Paints & Coatings Portfolio

As a leading global chemical manufacturer, ICL's R&D team is continuously developing innovative solutions which enable the manufacturing of sustainable, high-quality paints and coatings.

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Corrosion Inhibitors for Industrial & Architectural Applications


ICL
HALOX®
As a global leader in providing HALOX® corrosion inhibitors to the paint and coatings market, ICL is more than a pigment supplier. We are an innovative solutions provider for your ever-evolving needs.
MAKE THE RIGHT CHOICE!
Find the best HALOX® corrosion inhibitor to fit your formulation needs. For recommendations, ask the "Inhibitor" at halox.com
HALOX
ICL

Our Products

Our HALOX® product line is formulated to offer safer, more durable and longer-lasting solutions to address a multitude of coatings markets such as:

- Aerospace
- Agricultural & Construction Equipment
- Architectural
- Automotive Refinish
- Coil Coatings
- Industrial Maintenance

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HALOX® Recommendation Guide

HALOX® Recommended

By Resin (Solvent-Based Coatings)	Epoxies	Epoxy Esters	Polyurethanes	Moisture Cure Urethanes	Short & Medium Oil Alkyds	Long Oil Alkyds	Polyesters	Silicones
HALOX® CW-314	✓	✓	✓	✓	✓	✓	✓	✓
HALOX® CW-2230	✓	✓	✓	✓	✓	✓		
HALOX® CW-22/221					✓	✓		
HALOX® CW-291		✓	✓		✓	✓		
HALOX® 430	✓	✓	✓	✓	✓	✓	✓	✓
HALOX® 430 JM	✓	✓	✓	✓	✓	✓	✓	✓
HALOX® CW-491	✓	✓			✓	✓	✓	
HALOX® SW-111	✓	✓	✓					
HALOX® Z-PLEX® 111	✓	✓			✓	✓	✓	
HALOX® Z-PLEX® 250	✓	✓			✓	✓	✓	
HALOX® Z-PLEX® 750	✓	✓			✓	✓	✓	
HALOX® CZ-170		✓			✓	✓		
HALOX® SZP-391	✓	✓	✓	✓	✓	✓	✓	✓
HALOX® SZP-391 JM	✓	✓	✓	✓	✓	✓	✓	✓
HALOX® SZP-395	✓	✓	✓	✓	✓	✓	✓	✓
HALOX® 550 WF	✓	✓	✓	✓	✓	✓	✓	✓
HALOX® 630	✓	✓	✓	✓	✓	✓	✓	✓
HALOX® 650	✓	✓	✓	✓	✓	✓	✓	✓
HALOX® 700	✓		✓					
HALOX® Zinc Phosphate	✓	✓			✓	✓	✓	
HALOX® BW-111 & BW-191					✓	✓		

HALOX® Recommendation Guide

HALOX Recommended

By Resin (Water-Based Coatings)	Epoxies	Polyurethanes	Polyurethane Dispersions	Water Reducible Alkyds	Alkyds Dispersions	Chlorinated Polymers	Acrylics
HALOX® 430	HALOX	HALOX	HALOX	HALOX	HALOX		HALOX
HALOX® 430 JM	HALOX	HALOX	HALOX	HALOX	HALOX		HALOX
HALOX® CW-314	HALOX	HALOX	HALOX	HALOX	HALOX		HALOX
HALOX® CW-491	HALOX			HALOX			HALOX
HALOX® SW-111	HALOX	HALOX	HALOX				HALOX
HALOX® Z-PLEX® 111	HALOX			HALOX	HALOX		HALOX
HALOX® Z-PLEX® 250	HALOX			HALOX	HALOX		HALOX
HALOX® Z-PLEX® 750	HALOX			HALOX	HALOX		HALOX
HALOX® CZ-170				HALOX	HALOX		HALOX
HALOX® SZP-391	HALOX	HALOX	HALOX	HALOX	HALOX	HALOX	HALOX
HALOX® SZP-391 JM	HALOX	HALOX	HALOX	HALOX	HALOX	HALOX	HALOX
HALOX® 550 WF	HALOX	HALOX	HALOX	HALOX	HALOX		HALOX
HALOX® 350	HALOX	HALOX	HALOX	HALOX	HALOX		HALOX
HALOX® 515 & 515 LFG	HALOX				HALOX		HALOX
HALOX® 520	HALOX						
HALOX® 570 & 570 LS	HALOX	HALOX	HALOX	HALOX	HALOX		HALOX
HALOX® Zinc Phosphate	HALOX			HALOX	HALOX		HALOX
HALOX® BW-111 & BW-191			HALOX	HALOX			HALOX

By Specialty Application	Clear Coats	Thin Films	Acid Catalyzed	Powder Coating	Wash & Etch Primers	Aerospace	Coil Coating	High Temperature	Rust Converter
HALOX® 430 JM	HALOX	HALOX		HALOX	HALOX	HALOX	HALOX	HALOX	
HALOX® CZ-170		HALOX		HALOX	HALOX			HALOX	
HALOX® SZP-391 JM	HALOX	HALOX	HALOX	HALOX	HALOX	HALOX	HALOX	HALOX	
HALOX® 550 WF	HALOX	HALOX	HALOX		HALOX	HALOX	HALOX	HALOX	HALOX
HALOX® 350	HALOX	HALOX					HALOX		
HALOX® 570		HALOX							
HALOX® 630	HALOX	HALOX							
HALOX® 650	HALOX	HALOX	HALOX	HALOX	HALOX	HALOX	HALOX		
HALOX® RC-980									HALOX

Inorganic Corrosion Inhibitors with Zinc

For over 50 years, HALOX® corrosion inhibitive pigments have provided a high standard of protection without the use of lead or hexavalent chromium compounds.

Eliminate Hazardous Toxins Without Sacrificing Performance

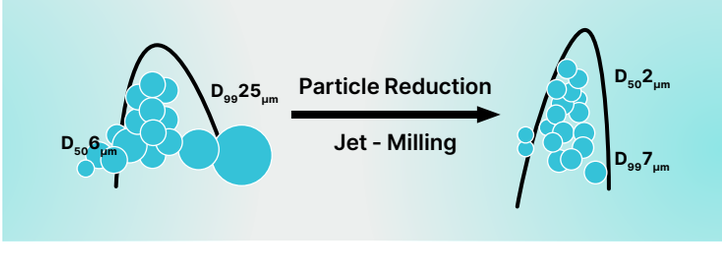
ICL proudly offers a variety of Inorganic Corrosion Inhibitors based on the proven performance of zinc. Our Z-PLEX® products are designed to allow you to choose the right inhibitor for your performance and manufacturing needs.

HALOX® 700
Controlled Solubility

HALOX® 700 is a zinc and aluminum based inorganic corrosion inhibitor designed to provide early and long-term corrosion protection. It combats the onset of corrosion in industrial coatings, and its broad formulating latitude provides good compatibility with most paint systems. Recommended usages include water and solvent-based paints (alkyd, epoxy and polyurethane coatings).

HALOX® SZP-391
Universal Workhorse

HALOX® SZP-391 is the standard for excellent corrosion protection in a myriad of coatings systems. The proprietary blend of strontium and zinc phosphosilicates offers protection in nearly all water and solvent-based applications. The versatility of HALOX® SZP-391 makes it the pigment of choice for formulators seeking long-term corrosion protection



HALOX® SZP-391 JM
Jet-Milled

HALOX® SZP-391 JM contains the same proprietary blend of strontium and zinc phosphosilicates as HALOX® SZP-391 at a reduced particle size. Its jet-milled feature not only extends the range of applications to thin-film (<25 microns) and clear coats (<10 microns) with its reduced particle size range, but offers the opportunity for increased ease of incorporation. Emerging commercial coatings technologies, such as alkyd dispersions, benefit greatly from this feature.

HALOX® SZP-395
Cost & Performance Balance

HALOX® SZP-395 is a proprietary blend of strontium and zinc phosphosilicates used in protective coating systems. It's our most efficient and versatile corrosion inhibitive pigment recommended for use in a wide variety of resin systems. It is equally effective in such resins as: alkyds (both traditional and high solids), epoxies, latexes, water reducible alkyds, high acid value resins, catalyzed baking systems and vinylidene chloride latexes.

HALOX® CZ-170
Corrosion & Tannin Blocking

HALOX® CZ-170 is a zinc ortho-phosphate pigment with attributes beneficial to both corrosion inhibition and tannin-stain blocking. It is ideally suited for applications over multiple substrates where both types of protection are desired. The benefits can also be realized in thin-film and high-gloss applications due to the low particle size range.

HALOX® Z-PLEX 111
Low Cost Zinc Phosphate Offset

HALOX® Z-PLEX® 111 is specially engineered to contain 80% less zinc compounds while providing improved corrosion efficiency. This engineered zinc phosphate complex is designed to compete head-to-head with standard zinc phosphate pigments. For light industrial coatings, the reduced cost of HALOX® Z-PLEX® 111 compared to that of zinc phosphate brings realized savings to your formulation without sacrificing performance.

