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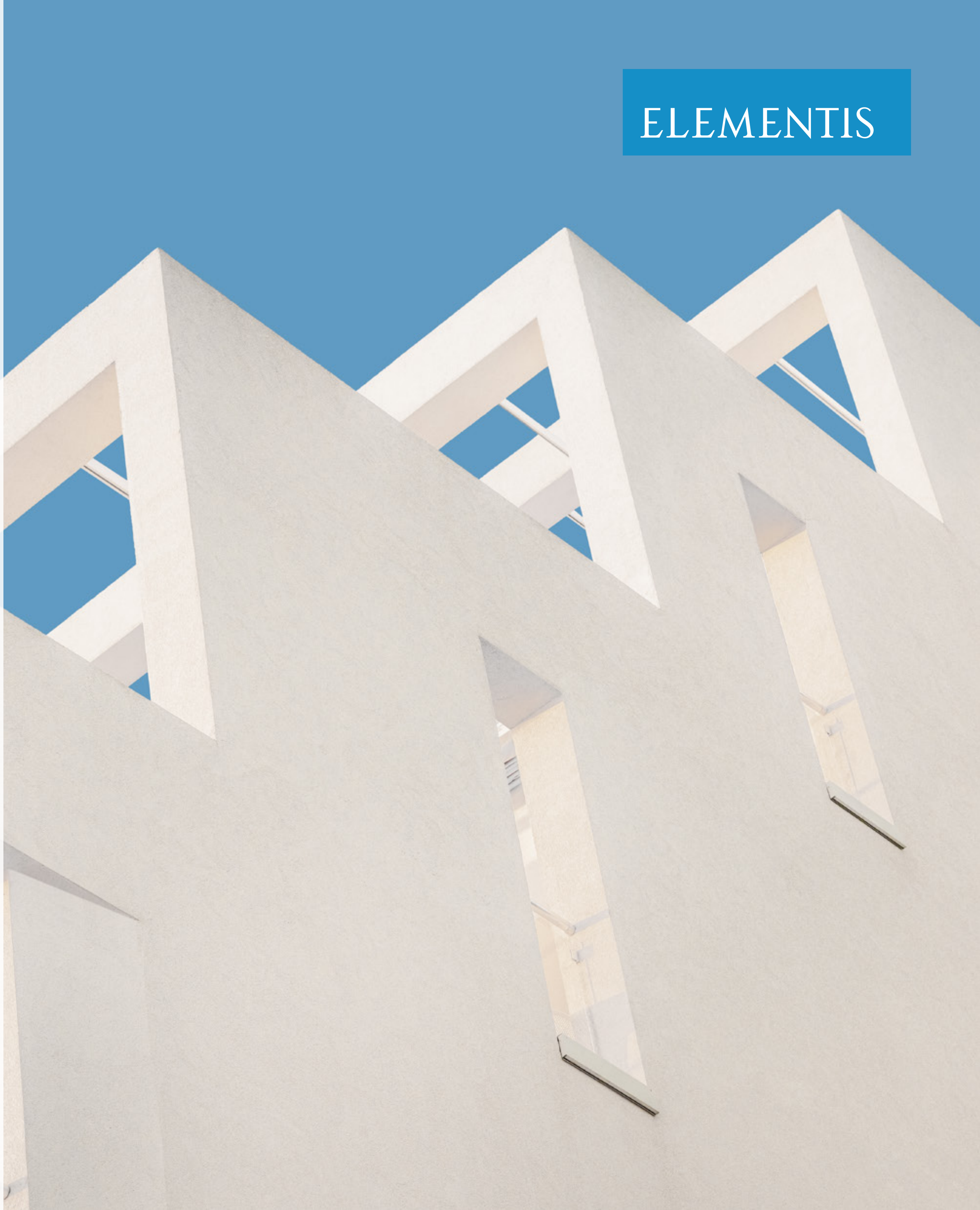
Application Leaflet

RHEOLATE® 150

HASE based thickener for decorative paint systems



Unique chemistry, sustainable solutions

Key Benefits

- Effective for low cost mid to high PVC paint systems
- Efficient low-mid shear viscosity builder
- Good balance of flow and levelling

