UNIQ CHEM

Performance Additives for composites and plastic industry

APPLICATION SYSTEM


Unsaturated polyester resin

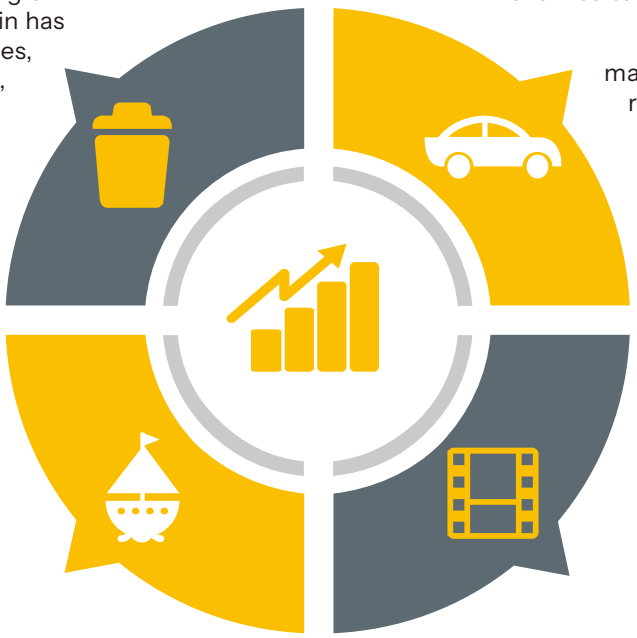
Unsaturated polyester resin is one of the most commonly used thermosetting resins. Excellent process performance is the biggest advantage of unsaturated polyester resin. It can be cured at room temperature and formed under normal pressure. The process performance is flexible. It is especially suitable for large-scale and on-site manufacturing of FRP products. After curing, the resin has good comprehensive properties, excellent corrosion resistance, electrical properties and flame resistance.

According to the needs of downstream customers, unsaturated polyester resin often needs to add defoamer, anti settling agent, thixotropic agent and other active additives to meet the needs of downstream customers.


Composite materials/SMC

Composite materials are the new material that people use advanced material preparation technology to optimize the composition of different materials. Fiber reinforced materials are the most widely used and used in composites. It is widely used in aerospace, automotive industry, chemical industry, textile and machinery manufacturing and medical fields.

The composites are usually made of unsaturated polyester resin or epoxy resin as the base resin by adding low shrinkage components, fillers and glass fibers through high-pressure molding. Among them, additives are needed for wetting and dispersing filler, preventing phase separation and wetting glass fiber.



PVC pigments paste/ Gel coats

Gel coat is one of the important downstream application industries of unsaturated polyester resin. It is mainly developed by adding pigment and thixotropic agent into unsaturated polyester resin. It is widely used in leather, mold, flame retardant, yacht, wind power and other fields.

There are many problems in gel coat production, such as air bubble, easy floating color and blooming of pigment, which need to be solved by adding additives.

Adhesives/Sealants

Adhesive is a kind of material with good adhesion. Through adhesion and cohesion, the surface is bonded to connect objects. Sealant is a multi-purpose functional material with both adhesive and sealing properties.

Adhesives and sealants are often solvent-free, resin viscosity is high, and sometimes fillers will be added to the system. Therefore, defoamers, wetting dispersants and thixotropic thickening and anti settling additives are essential.

Thixotropic in high fillers loading system

In the plastic industrials, customers may usually add quite big amounts of fillers in the formulations, such as calcium carbonate, quartz sand, microsilica and ATH etc. On the one hand, fillers can reduce the cost, and sometimes also provide flame retardant, sealing and other effects.

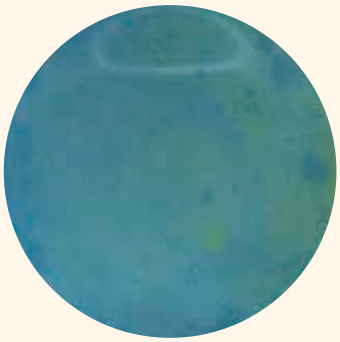
In the high filling system, if the good wetting and dispersing state can not be achieved, the base material tends to be thixotropic, which affects the subsequent processing.

The **UNIQ®SPERSE P-193**, **UNIQ®SPERSE P-195**, **UNIQ®SPERSE P-115** are wetting dispersant for fillers. Its excellent wetting and dispersing properties can effectively reduce the viscosity of the system and improve the loading capacity of filler.

Bubbles

Bubble entrainment often occurs in the production and application of unsaturated polyester and epoxy systems, especially in solvent-free and high thixotropic formulation systems, which will eventually lead to pinholes in the finished products and reduce the overall performance of the products.

The **UNIQ®FOAM P-595**, **UNIQ®FOAM P-573**, **UNIQ®FOAM P-590** are excellent defoamers for unsaturated polyester resin system, solvent-free epoxy system and polyurethane system. Its balanced defoaming force and transparency can solve the defoaming problem without affecting the transparency of the resin.



