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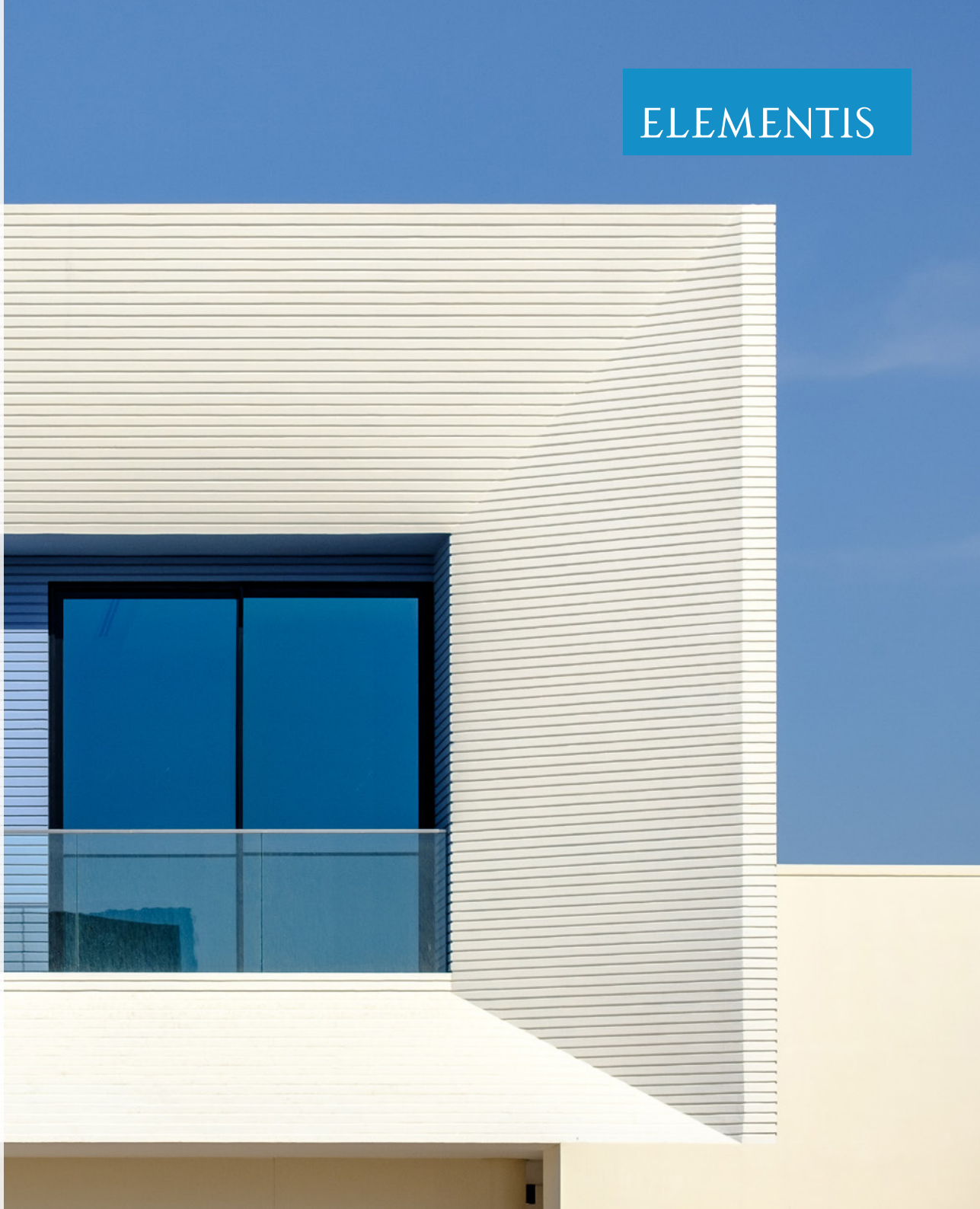
Application Leaflet

RHEOLATE®
HX 6008 IF

MIT and BIT free, extremely high efficient nonionic associative thickener (NiSAT) for excellent high shear viscosity build with additional low/mid shear contribution



Unique chemistry, sustainable solutions

Key Benefits

- Extremely high efficient thickener with both ICI and KU properties
- Compatible in various resin systems and especially
- efficient with acrylic and styrene acrylic resins
- Excellent balance of sag, flow, and levelling
- Minimal effect on final paint properties

Chemical and physical data

Composition	Solution of polyether polyurethane in water
Appearance	Opaque liquid
Active content [%]	25
Viscosity [mPas] (Brookfield RVT, Sp 4; 20 rpm; 25°C)	3200
Specific gravity [g/ml]	1.05
pH	4-6
VOC [%] (ASTM D 6886-03)	<0.2

Introduction

RHEOLATE® HX 6008 IF is a novel nonionic synthetic associative thickener (NiSAT) which has outstanding rheological properties for aqueous applications. It develops high shear viscosity (ICI) very efficiently, and additionally displays some mid-shear viscosity contribution. RHEOLATE® HX 6008 IF is effective in a broad range of latex chemistries.