Chemical and physical data

Composition	Acrylic emulsion in water
Appearance	Milky white liquid
Active content [%]	28.5% - 31.5%
pH value	ca. 2.3
Solvent	Water
Specific gravity [g/cm³]	Ca. 1.05

Introduction

RHEOLATE® 150 is a cost effective and versatile **H**ydrophobically **M**odified **A**lkali **S**wellable (abbreviation HASE) thickener in an easy to use emulsion form designed to provide excellent low shear viscosity build. It is particularly cost effective in mid to high PVC formulations.

RHEOLATE® 150 can be used alone or in combination with other rheological modifiers, e.g. HEC or PU thickeners, to achieve the desired flow performance. It imparts good sag and spatter resistance along with improved levelling and syneresis control and good color acceptance.

Benefits and Features

- Effective for low cost mid to high PVC latex paint systems
- Efficient low to mid shear viscosity builder
- Good balance of flow and levelling
- Easy to handle and formulate
- Potential alternative to HEC

Incorporation and handling

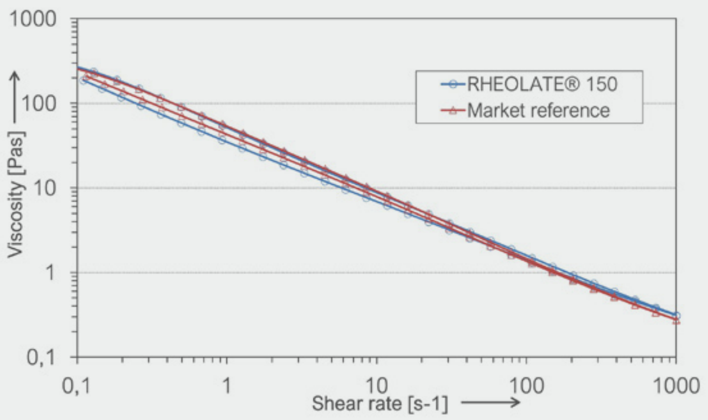
RHEOLATE® 150 is an alkali swellable thickener and requires proper pH adjustment with an alkali (like ammonium hydroxide or aminomethyl propanol) for complete activation. In a typical latex paint, a pH of 9 is usually recommended.

Addition is normally made in the let-down. At this stage RHEOLATE® 150 can be added slowly to the formulation under good mixing without dilution. Under slow speed mixing conditions, dilution with water (RHEOLATE® 150: water ratio 1:1 to 1:5 by weight) is recommended to ensure efficient activation of the additive and avoid possible shock or de-stabilization.

RESULT TABLE 1: Viscosity data

	Concentration [%]	KU viscosity [Units]	High-shear/ICI viscosity [P]	Brookfield viscosity [mPas]
RHEOLATE® 150	0.7	102	0.70	9200
Market reference	0.6	101	0.65	9550

FIGURE 1: Activation



RESULT TABLE 2: Application properties

	Sagging [µm]	Levelling 0 = poor 10 = excellent	Brush-Out 0 = poor 5 = excellent	Roller Spatter 0 = poor 5 = excellent	KU stability [ΔKU]
RHEOLATE® 150	> 500	0	1	1	-5
Market reference	> 500	0	1	1	-2

RHEOLATE® 150 can also be used together with other rheological additives to achieve the desired performance properties.

Technical evaluation

RHEOLATE® 150 has been evaluated versus a leading Market reference competitive shear-thinning HASE thickener in a Styrene Acrylic PVC 50 paint.

The viscosity data can be found in the below **RESULT TABLE 1**.

Prior to the viscosity measurements, both samples were adjusted to equal Krebs-Stormer (KU) viscosity of 100 units. At this mid shear viscosity, RHEOLATE® 150 provides very similar Brookfield and high-shear/ICI viscosity values. In terms of the required loading levels in order to achieve equal KU viscosity only slight variations can be observed.

Comparing the entire picture of flow characteristics (**FIGURE 1**), very similar results can be observed.