Flooding and floating

If the dispersion of solid pigments (fillers) in the liquid phase of resin system containing pigments does not reach the ideal effect, there will be many problems, such as flocculation, floating color or sedimentation. When the pigment dispersion is unstable and the degree of dispersion is different, the colored workpieces often have obvious color lines or color differences, which affect the quality of finished products.

The **UNIQ®SPERSE P-135** deflocculating dispersant, adding in the grinding stage **UNIQ®SPERSE P-160** controlled-flocculation dispersant, can be added later□can effectively improve the floating and flooding phenomenon.

Sedimentation & Sagging

In some dispersion systems with high pigment / filler, it is easy to have pigment / filler settlement or sagging in the construction stage after being placed or stored for a period of time, which will affect the product performance and use.

UNIQCHEM thickening agent **UNIQ®SPERSE P-904**, **UNIQ®SPERSE P-905**, **UNIQ®VIS P-910**, **UNIQ®VIS P-920** can effectively improve the anti sinking performance and provide excellent anti sagging effect.

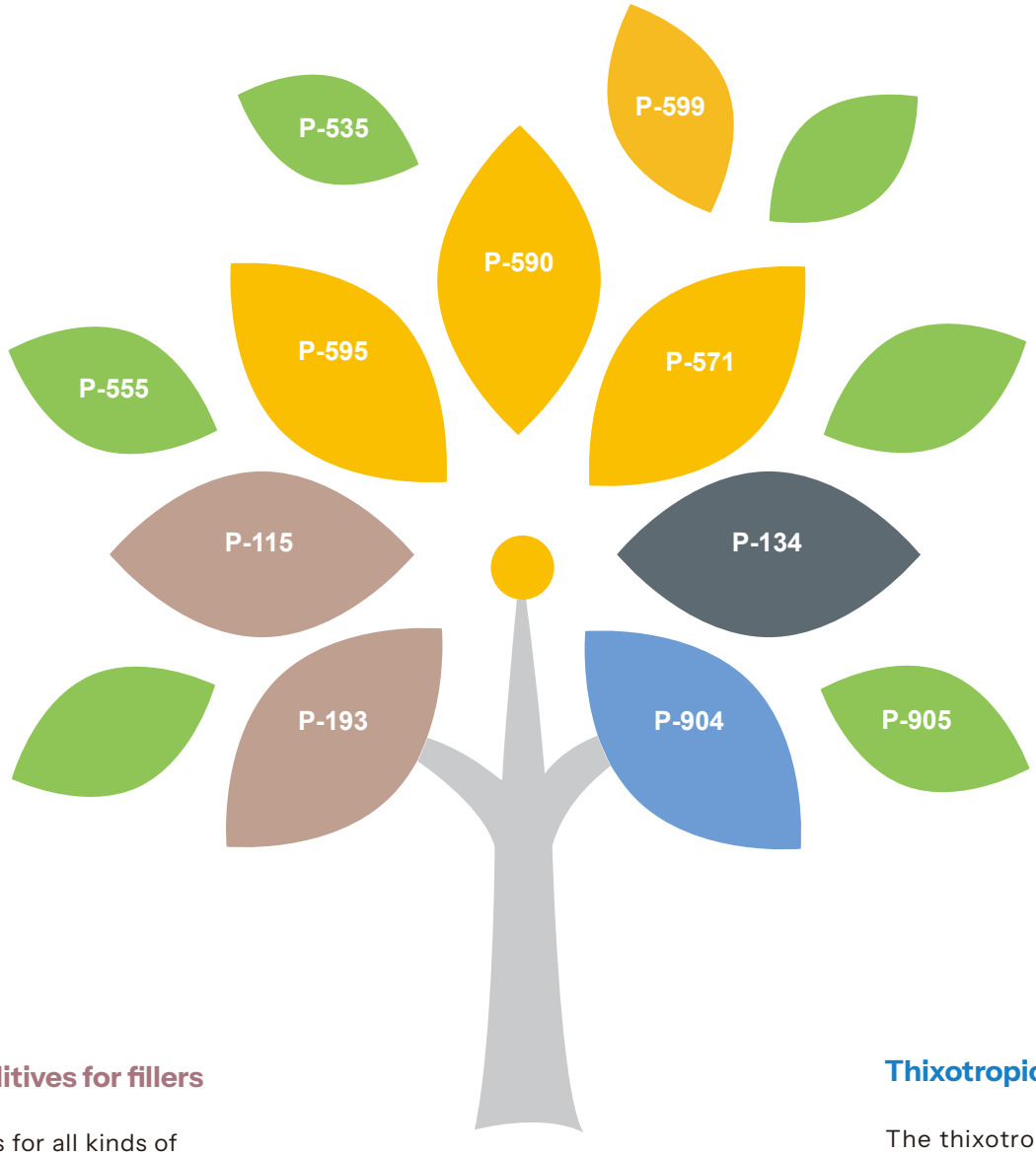
Recommendation

Defoaming

Excellent defoamers for solvent-free epoxy system can reduce the generation of bubbles in the production process and help leveing.

