



Technical Information B-RI 16

OPTIGEL/LAPONITE

Rheological Additives for Aqueous Systems

OPTIGEL/LAPONITE Formulations – Products and Applications

	LAPONITE				OPTIGEL								
	RD	RDS	S482	SL25	CK	CL	CG	CMO	LX	WA	WM	WX	W724

Paints and Building Coatings

Polyvinyl acetate systems	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<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"/>
Pure acrylate systems	<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 type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Styrene acrylate systems	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Silicate paints	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Silicone exterior paints	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Building paints	<input checked="" 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 type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Paints for artists	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input 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"/>	<input type="checkbox"/>	<input type="checkbox"/>
Finger paints	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Floor coatings	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Sealants	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Bituminous emulsions	<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 type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Construction adhesives	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Printing inks	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Paints for road markings	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Coatings

Acrylate resin systems	<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 type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Alkyd resin systems	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Alkyd resin systems, amine-neutralized	<input checked="" 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 type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Epoxy resins	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Cathodic dip paints	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
PU systems	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Underbody protectants	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Miscellaneous Applications

Adhesives	<input checked="" 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"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Putties	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Agrochemicals	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Pesticides	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Fertilizers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Foundry washes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Release agents	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Ceramic frits	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Glazes	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Enamel	<input checked="" 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"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Textile auxiliaries	<input type="checkbox"/>	<input checked="" 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 type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Paint removers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Abrasives and polishing agents	<input type="checkbox"/>	<input type="checkbox"/>	<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"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Welding electrodes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

☒ especially recommended ☐ recommended

figure 1

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

LAPONITE products

LAPONITE RD is a fully synthetic, inorganic product with a precisely

controlled chemical composition. It has a powerful stabilizing effect. Other outstanding features are its superior whiteness and its ability to form transparent gels. LAPONITE RDS and S482 have been modified in a way that makes these powdered products particularly easy to disperse.

LAPONITE SL25 is a ready-for-use aqueous dispersion at 25 % solids content.

OPTIGEL C products

OPTIGEL C products are natural smectites and can be stored as a

powder or as a pre-gel. They produce a high yield point in aqueous and water-soluble systems. This is why OPTIGEL C products significantly improve stabilisation of systems and help to prevent settling and sagging without raising the apparent viscosity.

Modified OPTIGEL products

OPTIGEL LX, WA, WM, WX and W724 are organically modified. They increase the viscosity and give aqueous and water-soluble systems a thixotropic behavior. All OPTIGEL products are easy to disperse and are excellent stabilizers and anti-sagging agents.



OPTIGEL/LAPONITE – Mode of Action

OPTIGEL and LAPONITE products from Rockwood are smectite based rheological additives for water-borne systems.

Smectites are a group of layered silicate minerals, which occur naturally, but can also be produced synthetically. Smectites have a platelet structure. The platelets are very thin, about 1 nm. The platelet diameter is about 500 – 1000 nm (1 μm) for natural smectites (OPTIGEL products) and 25 – 50 nm for synthetic smectites (LAPONITE products).

These stacks then separate into their individual platelets when added to water and dispersed under high shear conditions.

House-of-cards structure

The surfaces of individual OPTIGEL/LAPONITE platelets are negatively charged, but their edges are either neutral or even positively charged. Because their overall charge is predominantly negative, the platelets repel each other in the suspension, a process that distributes them evenly throughout the solution.

The difference in charge between their edges and their surfaces then generates a slight edge to face attraction between the platelets. Small amounts of divalent cations as Ca^{2+} or Mg^{2+} can further contribute to this interaction. These cations can link two platelets together at the edges this increasing the platelets size. This and the edge to face interaction produces a house-of-cards-like structure, which results in a gel formation.