HALOX® Z-PLEX 750
2-in-1 Inorganic/Organic

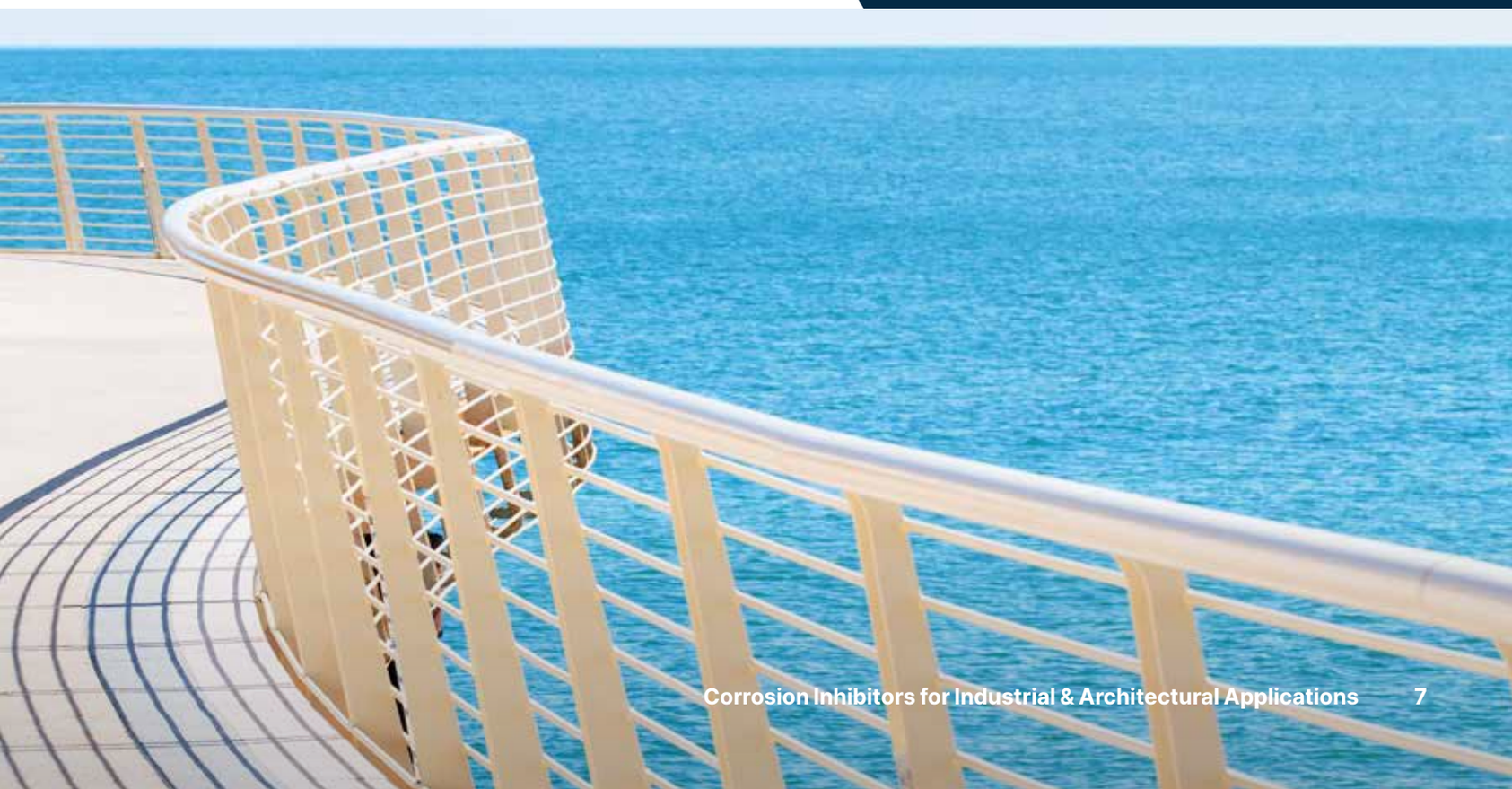
HALOX® Z-PLEX® 750 is a hybrid corrosion inhibitor combining organic and inorganic inhibitor synergies. A cost-effective alternative to modified zinc phosphate, it improves humidity resistance and wet adhesion in both water and solvent-based coatings.

HALOX® Z-PLEX 250
Tried & Proven

HALOX® Z-PLEX® 250 is the universally accepted alternative to lead and chrome inorganic corrosion inhibitors for all applications. Its high degree of versatility is due to its narrow particle size distribution. It is a Type I, zinc phosphate dihydrate crystal form, which allows for use in both water and solvent-based coatings.

HALOX® Zinc Phosphate
Chrome-Free & Lead-Free Workhorse

HALOX® Zinc Phosphate is a universal lead-free and chromium-free inorganic corrosion inhibitor designed for water-based and solvent-based coatings. It exhibits a high degree of versatility because of its narrow particle size distribution: upper particle size limit of 20 microns, mean particle size of 5 microns.



Zinc-Free Inorganic Corrosion Inhibitors

HALOX® SW-111
Superior Performance

HALOX® SW-111 is a strontium phosphosilicate pigment designed for high performance applications, such as water and solvent-based epoxy formulations. HALOX® SW-111 maintains a higher level of in-can stability compared to other zinc-based corrosion inhibitors. It performs well in the most demanding resins where the reactivity of zinc-containing anti-corrosive pigments can be problematic.

HALOX® 430
Zn-Free & Multi-Mechanism

HALOX® 430 is a patent protected pigment designed to provide both conventional passivation and ion-exchange technology in one product. The unique design enables formulation into nearly all water and solvent-based formulations. The ability to ion-exchange corrosion inducing species showcases the latest technology in heavy-metal replacements to ensure long-lasting performance.

HALOX® 430 JM
Jet-Milled

HALOX® 430 JM is a patent protected pigment designed to provide both conventional passivation and ion-exchange technology in one product. HALOX® 430 JM offers the same overall utility as HALOX® 430 with acceptance into thin-film and clear coat formulations. The ability to ion-exchange corrosion inducing species showcases the latest technology in heavy-metal replacements to ensure long-lasting performance.

HALOX® CW-314
FDA, Zn-Free, Multi-Functional

HALOX® CW-314 is especially suited for systems where 21 CFR 175.300 approval or conformance to ANSI/NSF standards are required. It is very effective in enhancing the infrared (IR) reflectance and thermal emissivity of elastomeric roof coatings. HALOX® CW-314 increases the total solar reflectance (TSR) while maintaining the dirt pick-up resistance (DPUR) and prevention of mildew growth. It can be used alone or in combination with other non-toxic corrosion inhibitors and mineral pigments in the formulation of environmentally friendly specialty paints.

HALOX® CW-2230
Anti-Corrosion & Flame Retardant

HALOX® CW-2230 is a calcium borosilicate pigment with unique manufacturing process results in a low moisture product, well-suited for polyurethane coatings, though not limited. HALOX® CW-2230 is an ideal choice for coatings applied over substrates such as galvanized steel and other treated substrates where saponification with surface zinc is undesirable.

HALOX® CW-22/221 & CW-291
Zn-Free, Phosphate-Free

HALOX® CW-22/221 is a calcium borosilicate pigment recommended for protective coatings formulated with alkyd technology. HALOX® CW-22/221 is an ideal choice for coatings applied over substrates such as galvanized steel and other treated substrates where saponification with surface zinc is undesirable. HALOX® CW-291 can be used as a stand-alone corrosion inhibitor or to enhance overall protection when used with traditional corrosion inhibitors over untreated substrates.

HALOX® CW-491
Legacy Zinc-Free

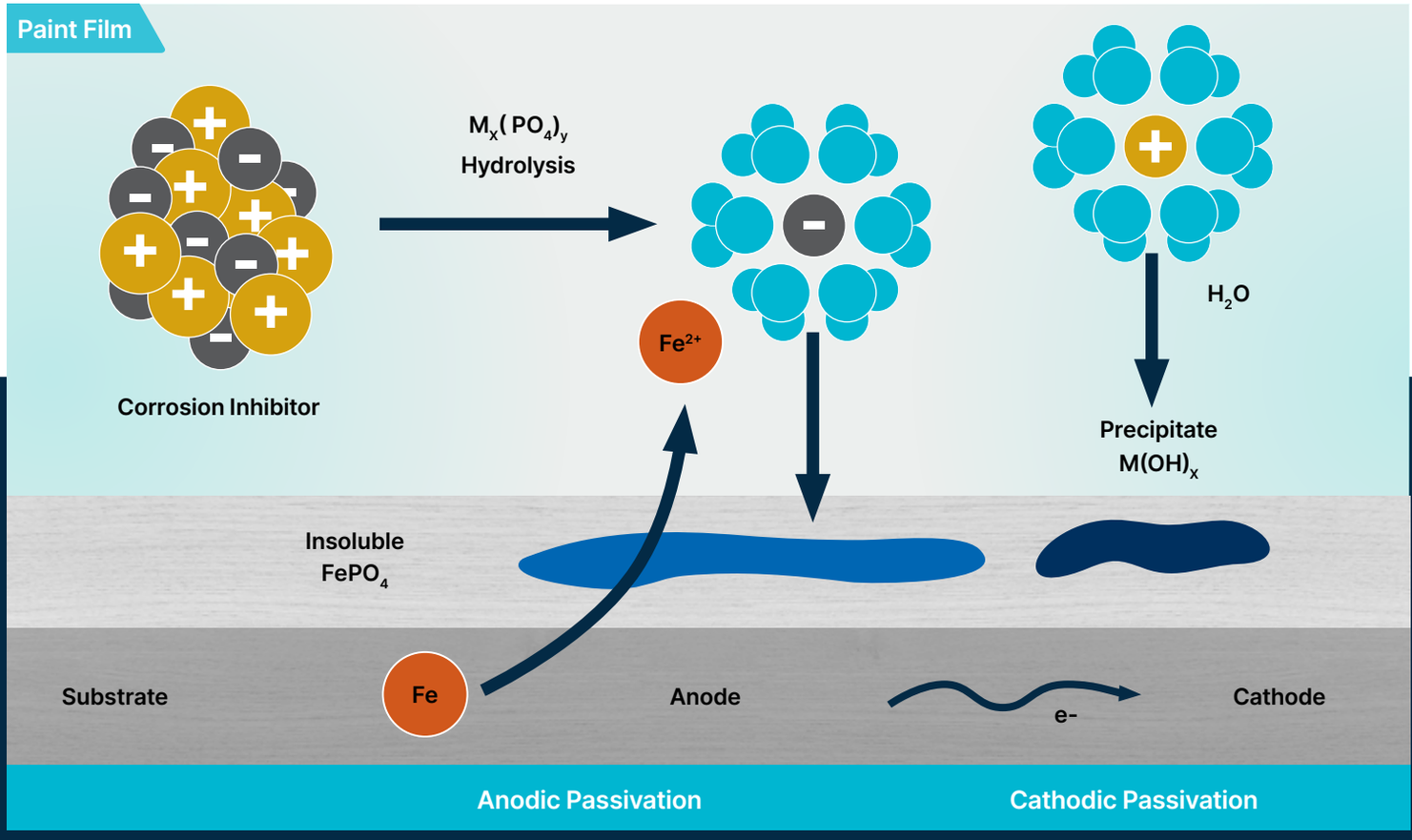
HALOX® CW-491 is a calcium phosphosilicate pigment recommended for zinc-free protective coatings. It offers a broad range of corrosion protection in both water and solvent-based systems.