W&D additives for pigments

Deflocculating wetting dispersant can effectively prevent titanium dioxide and organic pigment from floating and flooding.



W&D additives for fillers

Dispersants for all kinds of fillers in high filling system can effectively reduce the viscosity and increase the loading capacity of fillers.

Thixotropic synergism

The thixotropic synergist with fumed silica can be easily added into resins and curing agents.

Additives for composites

	PRODUCT TYPE	*INDUSTRIE*	SYSTEMS	FILLER TYPE	PROPERTIES
UNIQ®SPERSE P-115	Dispersant	Molding/pultrusion/ UPR/Adhesives/ Sealants/potting	UPR/Vinyl	$CaCO_3$/ATH	Wetting and dispersing agent for filler material with strong viscosity reduction.
UNIQ®SPERSE P-172	Phase seperation prevention additive	SMC	UPR/Vinyl	/	Effectively prevents phase separation of resin componentsfrom polysterene
UNIQ®SPERSE P-134	Dispersant	Liquid colorants	Plasticizers / PU	Organic pigments/ Carbon black	Excellent wetting and dispersing agent for organic- and carbon black pigments, strong viscosity reduction and excellent color development
UNIQ®SPERSE P-120	Dispersant	Epoxy/ UPR/ PU/ PVC	Gelcoats/putty/ Epoxy/PU	inorganic pigments/ fillers/$CaCO_3$/ATH	Wetting and dispersing agent for fillers, strong viscosity reduction
UNIQ®SPERSE P-141	Dispersant	UPR	UPR/Vinyl	$CaCO_3$	Wetting and dispersing agent for fillers, strong viscosity reduction
UNIQ®SPERSE P-144	Dispersant	UPR	UPR/Vinyl/ Epoxy	$CaCO_3$/ATH	Wetting and dispersing agent for fillers, strong viscosity reduction
UNIQ®SPERSE P-193	Dispersant	100	SMC/ Adhesives/ Sealants	$CaCO_3$/ATH/$Ca(OH)_2$, fumed silica/ SiO_2	Wetting and dispersing agent for filler material with strong viscosity reduction. Also suited for TiO2
UNIQ®SPERSE P-195	Dispersant	100	SMC/ Adhesives/ Sealants	$CaCO_3$/ATH/$Ca(OH)_2$, fumed silica/ SiO_2	Wetting and dispersing agent for filler material wth strong viscosity reduction. Also suited for TiO2
UNIQ®SPERSE P-904	Thixotropic synergist	Epoxy/UPR/Adhesives/ sealants	Epoxy/ UPR/ Adhesives / Sealant	Fumed Silica / Bentone	Thixotropic synergist with fumed silica, strong thixotropic effect
UNIQ®FOAM P-535	Defoamer	PU	PU	/	100% silicone free , excellent against micro and macro-foam
UNIQ®FOAM P-555	Defoamer	UPR	UPR	/	Strong defoamer, silicone free, especially suitable for UPR systems like putty and gelcoats
UNIQ®FOAM P-571	Defoamer	Epoxy/ UPR/ PU/ PVC	Epoxy/ UPR/ Adhesives / PU/ Sealant	/	Strong silicone free defoamer for Epoxy flooring and PU flooring, with fast air-release, defoaming and macro-foam destroying properies.
UNIQ®FOAM P-590	Defoamer	PU	PU adhesives and sealants	/	Silicone free 100% defoamer, offering strong ant-foam and macro defoaming properties, suited for fast curing systems
UNIQ®FOAM P-595	Defoamer	UPR/Epoxy/PU	UPR/Epoxy/PU	/	Excellent transparency, suited for clear systems
UNIQ®FOAM P-599	Defoamer	UPR/Epoxy/PU	UPR/Epoxy/PU	/	Excellent transparency, suited for PU, Epoxy and UPR. Helps avoiding pinholing and popping
UNIQ®VIS P-910	Rheology agent	Molding/pultrusion/ UPR/adhesives/ sealants	UPR/Epoxy/PU/ Vinyl	Fumed silica/bentones	Liquid rheology modifier can pprovide high thixotropic flow behavior and improve sag- and sedimentation resistance
UNIQ®VIS P-920	Rheology agent	Molding/pultrusion/ UPR/adhesives/ sealants	UPR/Epoxy/PU/ Vinyl	$CaCO_3$/H_3AlO_3/Fumed silica/ SiO_2/TiO_2	Liquid rheology modifier can pprovide high thixotropic flow behavior and improve sag- and sedimentation resistance
UNIQ®FLOW P-990	Fiber wetting agent	Composites/Wind power/pultrusions/ winding	UPR/Epoxy/PU/ Vinyl	Glass Fiber / Carbon fiber	Improves wetting of glass- and carbon fibers, reduce bubble entrapment, avoid dry spots and reduce surface defects
UNIQ®SPERSE P-1450	Internal release agent	Composites/Wind power/pultrusions/ winding	UPR/Epoxy/PU/ Vinyl	/	Multifunctional mold release agent, low migration, no effect on secondary processing and reduce surface defects

Dispersants for High Fillers loading system

UNIQ®SPERSE P-193 / P-115

One of the most important steps in high filling system is the uniform distribution of powdery filler in liquid matrix resin. If the dispersion of fillers is not ideal, thixotropy, sedimentation and poor fluidity will occur.

