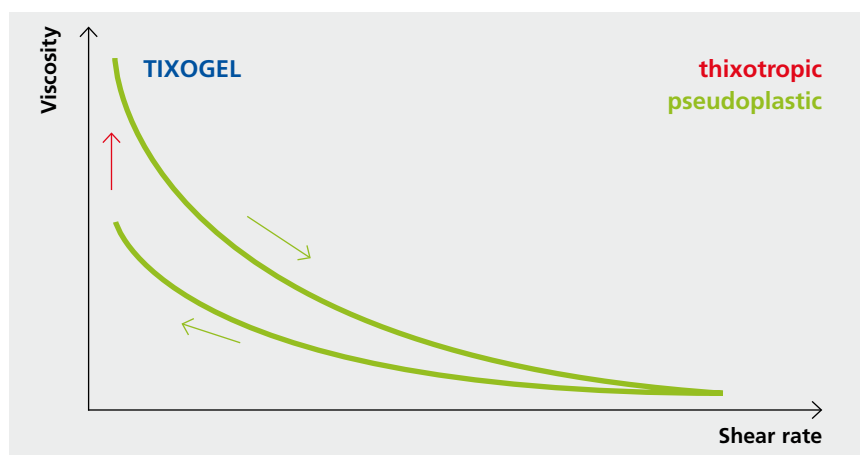


figure 3

## How TIXOGEL Prevents Sagging

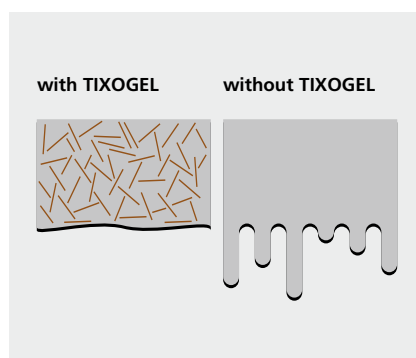


figure 4

## How the TIXOGEL Card-house Structure Prevents Sedimentation and Syneresis

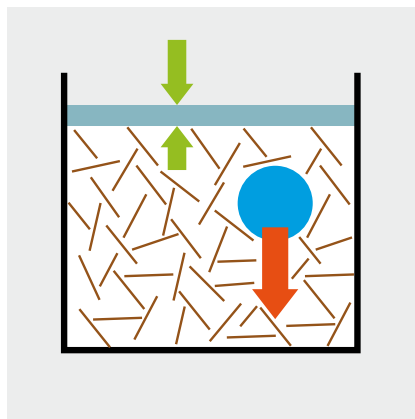


figure 5

## Dispersion

TIXOGEL must be fully dispersed in the product in order to optimize swelling and thixotropic effects. This means using highly effective shearing equipment such as a dissolver, a roller mill or other type of mill (colloidal, sand or ball mill).

The greater the amount of shear energy expended, the more effective gel formation will be. Elevated temperature also enhances dispersion.

## Activator

Dispersion and gel formation are also supported by the addition of highly polar solvents (activators). These substances form a hydrogen bridge bond between TIXOGEL platelets, thereby increasing cross-linking and, consequently, viscosity. If no highly polar solvents are present in a formulation, a minimum amount must be added. (Adding too much, however, will reduce swelling once again.) Activators are typically added to paints at a concentration of 20–60 % of the amount of TIXOGEL used.

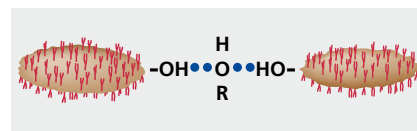


figure 6

### The following are some commonly used activators:

- Propylene carbonate or propylene carbonate/water (95:5)
- Methanol or methanol/water (95:5)
- Ethanol or ethanol/water (95:5)
- Other short-chain alcohols or acetone
- Wetting and dispersing agents, if necessary

Adding 5 % water to the activator will increase its ability to form hydrogen bridge bonds, thereby making it more effective.

### TIXOGEL: self-activating and easy to disperse

Theoretically, no additional activators are needed when using TIXOGEL MP 100, EZ 100 MP 250 as these products already contain activators. Nevertheless, adding small amounts of activator often improves performance. In non-aromatic, aliphatic solvents, for example, the addition of 10–20 % activator is sometimes helpful, even when using pre-activated products. TIXOGEL may be added directly as a powder.

### Adding TIXOGEL products

#### I. Traditional pregel:

Example:  
88 to 92.5 parts white spirit  
5 to 8 parts TIXOGEL  
2.5 to 4 parts activator  
[such as ethanol/water (95:5)]

Traditional pregel with higher levels of TIXOGEL may become too stiff and, as a result, cannot be pumped. In addition, solvent evaporation may cause these pastes to form crusts on their surfaces when stored over long periods of time.

Because these crusts are then very difficult to disperse, the use of modified pregels is common.

#### II. Modified pregels:

Example:  
77.5 to 85 parts white spirit  
10 to 15 parts TIXOGEL  
5 to 7.5 parts wetting agent

Using a wetting agent as an activator or solubilizer for TIXOGEL makes it possible to prepare more highly concentrated pregels that are more readily dispersed and yet are still easy to pump.

The wetting agent prevents the paste from drying out and either keeps crusts from forming on the surface or ensures that any crusts that form can be readily dispersed.

#### III. Powder addition:

Ideally, TIXOGEL should be added to the solvent or solvent/binding agent mixture at the very beginning of the process. To prevent lump formation the activator should be added only when TIXOGEL has been fully wetted and dispersed.

Because TIXOGEL products readily disperse, TIXOGEL may be added in powder form when using a dissolver operated at a high shear rate or when the system is produced using a mill to complete dispersion after having added the powder in a high-speed agitator.