HALOX® BW-111 & BW-191
Synergistic

HALOX® BW-111 & BW-191 are barium phosphosilicate pigments ideally suited to provide a balanced corrosion inhibitive package when used with lower solubility corrosion inhibitors such as HALOX® SZP-391 or HALOX® Z-PLEX 250. The increased solubility of these products compared to traditional zinc phosphate offers increased protection during the beginning of a coating's service life. These products can be used as sole corrosion inhibitors or as an enhancement for overall protection when used with HALOX® SZP-391.

How Do Our Inorganic Corrosion Inhibitors Work?

Our Inorganic Corrosion Inhibitors work hard to give your coatings the best corrosion protection by delaying the onset of corrosion and providing long-term corrosion protection.



Specialty Inhibitors

HALOX® Specialty Inhibitors provide formulators with additional tools to increase hydrophobicity and adhesion in challenging environments.

Maximize Corrosion Resistance While Promoting Adhesion

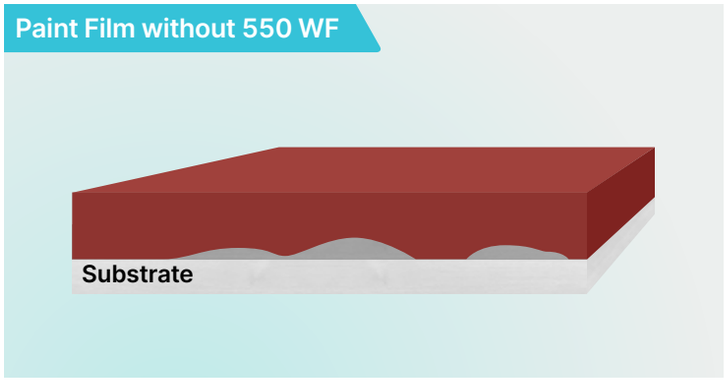
The performance attributes of HALOX® 550 and HALOX® 550 WF lead to overall improvements in barrier properties through both the formation of domains within the pores of a coating in addition to anaffinity for bonding at the metal surface.

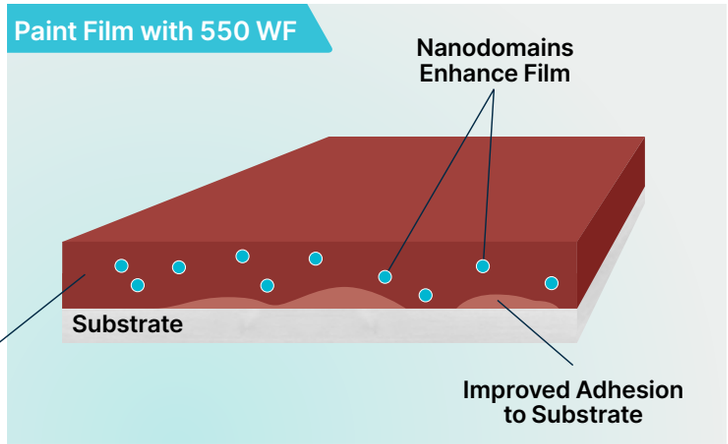
HALOX® 550 & 550 WF
Water-Based / Water & Solvent-Based

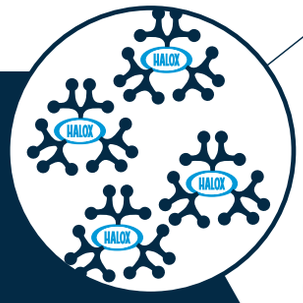
HALOX® 550/550 WF works directly with corrosion inhibitive pigments and organic additives. When used at a low loading level, they can boost the adhesion of the systems through the development of a sol-gel network and the formation of hydrophobic nanodomains within the coating. It's more than just an adhesion promoter – its fundamental chemistry is the ultimate synergist for improved coating performance. HALOX® 550 is designed for water-based systems. The versatility of HALOX® 550 WF enables it to be used in both water and solvent-based formulations.

HALOX® RC-980
Rust Converter

HALOX® RC-980 is an organic additive designed to convert red rust to a black iron oxide. It can be used in slightly acidic waterborne vinyl or PVDC binders applied to rusted steel substrates. It converts the rust within minutes of the coating application and forms a black iron oxide barrier which can further be top-coated with water or solvent-based paints.







Organic Corrosion Inhibitors

HALOX® Organic Corrosion Inhibitors are effective against flash rusting and in-can corrosion prevention, though the benefits of using these products does not end there.

Improve Adhesion and Provide a High Gloss, Corrosion-Resistant Finish

Our HALOX® Organic Corrosion Inhibitors are ideally suited for high gloss, thin film, and clear coat applications. They also provide superior synergy when used in combination with inorganic corrosion inhibitors in traditional coatings. To achieve desired performance, proper selection of inhibitors is essential.

HALOX® 515 & 515 LFG
Liquid Dual Protection

HALOX® 515 is a liquid corrosion inhibitor designed for water-based formulations which is free from heavy-metals and nitrites. This low viscosity, liquid organic corrosion inhibitor meets all the needs of a traditional flash-rust inhibitor in addition to providing galvanic corrosion resistance and superior humidity resistance, all of which lead to better overall corrosion inhibition. A lower freeze point variant, HALOX® 515 LFG, is available for improved stability during cold weather transport and application.

HALOX® 520
Dual Functionality

HALOX® 520 contains dual functionality as a corrosion inhibitor and an adhesion promoter. It may be used in water-based formulations such as: 2 pack epoxy systems, 1 and 2 pack polyurethanes, acrylics (especially epoxy/amine functionalized), and hybrid systems. HALOX® 520 can also be used as a metal pretreatment additive.

HALOX® 350
Organic Anodic Passivator

HALOX® 350 is a highly effective corrosion inhibitor designed for water-based formulations in order to provide flash-rust inhibition, in-can rust prevention and improved adhesion performance. This product may be used as a powder (formulation pH dependent) or as an easily prepared liquid additive to a wide array of coatings systems. HALOX® 350 is a nitrite-free corrosion inhibitor.

HALOX® 630
Hydrophobic Adhesion Promoter

HALOX® 630 is a high performance liquid corrosion inhibiting additive for solvent-based formulations. Its ability to improve adhesion to poorly prepared substrates is unsurpassed. HALOX® 630 may be used alongside traditional corrosion inhibiting pigments or as the stand-alone inhibitor for DTM applications including clear coats with proven performance on brass and aluminum alloy.

HALOX® 570 & 570 LS
Flash & Weld Seam Passivator

HALOX® 570 is a highly effective long-term corrosion inhibitor designed for water-based formulations in order to provide flash-rust inhibition, galvanic corrosion resistance, and improved adhesion performance. This product may be used as a powder (formulation pH dependent) or as an easily prepared liquid additive to a wide array of coatings systems including UV applications.

30% HALOX® 350 SOLUTION	WEIGHT
De-ionized Water	57.3
28% Ammonium Hydroxide*	15.0
HALOX® 350	27.7
TOTAL	**100.00**

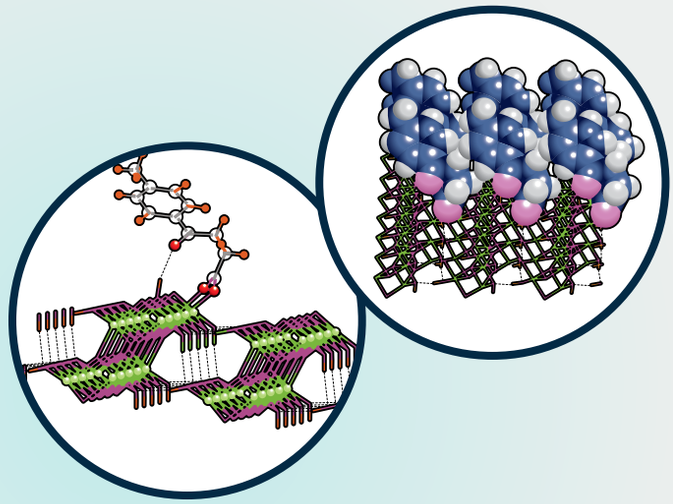
30% HALOX® 570 SOLUTION	WEIGHT
De-ionized Water	62.8
28% Ammonium Hydroxide*	7.2
HALOX® 570	30.0
TOTAL	**100.00**

*Stir slowly, adjust pH to 8-9 *AMP-95 is suitable*

HALOX® 650
Zero VOC Synergist

HALOX® 650 is an electron rich di-acid acid based organic corrosion inhibitor designed for solvents, high-solids and powder coatings. Its heterocyclic (C, N, S) composition makes it heat stable (<170 °C), an effective anodic inhibitor, reduces cut-edge corrosion and is a powerful synergist for other anticorrosive pigments such as HALOX® SZP-391, HALOX® Z-PLEX® 250, and HALOX® 430. It is used in chromate-free coatings such as coil coatings and wash/etch primers.
It also allows formulators to pass the T-bend test for force cured coatings.

How Organics Work



Molecular modeling of repeating dinuclear fragment.

Flash Rust Corrosion Inhibitors

Flash Rust Corrosion Inhibitors are added to water-based coatings in order to stop corrosion formation that occurs during the drying process.

Put an End to the Appearance of Rust Spotting and In-Can Corrosion

Without the use of Flash Rust Inhibitors, water soluble corrosion products migrate to the surface of the coating appearing as rust stains or spots. In addition to the flash rust protection provided by the entire line of HALOX® Organic Corrosion Inhibitors, we are proud to offer FLASH-X® products specifically designed to prevent unsightly staining which can ruin an otherwise perfect finish.