Handling

RHEOLATE® HX 6008 IF can be used as supplied or, if necessary, further diluted with water. Addition can take place at any time during the manufacturing process but incorporation into the mill base before the letdown is recommended. RHEOLATE® HX 6008 IF can be combined with other associative rheological additives, clay based thickeners or cellulosic thickeners for higher packaged viscosity.

It is important to assess the effectiveness of RHEOLATE® HX 6008 IF in the entire system, as performance can be affected by other raw material ingredients.

Typical use levels of RHEOLATE® HX 6008 IF are in a range 0.1% to 1.5% (product weight) related to the total system weight.

High efficiency

In an acrylic test paint, the effectivity of RHEOLATE® HX 6008 IF has been tested versus two commercially available market reference grades.

FIGURE 1: Overview properties

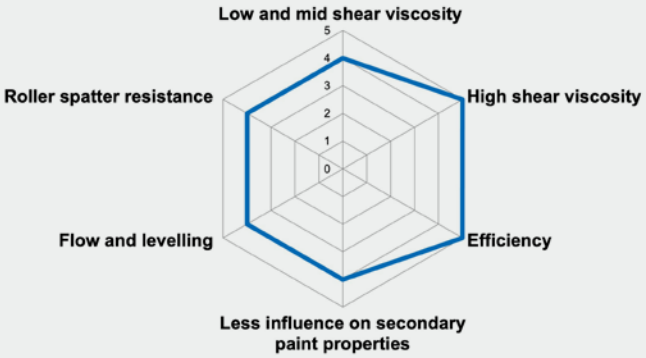
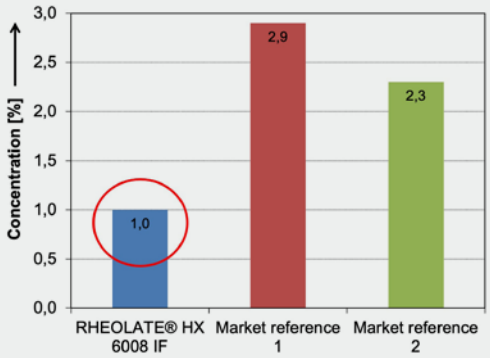
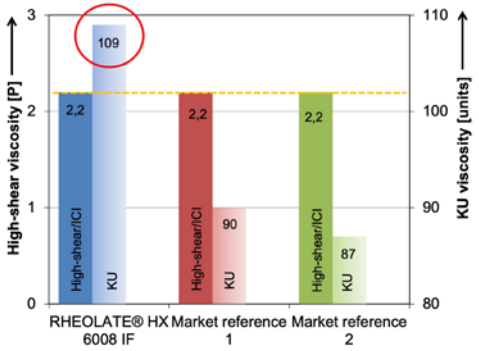


FIGURE 2: Efficiency in acrylic test paint



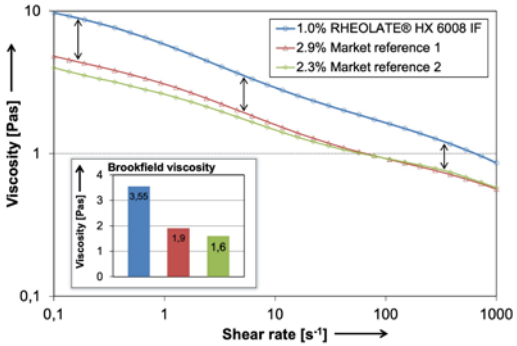
Efficiency in acrylic test paint 1% of RHEOLATE® HX 6008 IF is sufficient to obtain the required ICI viscosity of 2.2P measured with an ICI-rheometer. The high efficiency of RHEOLATE® HX 6008 IF requires the lowest amount of thickener to obtain the same ICI viscosity of 2.2 P.