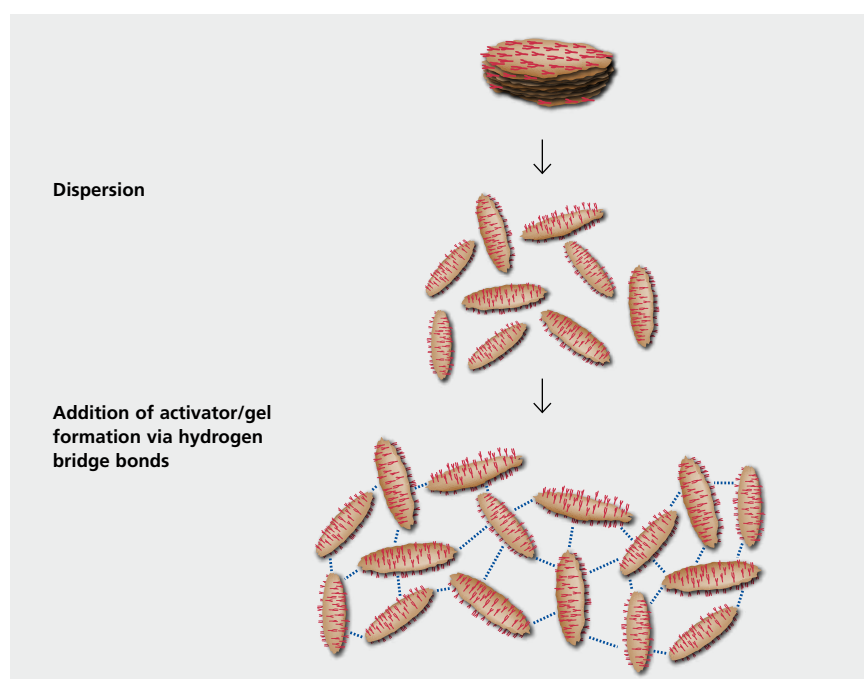


figure 7

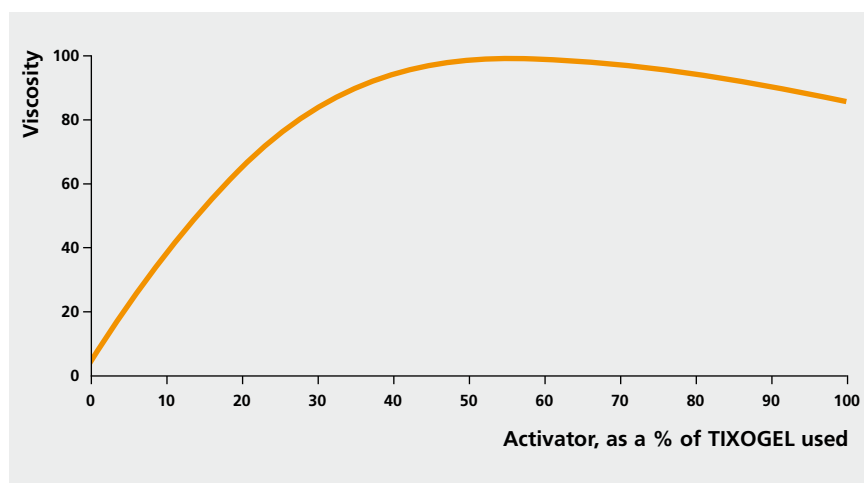


figure 8

## Fields of Application and Polarities

Aliphatic Hydrocarbons		Aromatic Hydrocarbons			Polar Systems	
Aromatic-free white spirits, isoparaffins	Aromatic-containing white spirits	High-boiling aromatics, toluene, xylene			Butyl glycol acetate, butyl glycols	Ethyl acetate ethanol/IPA MEK/acetone
Paints containing alkyd/acrylate resins		Chlorinated rubber systems			Acrylic resin finishes	
	Epoxy esters				Plastigels/plastisols	
		Silicon-mod. alkyds	Silicon resins	Urea resins	Amine-mod. epoxies	
			Petroleum and coal-tar distillates	Epoxy-mod. phenolic resins		Nitro-cellulose finishes
	Terpenes, coumarone indenes, petroleum, styrene butadiene resins					
Printing inks	Oxidative drying systems	Stoving systems	High-Solids		Foundry-washes	Wash-primers
GARAMITE 1958 / TIXOGEL MPG						
TIXOGEL MP 100				TIXOGEL VZ		
TIXOGEL EZ 100 / RHEOCIN				TIXOGEL MP 250 / TIXOGEL MPZ		
TIXOGEL VP / TIXOGEL MP						
TIXOGEL UN						
RHEOTHIX 240						

## Products and Applications

### BYK Additives

#### Product Range Additives:

- Additives to improve surface slip, leveling, and substrate wetting
- Adhesion promoters
- Defoamers and air release agents
- Processing additives
- Rheological additives
- UV absorbers
- Viscosity depressants
- Wax additives
- Wetting and dispersing additives for pigments and extenders

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#### Application Areas:

##### Coatings Industry

- Architectural Coatings
- Automotive Coatings
- Industrial Coatings
- Can Coatings
- Coil Coatings
- Wood & Furniture Coatings
- Powder Coatings
- Leather Finishes
- Protective & Marine Coatings

##### Plastics Industry

- Ambient Curing Systems
- PVC Plastisols
- SMC/BMC
- Thermoplastics

##### Printing Ink Industry

- Flexo Inks
- Gravure Inks
- Inkjet Inks
- Silk Screen Inks
- Offset Inks
- Overprint Varnishes

##### Paper Coatings

- Impregnation
- Coatings

##### Adhesives & Sealants

##### Construction Chemicals

##### Pigment Concentrates

##### Raw Materials for Manufacturing Release Agents

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