HALOX® FLASH-X® 150
Tried & Trusted

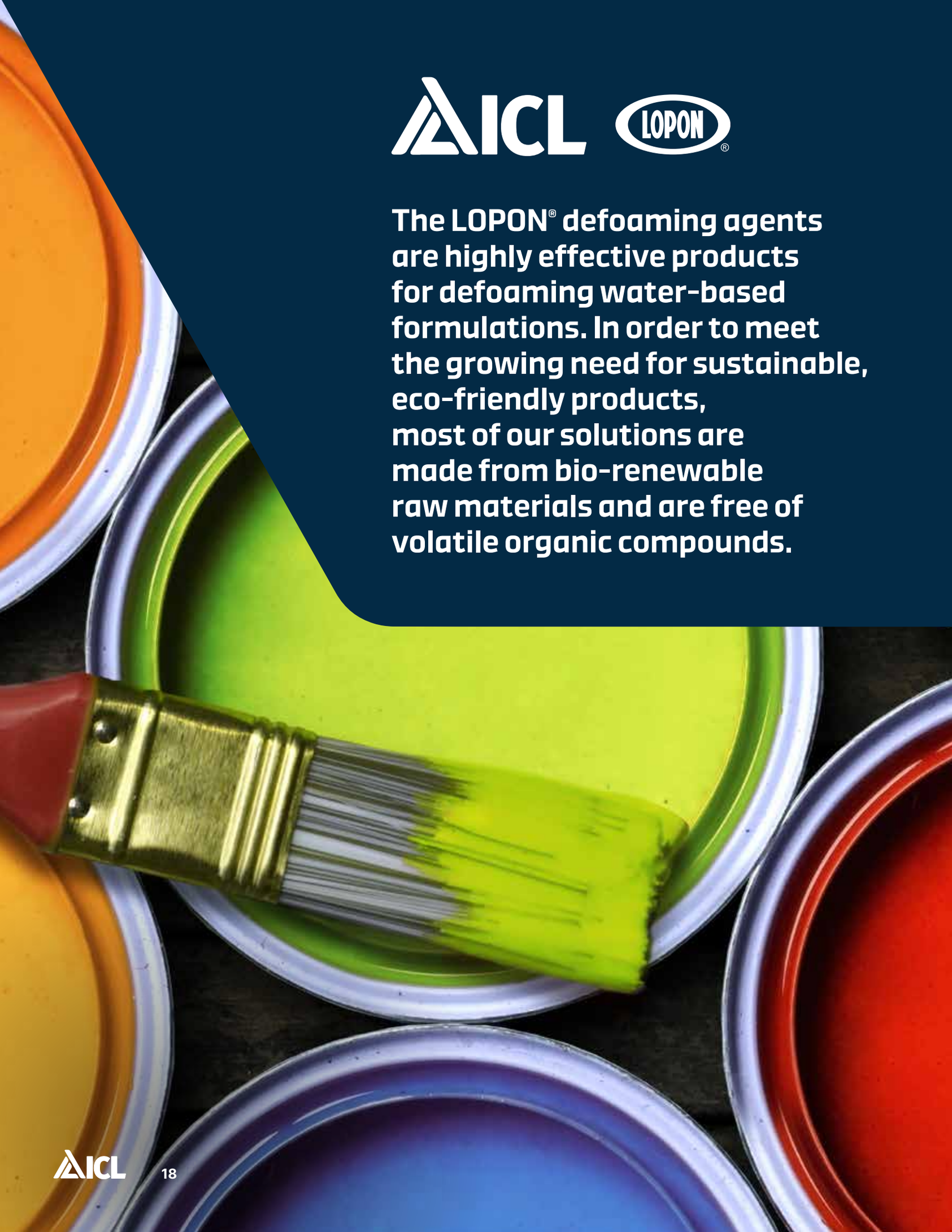
HALOX® FLASH-X® 150 combines dual mechanisms to combat flash rusting and in-can rusting. The low viscosity liquid is ideal for increasing production output and may be post-added to meet the challenges of customer specific modifications.

HALOX® FLASH-X® 330
Nitrite-Free

HALOX® FLASH-X® 330 is a low-odor, low-foam additive which has no effect on gloss and provides excellent package stability. It contains no nitrite or nitrate compounds, is effective at low loading levels and may be incorporated at any stage of the paint manufacturing process. The product is also suitable for use in water jet-blasting and metal working applications.

Our HALOX® Corrosion Inhibitors are available for purchase through our global distribution network. To contact a distributor in your area for pricing and availability, visit: halox.com/distributors

Defoamers for Water-Based Paints



The LOPON® defoaming agents are highly effective products for defoaming water-based formulations. In order to meet the growing need for sustainable, eco-friendly products, most of our solutions are made from bio-renewable raw materials and are free of volatile organic compounds.

What is Foam?

Foam is the inclusion of gas bubbles in a liquid medium. While gas bubbles in pure liquids migrate rapidly to the surface and burst, the surface-active substances used in paints and varnishes stabilize them.

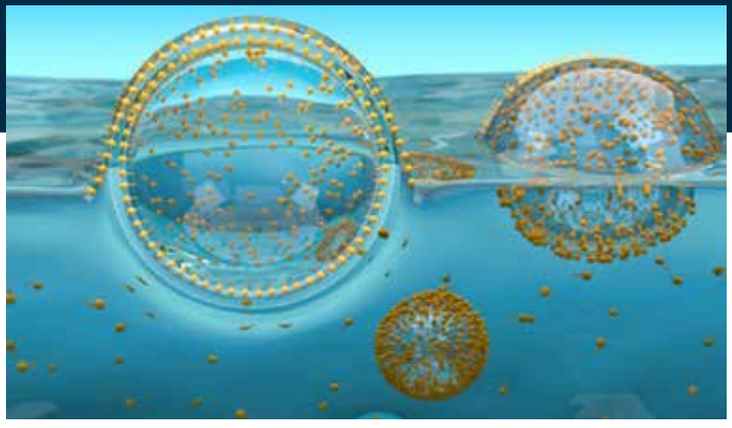
Stabilization occurs when surfactants cover the surface of gas bubbles with their hydrophobic end while the hydrophilic side of the surfactant molecule extends into the aqueous phase. Surfactants are also arranged on the surface according to their hydrophobicity/hydrophilicity. When a stabilized gas bubble rises to the surface, it is stabilized there by a surfactant double layer.

Manufacturing processes are negatively affected by stabilized foam. Shear forces necessary for dispersion are transmitted less efficiently, resulting in poor dispersion quality for the pigments and fillers.

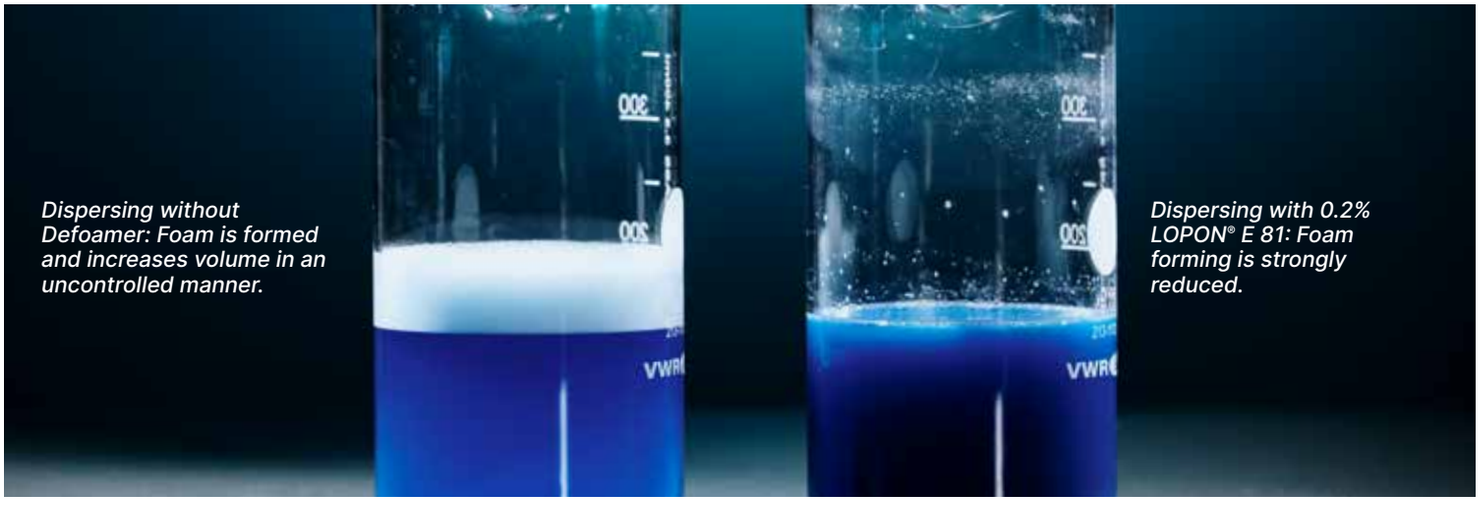
As a consequence of volume increase in an uncontrolled manner with foam present, a drastic decrease in density results. Reproducible and reliable production and the accurate filling of containers are another problem caused by trapped foam.

In dried paint film, surface defects caused by foam are visually unappealing and reduce the potential performance.

Migration to the surface and bursting of gas bubbles in pure water.



Stabilization of gas bubbles in a liquid containing surface-active substances.



Dispersing without Defoamer: Foam is formed and increases volume in an uncontrolled manner.

Dispersing with 0.2% LOPON® E 81: Foam forming is strongly reduced.

Our Portfolio

Our LOPON® defoamers show a high level of effectiveness when used at low dosage levels.

For a comparable defoamer effect, a lower dosage of LOPON® E 81 is usually necessary when compared to a traditional mineral oil defoamer.

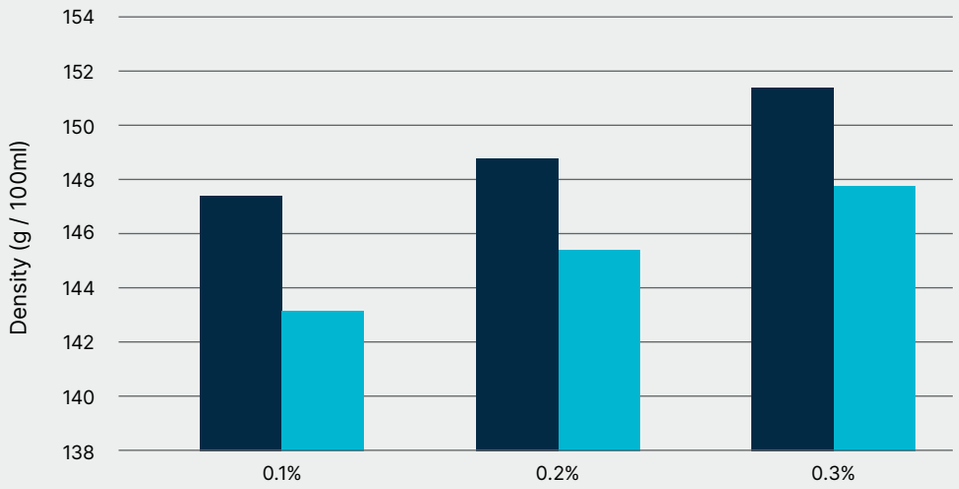
LOPON® E 81 is quite versatile due to its wide range of effects. In addition to our liquid defoamers, we also offer a powdery defoamer for use in powder systems.