The addition of wetting dispersant accelerates the wetting and stabilization of fillers:

- Viscosity reduction
- Increase the fillers loading
- Improving mobility
- Anti sedimentation

Application of electronic sealant systemsDispersion of silica powder

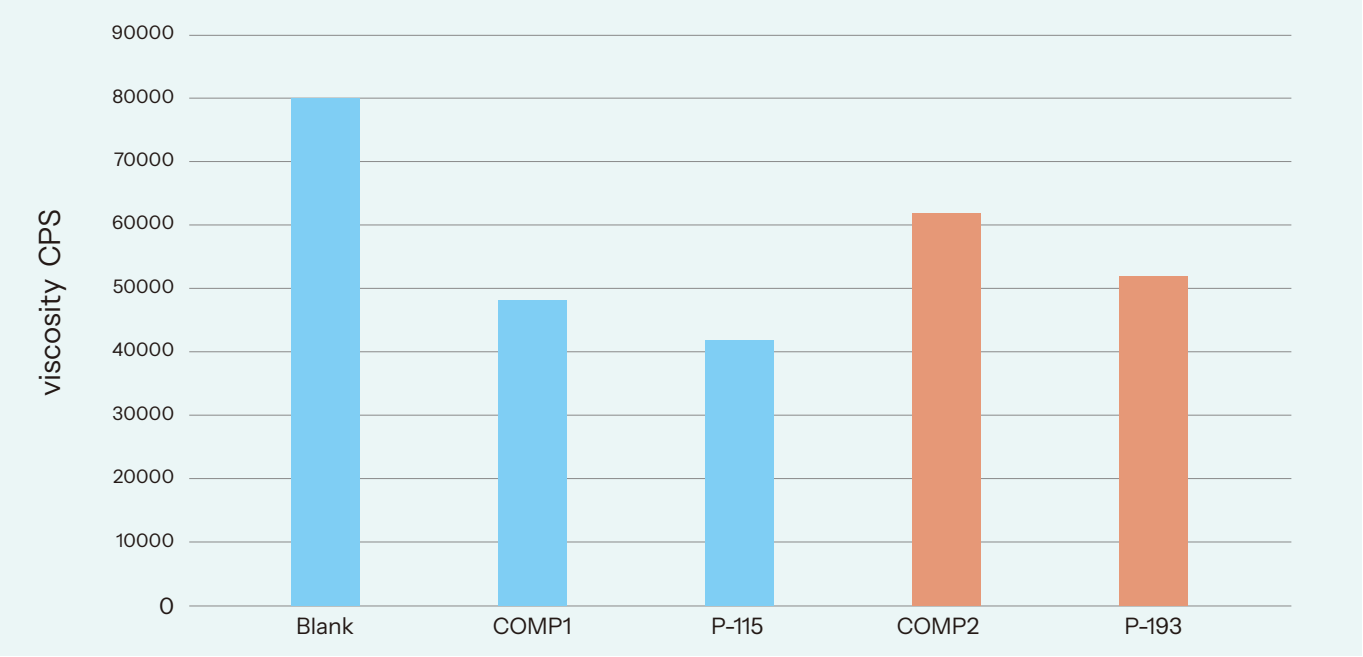
Dispersants: 2 phr

Filler: 200 phr

	COMP1	P-115	COMP2	P-193
Epoxy resin	35 g	35 g	35 g	35 g
Dispersants	1.4 g	1.4 g	0.7g	0.7g
Microsilica	70 g	70 g	70 g	70 g

1.Weight equal epoxy resin in glass bottle.
2.Add the dispersant according to the dosage.
3.Add the fillers at 500 rpm, then stirring at 1500rpm for 20min.