The both viscosity curves show that the rheological characteristics are very similar over the entirely measured range of shear rates.

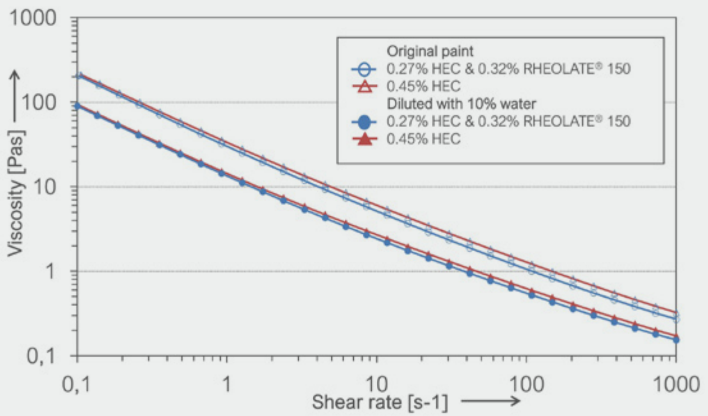
Almost equal flow characteristics are also shown by equal application properties as visualized in **RESULT TABLE 2**.

It becomes visible that RHEOLATE® 150 provides besides equal rheology also identical application properties such as levelling, sag and roller spattering characteristics as well as viscosity stability after tinting with an organic blue colorant.

RESULT TABLE 3: Influence on the viscosity build

	Concentration [%]	KU viscosity [Units]	High-shear/ICI viscosity [P]	Brookfield viscosity [mPas]
PVC 50 Styrene acrylic				
HEC	0.45	100	1.0	1600
HEC RHEOLATE® 150	0.27 0.32	98	0.9	1670
PVC 50 Styrene acrylic, diluted with 10% water				
HEC	0.45	83	0.6	800
HEC RHEOLATE® 150	0.27 0.32	79	0.6	750

FIGURE 2: Flow curves



HEC replacement

In this example, a standard HEC additive was partially replaced with RHEOLATE® 150 (**RESULT TABLE 3**). The target viscosity of the system was set to about 100 KU units.

The performance was studied with the original styrene acrylic PVC 50 paint as well as after further dilution with 10% water which is often practiced.

It becomes visible the use of a replacement of 40% of the originally formulated HEC content by RHEOLATE® 150 is generally possible. After readjusting the original Krebs-Stormer viscosity of 100 units, also the high-shear/ICI and Brookfield values can be matched.

With a dilution of the paint by 10% water which is often practices prior to the use, the viscosity loss in the mid shear rate range is similar to the sample with pure HEC.

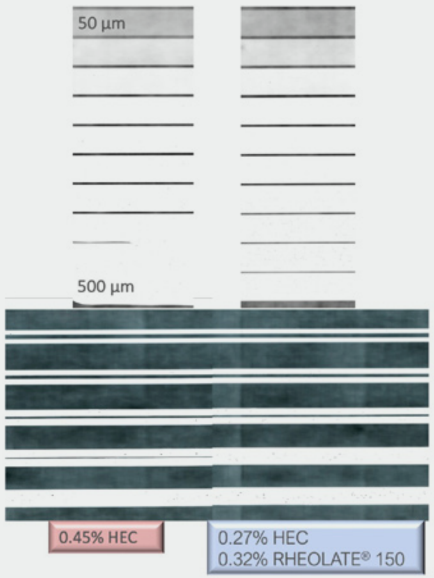
Determining the rheological characteristics as shown in **FIGURE 2**, displays that the conditions of the non-diluted and the diluted paint are very similar with both, the stand alone HEC and the combination of HEC and RHEOLATE® 150.

RESULT TABLE 4: Application properties

	Sagging [µm]	Levelling 0 = poor 10 = excellent	Brush-Out 0 = poor 5 = excellent	Roller Spatter 0 = poor 5 = excellent	Open time [min]
PVC 50 styrene acrylic					
HEC	600	0	2	3	55
HEC RHEOLATE® 150	1000	0	2	3	60
PVC 50 styrene acrylic + 10% water					
HEC	350	3	2	0	50
HEC RHEOLATE® 150	500	4	3	1-2	55

improved · equal · remains behind

FIGURE 3: Sag and levelling



The relation of the discussed rheological properties to the application behavior is shown in **RESULT TABLE 4**.