Products	Chemical Basis	Viscosity (mPas)	Low VOC	Mineral Oil Free	Silicon Free	Renewable Raw Materials (%)	Application(s)
LOPON® E 13	Vegetable Oil	3500 - 5000	✔	✔	✔	93	Low viscosity systems
LOPON® E 71	Polymer	3000 - 9000		✔	✔	2	High PVC paints, even surface
LOPON® E 81	Vegetable oil	3000 - 9000	✔	✔	✔	47	Universal
LOPON® E 100	Fatty acid esters	500 - 2000	✔	✔	✔	85	Glossy paints, varnishes
TARGON® P3	Vegetable oil	Powder	✔	✔	✔	26	Powder systems

Exterior Paint:
With a dosage of only 0.1% LOPON® E 81, a comparable effect is achieved as with 0.3% of a conventional mineral oil defoamer.

Key:

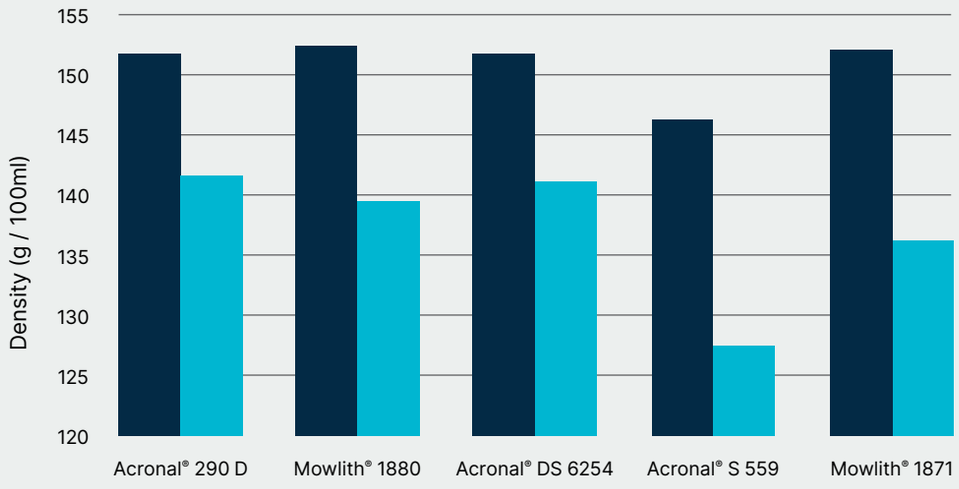
- LOPON® E 81
- Mineral Oil Defoamer



Effectiveness of LOPON® E 81 in different binders: density in g / 100 ml of emulsion paint.

Key:

- LOPON® E 81
- Without Defoamer



Acronal® is a registered trademark of BASF SE / Mowlith® is a registered trademark of Celanese Inc.

Sustainable & Eco-Friendly

Over time emphasis has slowly shifted from mineral oil-based defoamers to more sustainable options. As a result, many of our LOPON® defoamers use renewable raw materials, which are also biodegradable.

LOPON® E 81 is quite versatile due to its wide range of effects and contains 47% renewable raw materials.

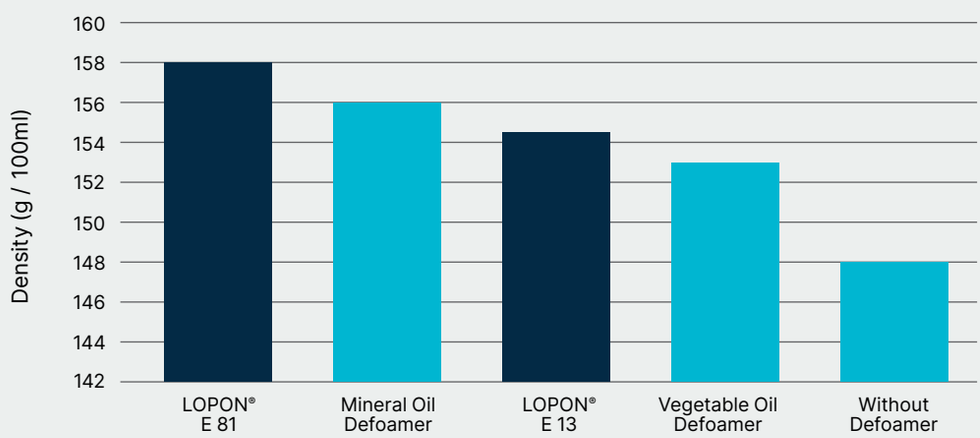
Even more environmentally friendly is LOPON® E 13, which contains 93% regrowing materials. Although its effectiveness is slightly lower than LOPON® E 81, it still outperforms biodegradable defoamers from other competitors.

All our LOPON® and TARGON® defoamers have been developed for water-based applications and are suitable for Ecolabel compliant formulations.

Effectiveness of LOPON® E 13 compared to different defoamers in a semi-gloss paint with a dosage of 0.3 %.

Key:

- LOPON®
- Competitors



Why Defoamers?

During the dispersion process, air is introduced into the paint through mixing or released when pigments and fillers are wetted. Defoamers are used to prevent unwanted foam as they destabilize the foam lamella and cause the bubbles to burst.

How Defoamers Work

For a defoamer to develop its optimum effectiveness, it must be insoluble in the formulation to be defoamed and compatible to prevent surface defects during application.

Another requirement is a positive penetration coefficient so that the defoamer drops can penetrate the foam lamella and the liquid/air interface. The entry barrier increases with higher surfactant content.

Defoamers use various mechanisms to be effective. For instance, using a "bridging" mechanism (Figure 1), the defoamer drop breaks through the foam lamella on both sides. This is followed by a "dewetting" or "stretching" mechanism (Figures 2, 3) which causes bubbles to burst.

Another defoaming mechanism is known as the "spreading" mechanism (Figure 4). After penetrating the liquid/air interface the defoamer drop spreads at the interface and displaces the surfactants. The former elastic foam lamella is replaced by a film with lower cohesive forces (Figure 5).

The entry barrier is reduced and additional defoamer drops enlarge the surface of the spread film. The spreading leads to a flow in the foam lamella which causes it to become thinner until it bursts.

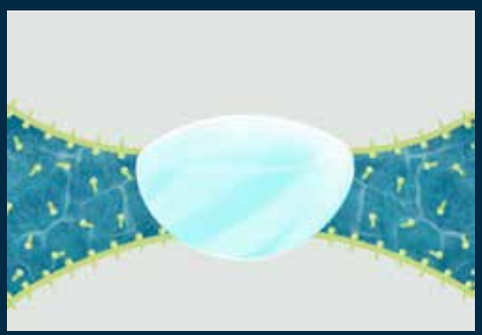


Figure 1 (Bridging Mechanism): Defoamer drop breaks through the foam lamella on both sides.

Figure 2: Dewetting of the defoamer drop.

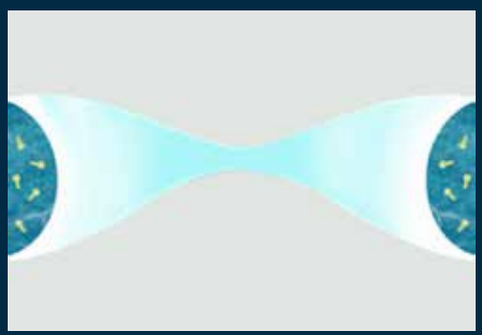


Figure 3: Stretching of the defoamer drop.

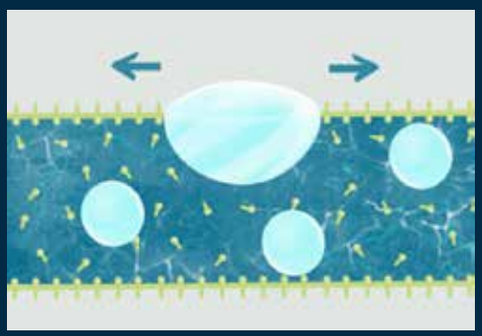


Figure 4 (Spreading Mechanism): The defoamer drop spreads at the interface.

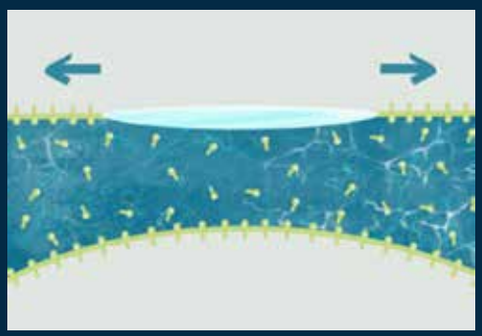


Figure 5: Thinning of foam lamella as a result of spreading.

Dispersing Agents for Water-Based Paints & Plasters

We provide condensed phosphates and organic polymers which are extensively used as dispersing agents in pigmented systems – primarily in water-based paints.

Main Applications

All of our dispersing agents are specially designed for water-based formulations. These products may be used for decorative wall paints in both indoor and outdoor applications such as:

- Emulsion Paints
- Silicate Emulsion Paints
- Silicone Resin Paints
- Pigment Pastes
- Varnishes
- Plasters
- Adhesives

Why Dispersing Agents?

By introducing mechanical forces, pigment particle agglomerates are broken up into smaller aggregates during the dispersion process.

The function of dispersing agents is to stabilize primary particles and prevent re-agglomeration. To achieve proper dispersion, molecules of the dispersing agent adsorb into the surface of the pigment particles and generate repulsive forces. Pigment particles are kept at a distance through electrostatic and/or steric stabilization.