Viscosity



Application of composites/SMC CaCO3/ATH dispersing

Dispersant: 2 phr

Fillers: 200 phr

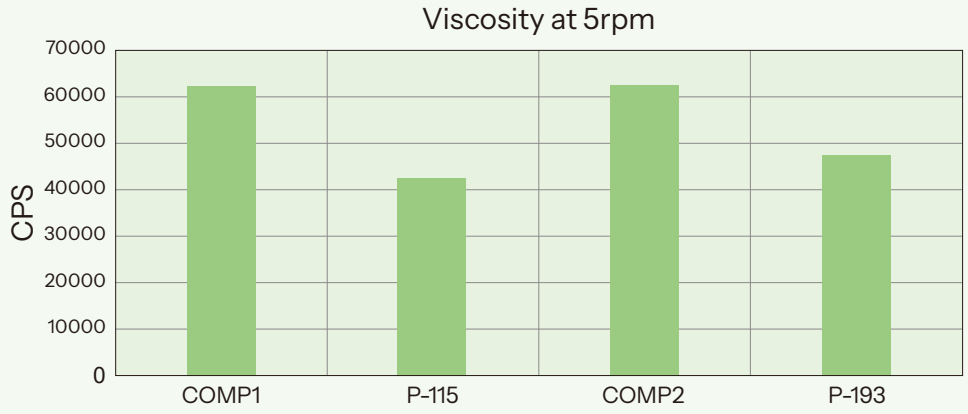
	COMP1	P-115	COMP2	P-193
UPE resin	35 g	35 g	35 g	35 g
Dispersants	1.4 g	1.4 g	0.7g	0.7g
CaCO3/ATH	70 g	70 g	70 g	70 g

1.Weight equal UPE resin in glass bottle.

2.Add the dispersant according to the dosage.

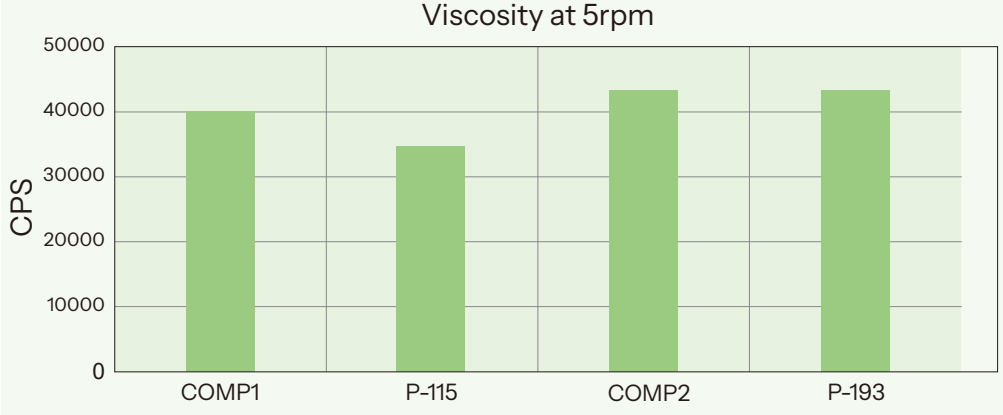
3.Add the fillers at 500 rpm, then stirring at 1500rpm for 20min.

Application of composites/SMC CaCO3 dispersing



	5rpm
COMP1	62625
P-115	42150
COMP2	61800
P-193	46800

Application of composites/SMC ATH dispersing



	5rpm
COMP1	40125
P-115	33215
COMP2	43050
P-193	42950

Defoaming testing UPE resin

·Good anti-foam and defoaming performance
·Excellent compatibility

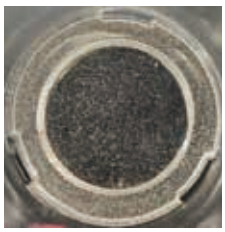
Formulation

Formulation	
UPE resin	50 g
Cobalt	0.03 g
M-50	1 g
Defoamers	0.05 g (0.1%)

1.Add the UPE resin and cobalt according to the dosage and mix together;
2.Add different defoamers, then add M-50 and mix together;
3.Mixing at 1000rpm 1min to create foams;
4.Observe the anti-foam, defoaming performance and compatibility.

Data

After high speed mixing



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15min

After curing

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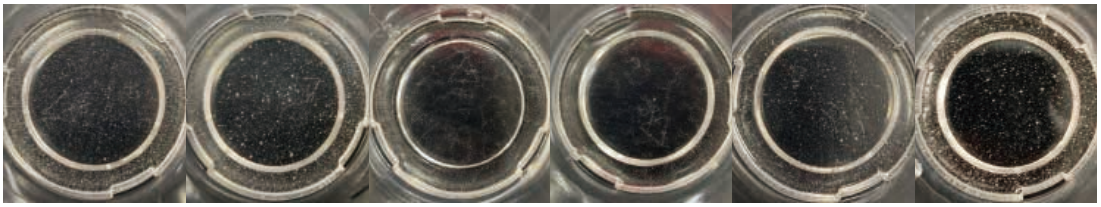
Anti-foam