In terms of the application properties, the combination of HEC and RHEOLATE® 150 acts beneficial compared to the paint equipped with pure HEC. In case of the undiluted samples, the sag control has significantly improved with the combination.

However, the benefits are even more pronounced in case of the diluted paint samples. Also in these cases the improvement of the sag control has to be named first. The combination of both rheology modifiers comes very close to the maximum applicable layer thickness of the undiluted paint formulated with just HEC.

Further remarkable benefits of the combinations are improvements in levelling, by blade as well as by brush, the roller spatter tendency and the open time.

The mentioned differences in sag and levelling are displayed in **FIGURE 3**.

Conclusion

The use of RHEOLATE® 150 HASE rheological additive provides excellent paint application properties:

- Superb thickening efficiency
- Good sag/levelling balance
- No influence on color stability
- Good spatter resistance compared to HEC

RHEOLATE® 150 is a low viscosity liquid, easy to handle and easy to incorporate into the manufacturing process. It is solvent- and APEO-free, low odor, and is ideal for low or zero VOC applications.

RHEOLATE® 150 matches the performance of the leading Market reference in a range of latex systems. It is particularly effective in mid-PVC paints.

APPENDIX

Test formulation:

Raw material	Concentration [%]	Function	Supplier
Millbase stage			
Tapwater	14.90	Diluent	
Add under stirring in the denoted order			
Sodium polyphosphate	0.10	Softener	ICL
NUOSPERSE® FX 504	0.10	Wetting agent	Elementis
DAPRO® DF 17	0.30	Defoamer	Elementis
Titanium dioxide	5.80	Pigment	Kronos
Calcium carbonate, various particle size	30.9	Extender	Omya
MICROTALC® IT Extra	3.40	Extender	Elementis
Aluminium silicate	1.50	Extender	Evonik
Grind for 15 min. at 10 m/s.			
Add and stir for further 10 minutes at low speed			
DAPRO® FX 511	0.80	Coalescing agent	Elementis
Acronal S 790	32.10	Binder	BASF
DAPRO® DF 17	0.10	Defoamer	Elementis
Tapwater	9.70-X	Diluent	
Add and stir slightly for 10 min.			
Rheological additive(s)	X	Rheological additive	
Ammonia Solution w=25%	0.20	pH adjustment	
Preservative	0.10	In can preservative	Schülke & Mayr
	100.00		

Test methods:

KU viscosity
KU describes the Krebs-Stormer viscosity. Typically the mid-shear or appearing in-can viscosity is represented.

High-shear/ICI viscosity
Indicates the viscosity at high shear rates of 10000 s^{-1} measured by a cone/plate equipped ICI viscometer.

Rheology measurements
Determined using the Anton-Paar MCR 301 rheometer, equipped with PP 50 measuring geometry at a gap width of 1 mm, at a temperature of 23°C.

Sag control
Sag stability tested using test blade 500 – 50µm; the larger the bar, the better the result.

Levelling (blade)
Levelling was determined using test blade 419 and after brush application. The characteristics were judged visually on a scale from 0 to 10 (in case of blade testing) and 1 to 5 (in case of brush-out testing). The higher the mentioned number indicates better performance.

Levelling (Brush-out)
25g of paint brushed out equally on leneta chart; levelling was evaluated relatively after 24 h drying time at room temperature.

Viscosity stability after tinting
Determined after the addition of 1% of an organic blue containing colorant. Incorporated for 10 minutes in the Scandex shaker. Viscosity stability was measured using the KU viscosimeter.

Roller spatter behavior
40g of paint rolled on vertical wall (10 times up & down); Spatters collected on black chart underneath and judged visually.

Open time
Open time test performed in accordance; with ASTM #7488-11. Layer thickness applied at a layer thickness of 250 µm on leneta charts.

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