Agglomerated particles

Primary particles

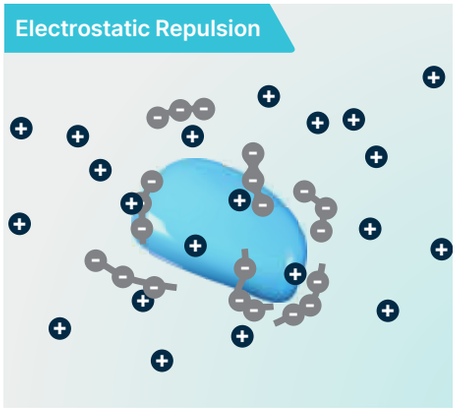
What are the Benefits of Dispersing Agents?

Stabilizing a dispersion not only prevents pigment particles from re-agglomerating, but also optimizes the distribution of pigments and other fillers.

Stabilization leads to improvements in hiding power, scrub resistance and storage stability. Properly stabilized dispersions allow for a higher pigment volume concentration (PVC).

Left: Pigment preparation without dispersing agent.
Right: Pigment preparation with 0.1% POLYRON® N. Adding just 0.1% POLYRON® N, the viscosity can be strongly reduced at the same PVC, thus a flowable paint can be achieved.

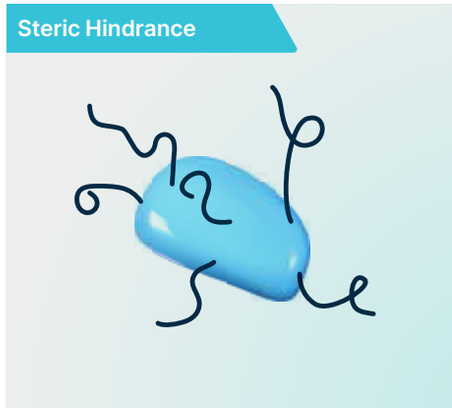
Stabilization Mechanisms



Electrostatic Stabilization

In an aqueous medium, the adsorbed dispersing agent dissociates into anionically charged macro molecules and low molecular weight cations.

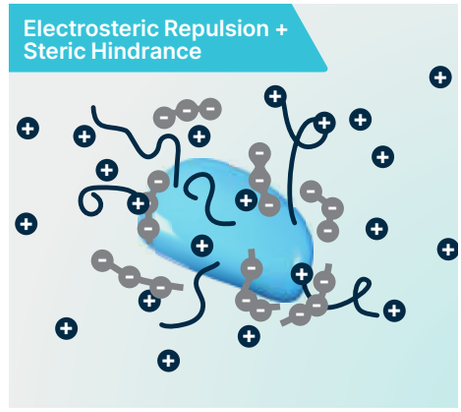
This results in an electrical double layer around each pigment particle. When pigment particles approach each other in the solution, the repulsive forces keep them apart because of their identical charge.



Steric Stabilization

During the dispersion phase, the adsorbed dispersing agent forms a polymer shell around each pigment particle. When pigment particles approach each other, the polymeric shells penetrate one another.

This penetration minimizes the mobility of the polymer chains resulting in a reduction of entropy.
To compensate for this loss of entropy, the pigment particles must increase their distance from one another.



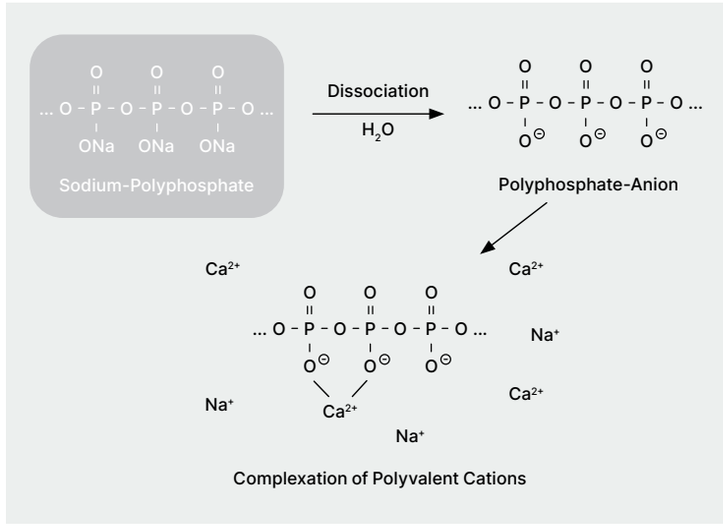
Electrosteric Stabilization

Electrosteric stabilization combines both mechanisms – electrostatic and steric stabilization.

What are the Additional Benefits of Polyphosphates?

In addition to their dispersing power, polyphosphates chelate multivalent cations.

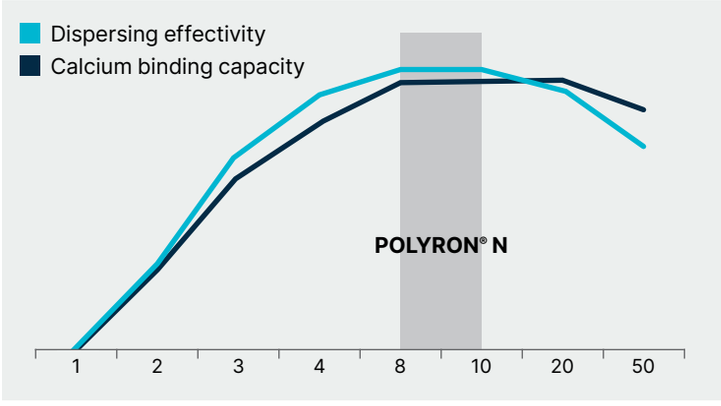
In aqueous systems they dissociate according to the electrostatic stabilization mechanism to form anionic polyions. These anionically charged macromolecules complex multivalent cations such as Ca2+ and therefore also act as water softeners.



Complexation of Polyvalent Cations

Why POLYRON® N?

The dispersing and calcium binding capacity of polyphosphates depends on their chain length. Best results are shown by polyphosphates with a chain length between 6 and 10.



POLYRON® N has an optimized chain length distribution and brings superior effectiveness in terms of both dispersion and water softening.


Dispersing effectiveness of various polyphosphates with $Ca(OH)_2$ in water. From left to right: no dispersing agent, STPP, POLYRON® N, SHMP.

Additional Benefits of Polyacrylates

Compared to polyphosphates, polyacrylates have the advantage of being structurally similar to the binder. Polyacrylate dispersing agents are compatible with many binders, resulting in improved film formation and positive impact to scrub resistance and gloss.

Combination of Polyphosphates and Polyacrylates

Combining polyphosphates and polyacrylates has a complementary effect. Being highly polar, the polyphosphates cover the surface of the pigment quickly and yield a high charge density. Stabilization is 100% electrostatic. Polyacrylates are comparatively less polar. They cover the surface of the pigment with a lower charge density but serve as buffers and adhere at the interface.

Our Portfolio

Products	Supplied As / Chemical Basis	Solid Content (%)	Solvent	pH Value	Low VOC	Interior Paints
Inorganic Dispersing Agents						
POLYRON® N	Powder / Sodium polyphosphate	100		7.6 (1 %)	✔	•
POLYRON® N NEW	Micro agglomerate / Sodium polyphosphate	100		7.5 (1 %)	✔	•
POLYRON® 322	Powder / Sodium polyphosphate	100		6.6% (1%)	✔	•
POLYRON® 322 NEW	Micro agglomerate / Sodium polyphosphate	100		6.6% (1%)	✔	•
Organic Dispersing Agents						
LOPON® P	Liquid / Amine phosphonate	38 - 42	Water	7.0		
LOPON® PL	Liquid / Amine phosphonate + polyacrylate copolymer	48 - 50	Water	8.5		•
LOPON® PO	Liquid / Sodium polycarboxylate	~24	Water	11	✔	•
LOPON® 890	Liquid / Sodium polyacrylate – low molecular weight	44 - 46	Water	8.5		•
LOPON® DA 200	Liquid / Sodium polyacrylate – low molecular weight	42 - 45	Water	7.8	✔	•
LOPON® DA 201	Liquid / Potassium polyacrylate – low molecular weight	40 - 45	Water	7.8	✔	
LOPON® DA 202	Liquid / Ammonium polyacrylate – low molecular weight	38 - 44	Water	7.0	✔	•
LOPON® DA 203	Liquid / Lithium polyacrylate – low molecular weight	33 - 37	Water	8.5	✔	•
LOPON® DA 204	Liquid / Organic amino polyacrylate – low molecular weight	57 - 61	Water	7.5		
LOPON® DA 400	Liquid / Sodium polyacrylate – middle molecular weight	38 - 42	Water	7.8	✔	•
LOPON® DA 401	Liquid / Potassium polyacrylate – middle molecular weight	38 - 43	Water	7.8	✔	
LOPON® DA 402	Liquid / Ammonium polyacrylate – middle molecular weight	36 - 42	Water	7.0	✔	•
LOPON® DA 403	Liquid / Lithium polyacrylate – middle molecular weight	33 - 37	Water	8.5	✔	
LOPON® DA 404	Liquid / Organic amino polyacrylate – middle molecular weight	57 - 61	Water	7.5		
LOPON® 892	Powder / Sodium polyacrylate	100		8.3 (1 %)	✔	•
LOPON® 826	Liquid / Preparation	52 - 54	Water	>13	✔	

Exterior Paints & Plasters	Emulsion Silicate Paints	Silicone Resin Paints	Varnish/ Lacquer	Advantages/Properties	Products
Inorganic Dispersing Agents					
•	•	•		Optimum dispersing and calcium binding properties	**POLYRON® N**
•	•	•		Optimum dispersing and calcium binding properties that contain low dust micro particles which are easier to handle and disperse	**POLYRON® N NEW**
•	•	•		Good dispersing and calcium binding properties that contain low dust micro particles which are easier to handle and disperse	**POLYRON® 322**
•	•	•	•	Good dispersing and calcium binding properties	**POLYRON® 322 NEW**
Organic Dispersing Agents					
•		•		High calcium binding capacity; prevention of efflorescence at colored facade paints	**LOPON® P**
				Good dispersing property, improved color leveling	**LOPON® PL**
•		•	•	Dispersing for glossy paints	**LOPON® PO**
•		•	•	Dispersing for white and colored wall paints	**LOPON® 890**
•		•	•	Dispersing for white and colored wall paints	**LOPON® DA 200**
•	•	•	•	Dispersing for facade paints and mineral paints	**LOPON® DA 201**
•		•	•	Dispersing for interior and exterior paints	**LOPON® DA 202**
	•		•	Dispersing for anti-allergenic and environmentally friendly paints, free of preservatives	**LOPON® DA 203**
•		•	•	Dispersing for white and colored wall paints	**LOPON® DA 204**
•		•		Dispersing for white wall paints	**LOPON® DA 400**
•	•	•		Dispersing for emulsion silicate paints and facade paints	**LOPON® DA 401**
•		•		Dispersing for interior and exterior paints	**LOPON® DA 402**
	•			Dispersing for anti-allergenic and environmentally friendly paints, free of preservatives	**LOPON® DA 403**
•		•	•	Dispersing for white and colored wall paints	**LOPON® DA 404**
				Dispersing for powder systems	**LOPON® 892**
	•			Dispersing for emulsion silicate paints	**LOPON® 826**

Stabilizers & Dispersing Agents for Silicate Emulsion Paints

ICL offers stabilizers, co-stabilizers and dispersing agents specially designed for silicate emulsion paints.