FIGURE 3: Influence on mid shear viscosity (Acrylic)



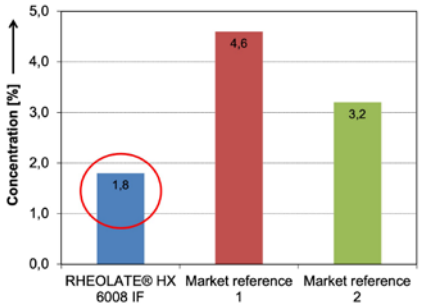
By adjusting the formulations to an equal ICI-viscosity value the resulting Krebs-Stormer viscosity will vary. 1% of RHEOLATE® HX 6008 IF yields the largest KU contribution and resulted in a ready to apply paint. The Krebs-Stormer viscosities of the paints with reference thickeners are too low for practical use and required additional adjustments with a KU-thickener to increase mid shear viscosity.

FIGURE 4: Rheological characteristics (Acrylic)



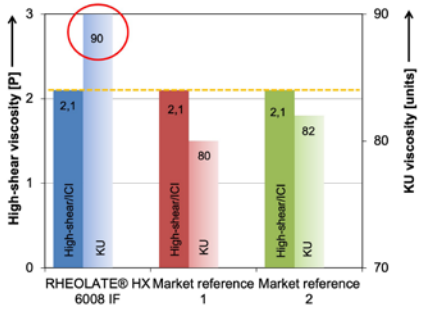
The flow curve of the paint based on RHEOLATE® HX 6008 IF confirms the additional contribution to the low-mid shear viscosity in comparison to the paints

FIGURE 5: Efficiency in styrene-acrylic test paint



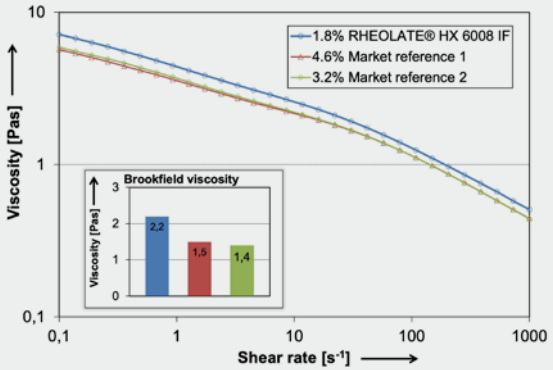
Only 1.8 % of RHEOLATE® HX 6008 IF is needed to achieve an High-shear/ICI viscosity of 2.2P which is in this test the lowest required loading level. The reference formulations requires at least 3.2% of thickener in order to achieve the target viscosity.

FIGURE 6: Influence on mid shear viscosity (S/A)



A Krebs-Stormer viscosity of 90 has been obtained with 1.8% of RHEOLATE® HX 6008 IF which represents an acceptable level for application.

FIGURE 7: Rheological characteristics (S/A)



The rheogram shows that RHEOLATE® HX 6008 IF increased the viscosity over the full shear rate range up to 1000 s-1. The reference thickeners in this latex technology yielded lower KU-viscosity values compared to RHEOLATE® HX 6008 IF. They needed a small adjustment with a second KU-builder to reach workable viscosities.

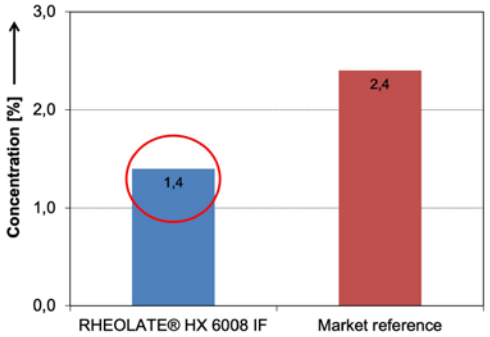
Binder chemistry	Savings in loading up to [%]
Acrylic	60
Styrene-acrylic	50

RHEOLATE® HX 6008 IF allows a significant reduction of the loadings to achieve identical mid shear viscosity in comparison to two market leading market reference NiSAT grades.

Influence on final

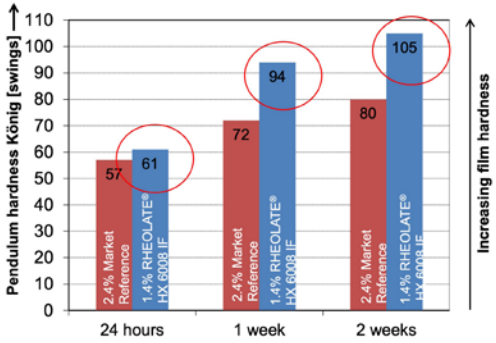
In a 1c acrylic high gloss clear wood coating, the effectivity of RHEOLATE® HX 6008 IF has been tested versus a commercially available market reference.