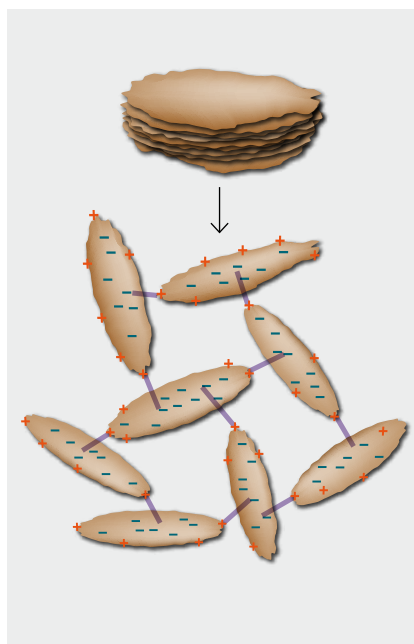


figure 2

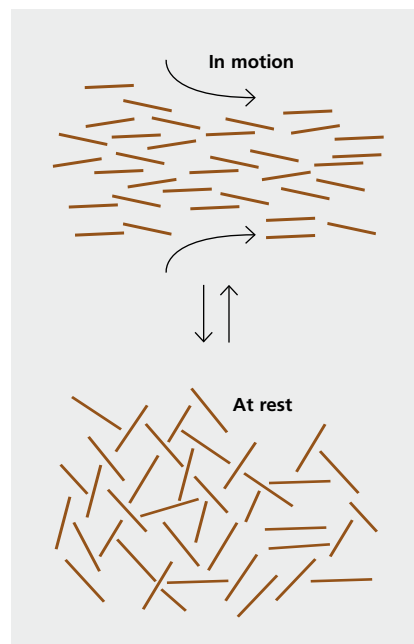


figure 3

Yield point and thixotropy

The stability of the gel reflects the bonding strength between platelets. When external forces (such as a stirrer, paint brush, roller) act on the gel, the house of cards collapses and the gel returns to its fluid state. Once the external force is reduced, the card house reforms and the liquid again behaves like a gel. OPTIGEL/LAPONITE produces what is known as a yield point. This means, a minimum force is required before a substance starts to flow.

Additionally, the gel exhibits thixotropic behavior. The greater the stirring force acting on the gel, the more completely the card-house structure will collapse, i.e., the thinner the liquid will become. After stirring, the card-house structure will reform within a short period of time and the viscosity will return to its original level.

Associative/Newtonian thickeners in the OPTIFLO product line, on the other hand, behave differently, exhibiting virtually no yield point and remain highly viscous, even when vigorously stirred.

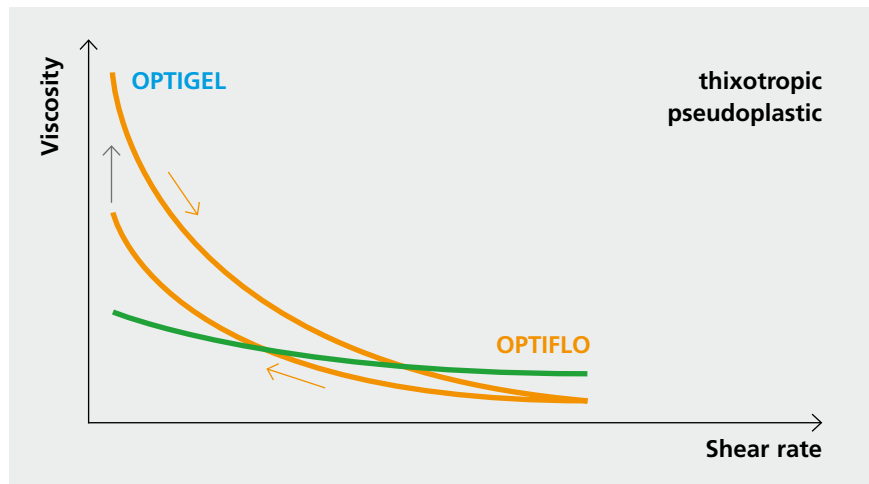


figure 4

OPTIGEL/LAPONITE – Advantages

Benefits of the yield point

The formation of a yield point reduces sagging. This makes it possible to apply thick coats of paint in one application step without negative side effects such as beading, dripping or sagging.

This is achieved by the stabilizing effect of the OPTIGEL card-house structure, which completely rebuilds shortly after applying the paint.

The yield point significantly improves storage stability. It keeps pigments

and fillers in suspension and prevents heavier pigments from settling and lighter pigments from floating up to the surface.

Thixotropic behavior alone would not have this effect-while it may slow down the settling process, it does not prevent it. The system must also have a yield point.

A yield point likewise reduces liquid separation (syneresis).