After high speed mixing



COMP1 COMP2 COMP3 P-595 P-571 P-555

Anti-foam
P-595 ≈ COMP3 > P-571 > P-555 > COMP2 > COMP1

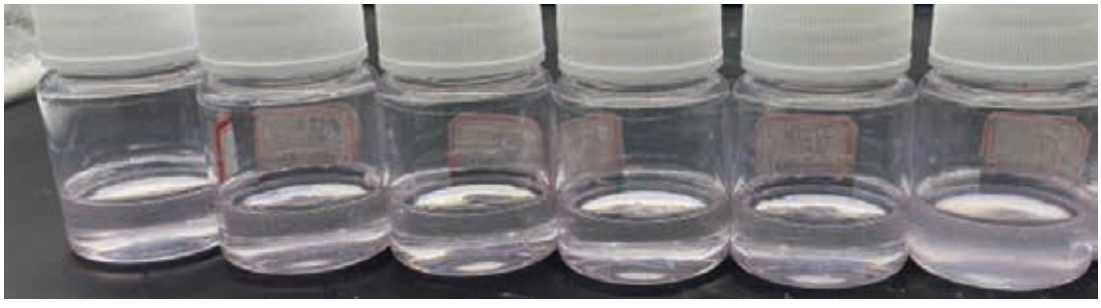
Defoaming

After curing curing time 15min

COMP1 COMP2 COMP3 P-595 P-571 P-555

Defoaming:
P-595 ≈ P-571 ≈ P-555 ≈ COMP3 > COMP2 > COMP1

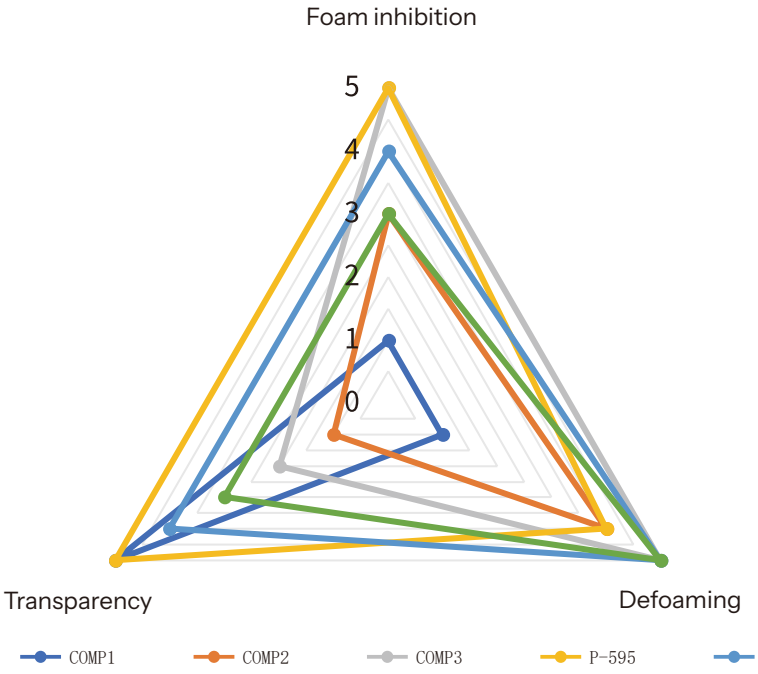
Compatibility/Transparency



P-595 P-555 COMP3 COMP1 P-571 COMP2

Transparency:
COMP1 > P-595 > P-571 > P-555 ≈ COMP3 > COMP2

Comprehensive performance



	Anti-foam	Defoaming	Transparency
COMP1	1	1	5
COMP2	3	4	1
COMP3	5	5	2
P-595	5	4	5
P-571	4	5	4
P-555	3	5	3

UNIQ®FOAM P-595 shows very good performance around anti-foam, defoaming and transparency.

Defoamers for solvent free epoxy systems

UNIQ®FOAM P-571

Formulation

Formulation	
Epoxy resin	50 g
Defoamers	0/30 g
Hardner	10 g

1.Add the epoxy resin according to the dosage;
2.Add different defoamers, then add the hardner and mix together;
3.Mixing at 1000rpm 1min to create foams;
4.Observe the anti-foam, defoaming performance and compatibility.

Defoaming performance

P-571

COMP 1

Dosage total formulation: 0,5%

Filler free Epoxy sealants

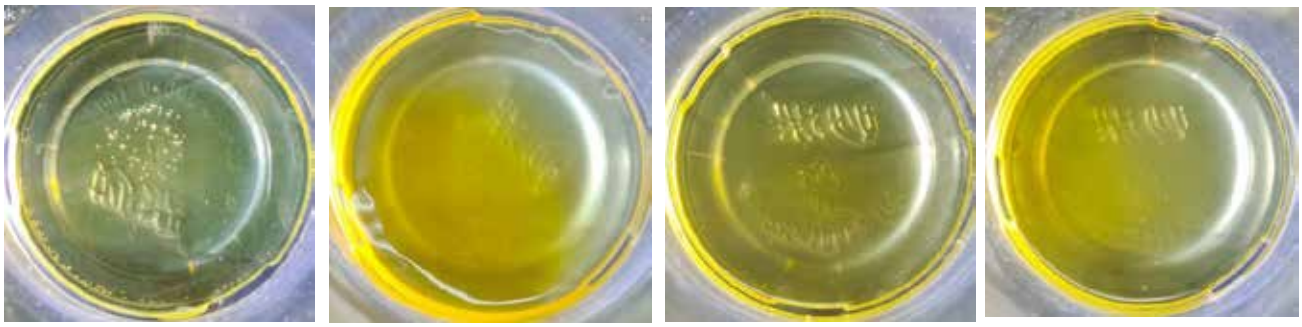
UNIQ®FOAM P-572、P-573

Formulation

Formulation	
Epoxy resin	30 g
Defoamer	0.09g (0.3% to resins)
Hardener	25.5 g

1.Add the epoxy resin according to the dosage;
2.Add different defoamers, then add hardener and mix together;
3.Mixing at 1000rpm 3min to create foams;
4.Observe the anti-foam, defoaming performance and compatibility.