What are Silicate Paints?

Silicate paints offer protection against UV radiation. They are resistant to water and other environmental factors stuch as acids, algae and bacteria.

Silicate paints contain mineral-based binders made from potassium silicate (water glass). The high alkalinity of the binding agent inhibits the growth of mold, fungi and algae, thus making it possible to remove in-can preservatives from the formulation. By intentionally avoiding solvents and plasticizers, silicate paints are not only environmentally friendly, but also ideal for allergy sufferers.

Due to the silification process (a chemical reaction with mineral substrates), silicate paints provide a durable, long-lasting coating. Along with longevity, their high water vapor permeability ensures that moisture is released quickly and unhindered to the outside.

The advantages come with a challenge in handling – as mixing the two component systems is very labor-intensive and requires expert knowledge. As soon as the two components are mixed, the silicification process begins. Therefore, a silicate paint only offers a very small working window, typically 1-2 days.

Stabilizers for Silicate Emulsion Paints

The addition of suitable, organic binders enables the production of stable, ready-to-use emulsion silicate paints.

ICL has developed highly effective additives that prevent the silicate groups in water glass from building a polymeric network during storage and thus prevent the paints from thickening.

With LOPON® ST, LOPON® 827 and LOPON® 828, the viscosity of the paint levels off quickly and remains stable over a long period of time. LOPON® 827 and LOPON® 828 are particularly low in VOC, which makes them ideal for decorative wall paints for indoor living spaces.

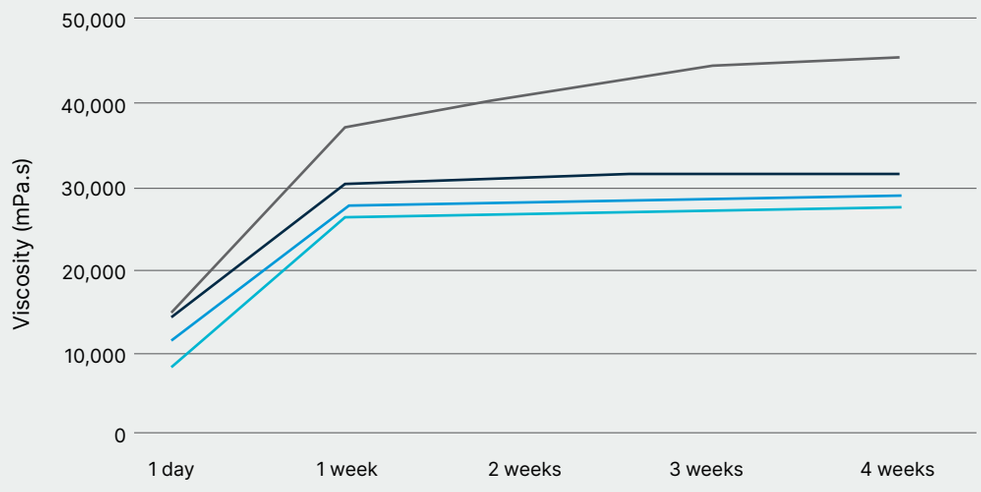
Products	VOC
LOPON® ST	~8%
LOPON® 827	<0.1%
LOPON® 828	<0.1%

Storage stability of silicate emulsion paints using styrene acrylic binder.

With each of our stabilizers, a stable viscosity is reached after a short period of time.

Key:

- No Stabilizer
- LOPON® ST
- LOPON® 827
- LOPON® 828



Co-Stabilizers for Silicate Emulsion Paints

To enhance the performance of silicate emulsion paints, co-stabilizers LOPON® STA and LOPON® STM are recommended. Both co-stabilizers can only be used in combination with LOPON® ST, LOPON® 827 and LOPON® 828.

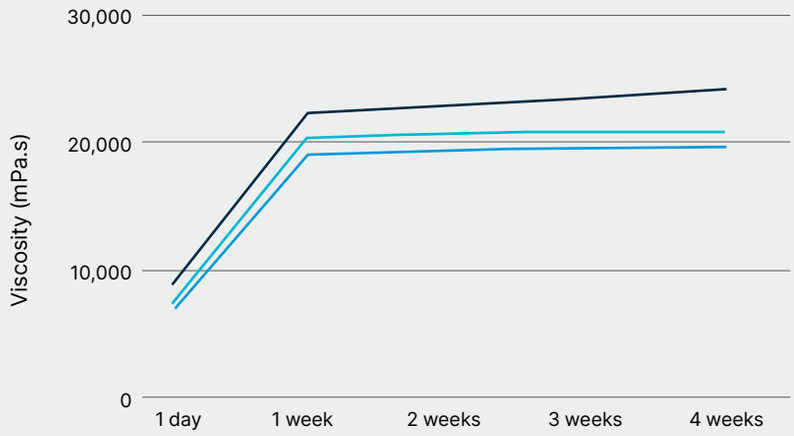
Where conformity to Ecolabel is desired, LOPON® STM is the proper choice as it is EDTA-free. Both LOPON® STA and LOPON® STM add additional stabilization and have a positive influence on leveling behavior.

Storage stability of different silicate emulsion paints with additional co-stabilizers.

By adding LOPON® STA or LOPON® STM the thickening is further suppressed, and an even lower viscosity is obtained.

Key:

- LOPON® ST
- LOPON® ST + LOPON® STA
- LOPON® ST + LOPON® STM

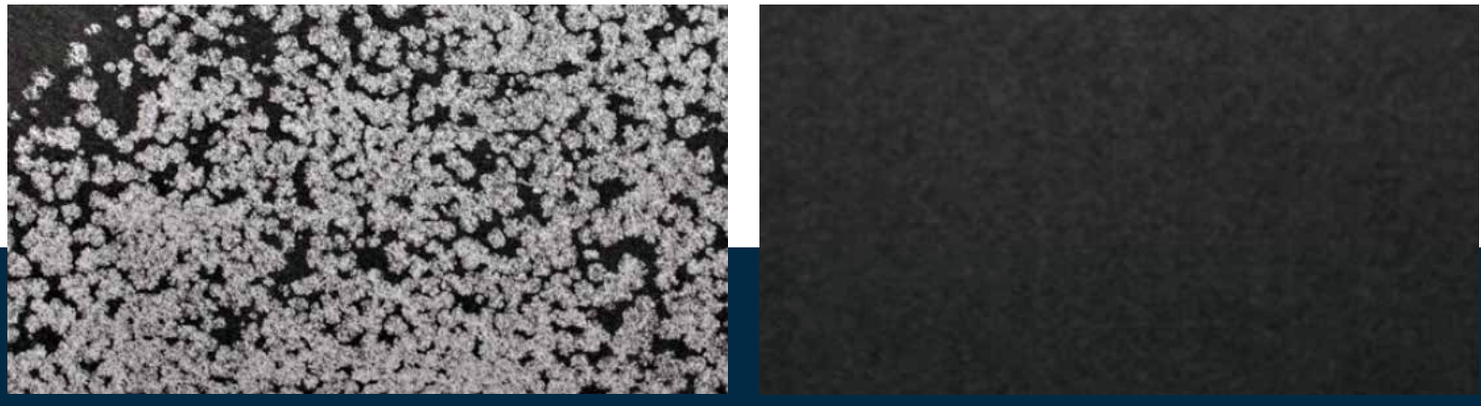


Dispersing Agents for Silicate Emulsion Paints

With LOPON® DA 201, LOPON® DA 401 and LOPON® 826, ICL developed dispersing agents specifically designed for silicate emulsion paints.

This type of ionic dispersing agent contains potassium as cation, meaning no further cations are brought into the system.

More importantly, with potassium polymeric dispersants, no efflorescence will be obtained during the drying process as it can through the formation of sodium carbonate.



During the drying process of silicate emulsion paints, carbonate salts are formed. While sodium carbonate can form white stains (left), potassium carbonate appears colorless (right).