FIGURE 8: Efficiency in acrylic wood clear coat



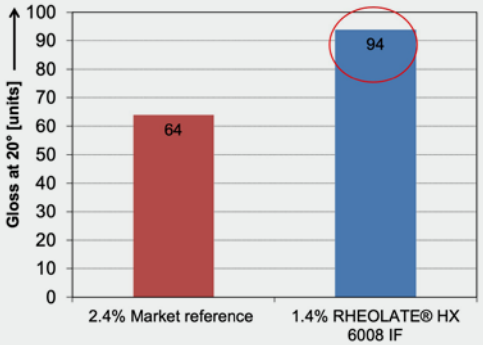
To achieve a stable DIN 4 cup viscosity of 100 seconds the formulation with RHEOLATE® HX 6008 IF required a significantly lower loading level than the formulation with the reference thickener system. The blank formulation without thickeners had a DIN 4 mm cup viscosity of 14 seconds. At equal DIN 4 cup viscosity the formulation with RHEOLATE® HX 6008 IF showed higher Brookfield viscosity over the full.

FIGURE 9: Pendulum hardness acrylic wood clear coat



The initial hardness of the clear coat containing RHEOLATE® HX 6008 IF was already on a higher level than the reference clear coat and over time the hardness continued to develop much faster. This illustrates that RHEOLATE® HX 6008 IF has limited influence on the primary coating properties.

FIGURE 10: Gloss acrylic wood clear coat



The same trend was found for the obtained gloss. The gloss of the clear coat based on RHEOLATE® HX

Conclusion

RHEOLATE® HX 6008 IF is an MIT and BIT free, extremely high efficient next generation nonionic synthetic associative thickener for water-borne systems that

- Provides excellent high shear rate viscosity build (ICI) with additional low and mid-shear contribution
- Provides savings up to 60% of the amount of thickener depending on the latex chemistry
- Reduces complexity in formulation and production
- Can help to reduce the number of raw material in the portfolio
- Has less adverse effects on paint film

Acrylic pvc 30 paint

Raw material	Concentration [%]	Function	Supplier
Millbase stage			
Tapwater	7.55	Diluent	
Add under stirring in the denoted order			
NUOSPERSE® FX 504	0.10	Dispersing agent	Elementis
DAPRO® DF 17	0.20	Defoamer	Elementis
Sodium polyphosphate	0.50	Softener	ICL
Titanium dioxide	4.10	Pigment	Kronos
Calcium carbonate, various particle size	21.7	Extender	Omya
MICROTALC® IT Extra	2.40	Extender	Elementis
Aluminium silicate	1.10	Extender	Evonik
Grind for 15 min. at 10 m/s.			
Add and stir for further 10 minutes at low speed			
DAPRO® DF 17	0.05	Defoamer	Elementis
Tapwater	10.00-X	Diluent	
Add under stirring			
Mowiltith LDM 7717	51.55	Binder	Calanese
Dowanol DPnB	0.55	Coalescing agent	Dow
Add and stir slightly for 10 min.			
Rheological additive(s)	X	Rheological additive	
Ammonia solution w=25%	0.15	pH adjustment	
Preservative	0.05		
	100.00		

1c Acrylic, high gloss clear coat

Raw material	Concentration [%]	Function	Supplier
Alberdingk AC 2714	83.00	Binder	Alberdingk Boley
Add under stirring in the denoted order			
DAPRO® DF 21	1.60	Defoamer	Elementis
DAPRO® W-77	0.50	Substrate wetting	Elementis
Dowanol DPM	4.00	Coalescing agent	DOW
Dowanol DPnB	5.00	Coalescing agent	DOW
Rheological additive(s)	X	Rheological additive	
Water	5.90-X	Diluent	
Disperse for 10 min. 6 m/s			
	100.00		

APPENDIX

Formulations

Styrene-acrylic pvc 50 paint

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		

APPENDIX

Test methods

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

Rheology data
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. In case of the oscillatory, amplitude sweep data shown an fixed angular frequency of 10 rad/s was pre-adjusted.

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

Gloss
Gloss determined using the Byk Gardner Haze/Gloss tester at a measuring angle of 20°.

Pedulum hardness
Tested using the Byk Gardner Pendulum hardness tester in accordance with König.

NOTE:

The information herein is currently believed to be accurate. We do not guarantee its accuracy. Purchasers shall not rely on statements herein when purchasing any products. Purchasers should make their own investigations to determine if such products are suitable for a particular use. The products discussed are sold without warranty, express or implied, including a warranty of merchantability and fitness for use. Purchasers will be subject to a separate agreement which will not incorporate this document.

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