Defoaming performance



Blank　　P-573　　COMP1　　P-572

Defoaming performance P-573 > P-572 > COMP1 >Blank

Defoaming testing
Filler containing Eopxy sealants

Formulation 100:85

Component A	
Epoxy resin	300 g
CaCO3 800 mesh	300 g

Formulation	
Base	40 g
Defoamer	0.06 g(0.15% to Component A)
Hardener	17 g

Defoaming performance

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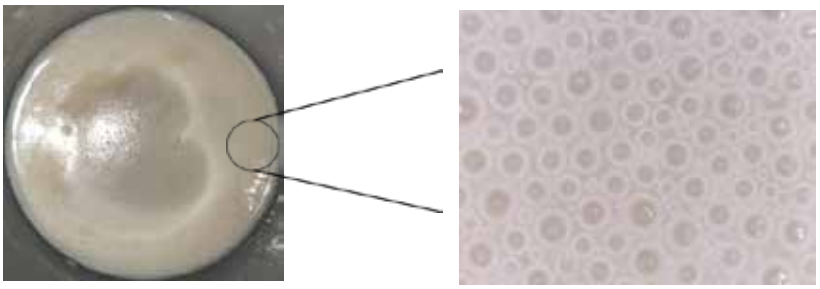
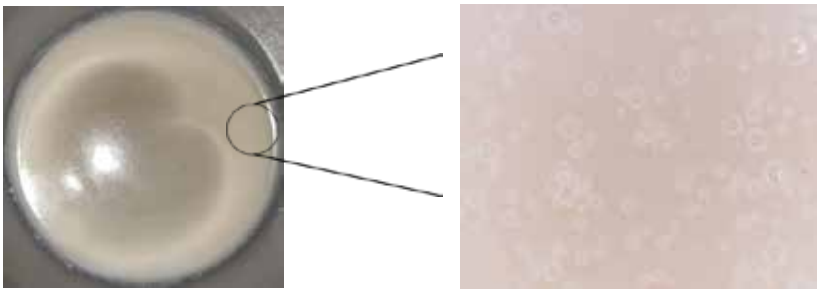
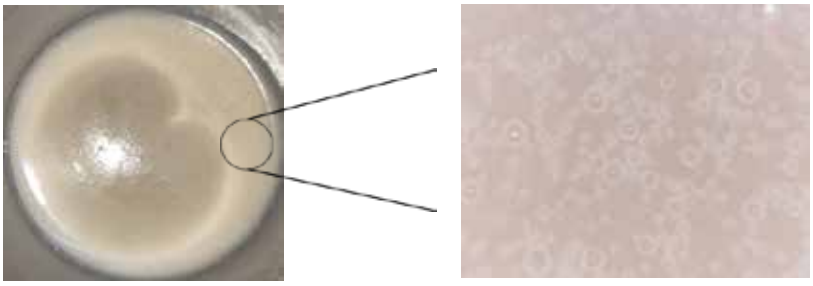


COM1

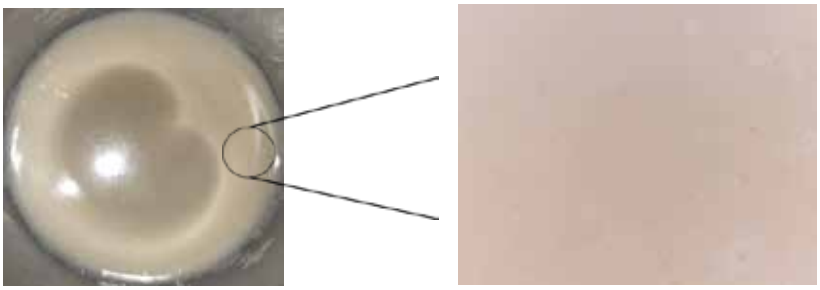


The viscosity increases, and the filler blocks bubble removal.

COM2



P-573



UNIQ®FOAM P-573 shows excellent defoaming performance in filler containing epoxy system.

Defoamers for 2KPU systems

UNIQ®FOAM P-590

Formulation

Formulation	
PU resin	30 g
Hardner	0.3 g (0.1%)
Defoamer	10 g

1. According to the formula, first weigh about 20g resin component in the plastic cup
2. Add different defoamers according to the amount, then add resin again to 30g, stir slightly
3. Add relative amount of curing agent
4. Stir vigorously by hand until the resin and curing agent are fully mixed and then stand
5. Observe the performance of foam inhibition and defoaming

Defoaming performance

UNIQ®FOAM P-590
0.1%dosage

COMP1
0.1%dosage

UNIQ®FOAM P-535
0.1%dosage

UNIQ®FOAM P-590 and P-535 shows better defoaming performance against COMP1 at 0.1%dosage and at 0.075%, it shows the same defoaming effect as COMP1.