Our Portfolio

Products	Chemical Basis	Solid Content (%)	Solvent	pH Value	Dosage (%)	Low VOC	Ecolabel Conform
Stabilizer for Emulsion Silicate Paints							
LOPON® ST	Quaternary ammonium compound	~20	Water	> 12	0.5 - 1.0	–	–
LOPON® 827	Tertiary ammonium compound	~20	Water	10 - 12	0.5 - 1.0	✔	✔
LOPON® 828	Tertiary ammonium compound	~30	Water	11.5 - 13	0.5 - 1.0	✔	✔
Co-Stabilizer for Emulsion Silicate Paints							
LOPON® STA	Preparation with EDTA	~50	Water	> 13	1.5	–	–
LOPON® STM	Preparation, EDTA-free	~50	Water	> 13	1.5	–	✔
Dispersing Agents for Emulsion Silicate Paints							
LOPON® DA 201	Potassium polyacrylate – low molecular weight	40 - 45	Water	7.8	0.2 - 0.5	✔	✔
LOPON® DA 401	Potassium polyacrylate – middle molecular weight	40 - 45	Water	7.8	0.2 - 0.5	✔	✔
LOPON® 826	Preparation	52 - 54	Water	> 13	0.2 - 0.5	✔	✔

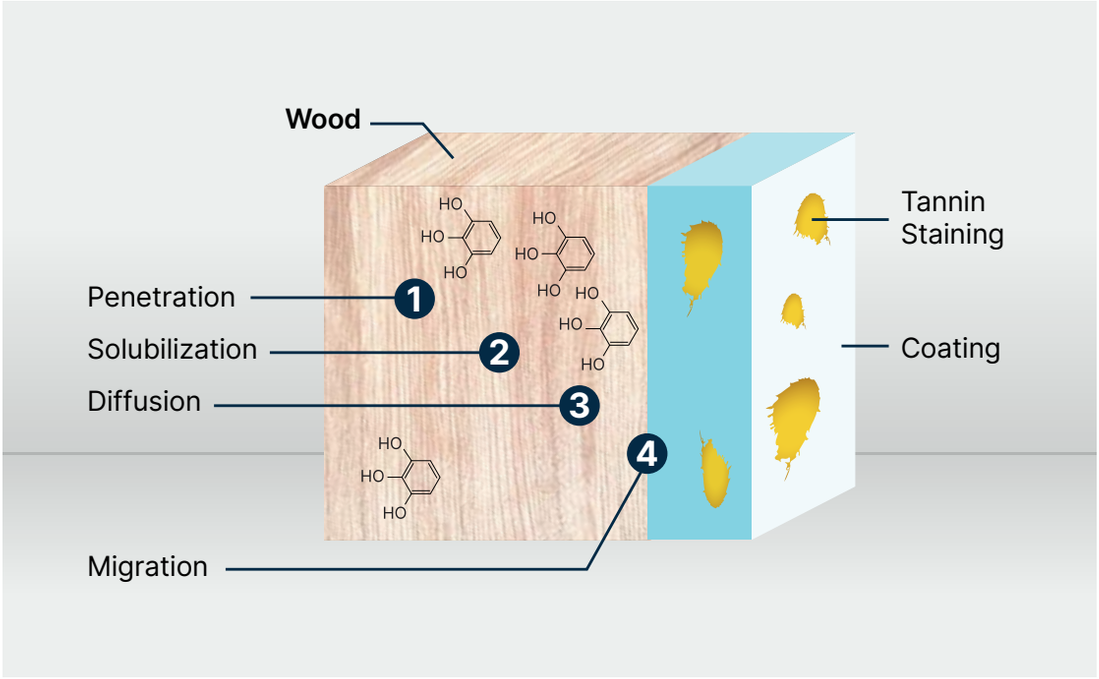
Tannin Stain Inhibitors for Wood Finishes

Stop the migration of soluble tannin stains on painted surfaces using our tannin blocking additives in conjunction with resins for superior results.

What are Tannins and How do They Manifest?

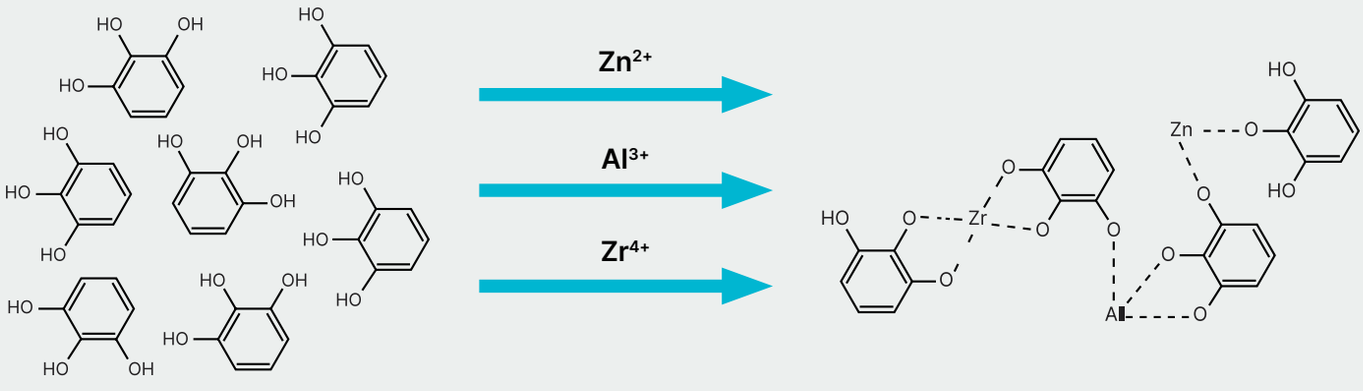
Tannins are high molecular weight, water soluble, poly-phenolic molecules found in many types of wood around the world, including:

- Western Red Cedar
- Redwood
- Oak
- Fir
- Birch
- Willow
- Merbau
- White and Yellow Pine



How do HALOX Tannin Stain Inhibitors Work?

HALOX® has developed several technologies that rely on chelation to combat tannin staining. The chelation process is the reaction of soluble metal cations from tannin stain inhibitive pigments with anionic groups on the phenolic rings present in tannins.



Water Soluble

Insoluble Complex

Our Portfolio

Classification	HALOX® BW-100 Calcium Barium Phosphosilicate	HALOX® XTAIN® A Aluminum Zirconium Phosphosilicate	HALOX® XTAIN® L-44 Stabilized Ammonium Zirconium Complex	HALOX® XTAIN® L-47 Stabilized Zirconium Complex	HALOX® CZ-170 Zinc Ortho Phosphate Complex
pH	7.5	10.0	9.0	7.5	8.1
Oil Absorption	37.1	33.1	N/A	N/A	43.5
Water Solubility (%)	0.17	0.12	100	100	0.02
Density (g/ml)	2.8	3.1	1.26	1.45	3.6
Mean Particle Size (Microns)	5.1	5.8	N/A	N/A	4.3
Appearance	White Powder	White Powder	Clear Liquid	Clear Liquid	White Powder
Recommended Loading Levels	5-10% TFW	1-3% TFW	1-3% TFW	1-3% TFW	5-10% TFW
Water-Based	✔	✔	✔	✔	✔
Solvent-Based	✔				✔
Product Benefits	• Effective in high PVC Alkyd primers • Demonstrates excellent performance	• Effective at very low loading levels • Barium and antimony-free • Contains multivalent cations	• Provides superior performance and good compatibility in water-based coatings systems • Barium and antimony-free • Zinc oxide replacement • Easy to post-add to a coating (1:1 with water)	• Similar performance and compatibility to HALOX® XTAIN® L-44 • Zinc-free • Ammonia-free • Low VOC • No labeling • EU Ecolabel compliant • Easy to post-add to a coating (1:1 with water)	• Contains high levels of zinc compounds that provide dual tannin blocking and corrosion resistance • Barium and antimony-free • Zinc oxide replacement

These redwood panels demonstrate how XTAIN® L-47 blocks tannin stains.

Left Panel: (Top) One coat of paint without XTAIN® L-47; (Bottom): Two coats of paint without XTAIN® L-47.

Right Panel (Top): One coat of paint with XTAIN® L-47; (Bottom): Two coats of paint with XTAIN® L-47.

ICL Test Method (Tannin Stain Characterization)

- Post-add or high speed disperse into latex paint
  - 2% TFW liquid tannin stain inhibitor
  - 5% TFW tannin stain reactive pigment
- Apply first coat to board at desired spread rate (ft^2/gal or m2/L)
- Air dry for 24 hours
- Apply second coat to half of the board at desired spread rate (ft^2/gal or m2/L)
- Air dry for 24 hours
- Colorimetry: Measure CIE L*a*b* values (before testing)
- Expose boards to 90-100% RH, 100°F (38°C) for 16 - 24 hours to accelerate tannin or stain bleeding through the coating
- Air dry for 2 hours
- Colorimetry: Measure CIE L*a*b* values (after testing)
- Quantify degree of staining

Important Formulation Tips

Extender Pigment(s) Used

Certain pigment morphologies can improve the barrier properties of the coating (e.g. platy talc). The alkaline nature of certain pigments can help to buffer the paint (e.g. calcium carbonate).

Coalescent Solvent Used

Ester alcohols and glycols are preferred. Glycol ethers can adversely affect the chelation mechanism.

ICL is one of the world's leading fertilizer and specialty chemicals producers committed to fulfilling humanity's ever-evolving needs. Our major production activities are located in Israel, Europe, the US, South America and China, and are supported by major global marketing and logistics networks.

Our Commitment: Successful relationships begin at the product development planning stage and extend through plant trials and product launch. Customers come to us with challenges, and we are dedicated to providing them with solutions. For manufacturers who rely on quality coatings, ICL offers proven performance, long-term corrosion and tannin stain protection, and protection of the world around us.

Technical Service: Our technical support capabilities allow us to help customers achieve better products. We are committed to building our product portfolio and continually exploring and expanding the frontiers of today's coatings technologies. This includes delivering timely assistance on coating formulation questions, aiding formulators in achieving total system compatibility and identifying an optimum inhibitor package to address individual cost and performance targets. We take the problem, analyze the parameters, work jointly with company product experts and create solutions that exceed customer expectations.

Quality / REACH Statement / Responsible Care: As a responsible international supplier of specialty chemicals, ICL is committed to advancing the principles of sustainability in the industries in which we operate. We incorporate quality, health, safety and environment management systems into all phases of the chemical life cycle. We pledge continuous improvement to provide the highest quality of products while protecting the safety of our people, our business partners, and the environment.

ICL is ISO 9001, ISO 14001:2004 and RC 14001:2014 certified. We are committed to our Responsible Care® initiatives and are consistent with the Responsible Care® code of Product Stewardship. We remain fully engaged in the implementation of the European Union's Registration, Evaluation, Authorization and Restriction of Chemicals legislation (REACH). The impact it will have on the future availability of chemicals is of vital importance for ICL, our customers and the entire global chemical industry.

To learn more, visit: www.halox.com
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Additional Product Lines

HALOX®: An extensive portfolio of organic and inorganic corrosion and flash rust inhibitors, supplemented by tannin stain inhibitors.

LOPON® & POLYRON®: Dispersing agents and stabilizers specially formulated for silicate and biocide-free paints.

TARGON®: Versatile additives for the construction industry.