OPTIGEL/LAPONITE Reduces Sagging

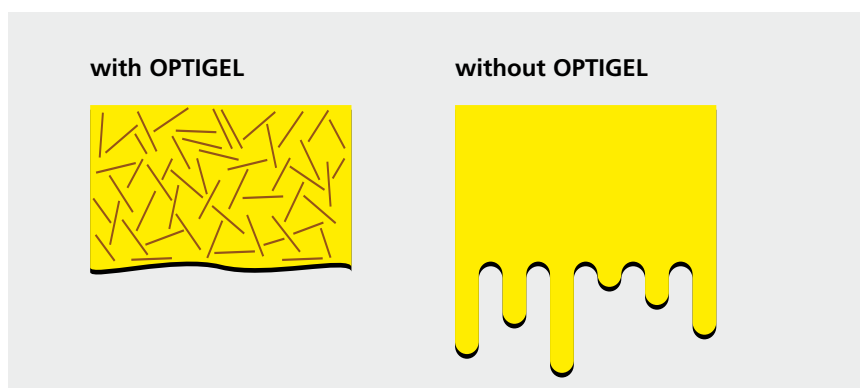


figure 5

OPTIGEL/LAPONITE Reduces Settling and Syneresis

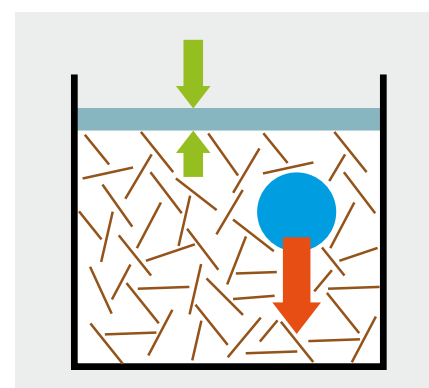


figure 6

OPTIGEL/LAPONITE – Product Overview

	LAPONITE				OPTIGEL								
	RD	RDS	S482	SL25	CK	CL	CG	CMO	LX	WA	WM	WX	W724

Product Description

Chemistry	Synthetic Layered Silicate				Activated smectites				Modified smectites				
Product	Powder			Liquid	Powder								
Whiteness (Elrepho R 457) [%]	> 90	> 90	> 90	N/A	65	80	40	60	60	65	60	60	60
Favorable dispersibility	△	▲	▲	N/A	△	○	○	○	△	△	△	△	

Rheological Effect

Swelling	△	△	△	△	○		○	○	▲	△	▲	△	▲
Thixotropic/pseudoplastic behavior	▲	△	△	△	△	△	△	△	△	△	△	△	△
Yield point	▲	▲	▲	▲	△	△	△	△	△	△	△	▲	△
Stabilization	△	△	△	△	△	△	△	△	△	△	△	▲	△
Anti-settling effect	△	△	△	△	△	△	△	△	△	△	△	▲	△
Anti-sagging effect	△	△	△	▲	△	△	△	△	△	△	△	△	△

Resistance

To organic solvents	▲	▲	▲	▲	△	△	△	△	△	△	△	▲	△
To changes in temperature	▲	▲	▲	▲	▲	△	△	△	△	△	△	▲	△
To high concentrations of electrolytes	○	○	○	○	△	△	○	▲	△	△	△	▲	△
Preservatives necessary									✓		✓	✓	✓
pH stability	3-13	3-13	3-13	3-13	2-13	2-13	6-13	4-13	5-11	6-11	5-11	2-13	5-11

Quantity Typically Required [%]

	0.1-2	0.5-8	0.3-3	0.5-5	0.3-3	0.5-5	0.1-2	0.3-2	0.1-2	0.3-2	0.1-1
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▲ very high △ high ○ average

figure 7

OPTIGEL/LAPONITE – Major Applications

LAPONITE RD	Thixotropic thickeners and stabilizers for latex paints (e.g., solid paint); water-borne metallics or clear coats; wood coatings; adhesives
LAPONITE RDS	
LAPONITE S482	
LAPONITE SL25	
OPTIGEL CK	Universal, thixotropic thickener for water-soluble systems; stabilizer for latex paints, ceramics
OPTIGEL CL	Thixotropic anti-settling agent/stabilizer for paints, ceramics
OPTIGEL CG	Economical, thixotropic thickener for paints and building chemicals
OPTIGEL CMO	Thixotropic thickener and stabilizer for paints and technical applications; compatible with large amounts of electrolytes
OPTIGEL LX	Highly effective thickener for flat and semi-gloss latex paints, silicon resin paints and adhesives
OPTIGEL WA	Effective thickener for flat and semi-gloss latex paints, water-soluble paints, additive for the building industry and cleansers
OPTIGEL WM	Highly effective, universal thickener for semi-gloss latex paints, water-soluble paints, adhesives and textile auxiliaries
OPTIGEL WX	Effective thickener for flat and semi-gloss latex paints, water-soluble paints, silicate paints and printing inks
OPTIGEL W724	Highly effective thickener for semi-gloss and high PVC latex paints, water soluble coatings and anti-corrosion primers (i.e. 2K PUR, 2K Epoxy)

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

BYK-Chemie GmbH

P.O. Box 10 02 45
46462 Wesel
Germany
Tel +49 281 670-0
Fax +49 281 65735

info@byk.com

www.byk.com/additives

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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P.O. Box 970
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Tel +49 8171 3493-0
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info.byk.gardner@altana.com
www.byk.com/instruments

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