Thixotropic synergism

UNIQ®SPERSE P-905

Formulation

Component A Resin

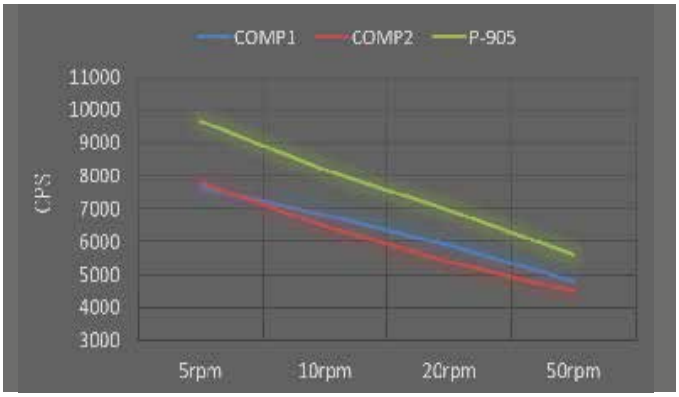
Materials	Dosage
Epoxy resin	76%
Fumed silica	6%
Benzyl alcohol	8%
Pearl powder	10%

Component B Curing agent

Materials	Dosage
Curing agent	93.5%
Fumed silica	5%
Thixotropic synergism	1.5%

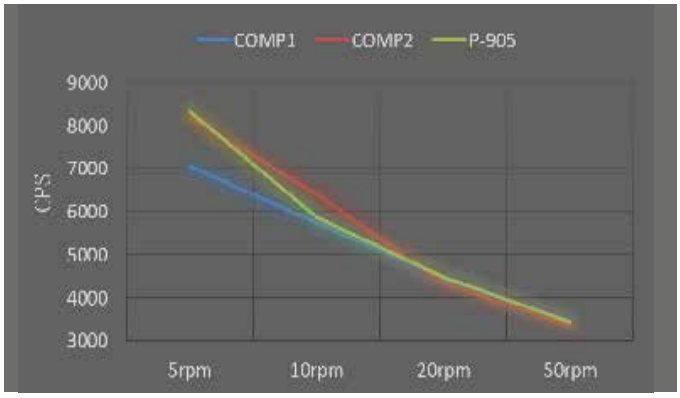
Component A : B =1:1

Viscosity in component B



Component B	COMP1	COMP2	P-905
5rpm	7650	7800	9674
10rpm	6825	6487	8170
20rpm	5887	5381	6956
50rpm	4800	4492	5617
Thix index	1.59	1.73	1.72

Viscosity in component A+B



Component A+B	COMP1	COMP2	P-905
5rpm	7050	8175	8325
10rrpm	5737	6412	5850
20rrpm	4425	4331	4481
50rrpm	3443	3353	3430
Thix index	2.04	2.43	2.42

Recommendation

		First recommendation	Second recommendation
Unsaturated polyester resin	Defoaming	UNIQ®FOAM P-595	UNIQ®FOAM P-571
	Anti-separation	UNIQ®SPERSE P-115	UNIQ®SPERSE P-144
	Thixotropic synergism	UNIQ®SPERSE P-905	UNIQ®SPERSE P-160
Composite materials/SMC	Fillers dispersing	UNIQ®SPERSE P-193	UNIQ®SPERSE P-195
	Anti-separation	UNIQ®SPERSE P-128	UNIQ®SPERSE P-172
	Fibers wetting	UNIQ®FLOW P-990	UNIQ®SPERSE P-128
	Thixotropic synergism	UNIQ®SPERSE P-905	UNIQ®SPERSE P-904
	Mold releasing	UNIQ®SPERSE P-1450	UNIQ®SPERSE P-145
Pouring	Defoaming	UNIQ®FOAM P-590	UNIQ®FOAM P-573
	Fillers dispersing	UNIQ®SPERSE P-193	UNIQ®SPERSE P-195
	Thixotropic synergism	UNIQ®SPERSE P-905	UNIQ®SPERSE P-910
PVC pigments pastes	Fillers dispersing	UNIQ®SPERSE P-115	UNIQ®SPERSE P-193
	Pigments dispersing	UNIQ®SPERSE P-134	UNIQ®SPERSE P-139
	Defoaming	UNIQ®FOAM P-595	UNIQ®FOAM P-571
Gel coat/pastes	Fillers dispersing	UNIQ®SPERSE P-193	UNIQ®SPERSE P-195
	Pigments dispersing	UNIQ®SPERSE P-135	UNIQ®SPERSE P-139
	Defoaming	UNIQ®FOAM P-595	UNIQ®FOAM P-571
	Wetting&Leveling	UNIQ®FLOW P-393	UNIQ®FLOW P-304
	Thixotropic synergism	UNIQ®SPERSE P-905	UNIQ®SPERSE P-160

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