Laroflex® MP 35

General	is a chlorinated binder that is used for the manufacture of physically drying coatings on iron and steel, non-ferrous metals, mineral substrates as well as road marking paints resistant to hydrolysis.
Key features & benefits	Excellent Corrosion Protection Excellent Solubility
Chemical nature	Co-polymer based on vinyl chloride and vinyl isobutyl ether

Properties

Appearance White powder

Typical characteristics *(should not be interpreted as specifications)*

Viscosity (20% solution in toluene) Shear rate D= 500s^{-1}	35 cps
Density（20 °C）	1.24 g/cm^3
Vicat softening temperature range	48-52°C
K value	35
Chlorine mass fraction	44%

Solubility Soluble in aromatic hydrocarbons, esters, ketones, glycol ethers and acetates.

Compatibility Compatible with alkyd acrylic resins, hydrocarbon resins and cyclohexanone-aldehyde resins.

These typical values should not be interpreted as specifications. Solubility and compatibility should be tested in each individual case.

Application

Laroflex® MP 35 is a binder resistant to hydrolysis. It can be used for anti-corrosion coatings, for coatings on galvanized steel, other non-ferrous metals, concrete, fiber cement, road marking paints, flame-retardant coatings on non-flammable building materials, and marine and container paints.

Laroflex® MP 35 is recommended for applications such as:
- Interior/exterior general industrial metal coating applications
- Interior/exterior plastic component applications
- Interior/exterior concrete coating applications

Laroflex® MP 35 offers the following advantages to both manufacturers and users of coatings:

- Broad choice of solvents, particularly economical blends of aromatic and aliphatic hydrocarbons
- Good compatibility with other coating raw materials
- Good pigment binding capacity even at high solids
- Unrestricted choice of pigments and extenders
- Easy application by all common techniques, no cob-webbing even at high solids
- Thermal stability allows force drying
- Good adhesion on iron, steel, and many unrelated coating systems, good inter-coat adhesion
- Good resistance of properly formulated coatings to aqueous alkalis and acids, salt solutions, to stress from water, humidity changes, low and cyclic Temperatures as well as to chalking and yellowing
- Long lasting corrosion protection even under extreme outdoor conditions

Fields of Application

Industrial corrosion protection
Combinations of equal proportions of Laroflex® MP 35 and air-drying binders have proven effective. Two to three coats of thixotropic high-build coatings are needed to obtain the overall thickness of 200 – 250 µm necessary for effective corrosion protection. Depending on the make-up of the systems and the quality of pigments and extenders, the PVC is 30 – 40%. Lower pigmented gloss coats may be used for topcoats.

Marine coatings, underwater corrosion protection
Coatings having to withstand sea or river water can be formulated with Laroflex® MP 35 and non-saponifiable hydrophobic plasticizers. Combinations with tar and/or hydrocarbon resins can also be used; a polyamine-cured epoxy resin may replace some of the Laroflex® MP 35 proportion. PVC of 35 – 40% is ideal for high-build coatings. These adhere extremely well to sandblasted steel, commercial shop primers, and other unrelated coating systems. Laroflex® MP 35 being resistant to alkalis allows formulating underwater coatings that give excellent performance in cathodic protection and on zinc/ethyl silicate primers. Since high-build coatings based on Laroflex® MP 35 can be sprayed outstandingly well, only two or three spray coats are needed to achieve perfect corrosion protection.

Laroflex® MP 35 can also be used as a binder in antifouling paints. Hydrophilic co-binders like Lutonal® M 40 approx. 70% in ethanol and/or rosin ensure that the antifouling agent is released at a uniform rate.

Machinery, automotive and container finishes
Suitable coatings can be formulated from Laroflex® MP 35 and roughly equal amounts of air-drying binder.

Coatings on galvanized steel and aluminum
Air-drying binders should be avoided in primers and topcoats on aluminum or, in particular, galvanized steel. Coatings based on such binders could flake or peel off after prolonged exposure to moisture and fluctuating temperatures. Addition of special hard resins, talc, and/or micaceous iron oxide allows coats with extremely good adhesion.

Coatings for mineral substrates
Laroflex® MP 35 and alkali-resistant plasticizers are used to obtain coatings for mineral substrates. The pigmentation depends on the desired degree of gloss.

Architectural finishes with adequate permeability to water vapor should have PVC of 50 – 60%.

Combinations of Laroflex® MP 35, polyamine-cured epoxy resins, and tar are used for underwater and underground mineral substrate.

The PVC for swimming pool coatings should be at least 50% in order to avoid blisters forming from osmosis, even in high-build coats.

Since Laroflex® MP 35 is resistant to hydrolysis; it is a suitable binder for sealing and impregnating primers for stabilizing mineral substrates and reliably ensuring that subsequent coats of architectural finishes adhere well. Depending on the substrate's actual porosity, the binder concentration in these coatings should be 8 – 15%.

Road marking paints
Road marking paints can be formulated from Laroflex® MP 35 alone or combined with air-drying binders. Note, however, that air-drying binders will reduce the life of road markings.

Flame-retardant coatings
Laroflex® MP 35 is suitable for flame-retardant coatings on non-flammable substrates.

Other fields of applications
- Indoor/outdoor coatings on wood and duroplastics
- Impregnating and coating of paper, cardboard, and textiles
- Effect paints such as wrinkle, hammer, and crackle finishes

Differences in Properties

Laroflex® MP 35 and other Laroflex® grades mainly differ in their viscosities and the rheology of their solutions. Viscosity range differences relate to 20% solutions in toluene at 23°C (73°F). The less polar solvent, the greater the differences in viscosity.

Solvent Selection

Aromatic hydrocarbons or their blends with esters and glycol ether acetates are suitable solvents; aliphatic hydrocarbons and/or alcohols are used as diluents.

Ketones, in general, are less suited since they are retained by vinyl chloride polymers longer than other solvents with equal volatility, resulting in slower drying coatings.

The diluent fraction of the solvent blend mainly depends on the solvency of the true solvent. Depending on the type of solvent and if Laroflex® MP 45 is used, the diluent proportion must be reduced by up to 40% as compared with Laroflex® MP 35. The diluent proportion can be increased if other raw materials in the formulation are readily compatible with Laroflex® MP 35 and soluble in aliphatic hydrocarbons or alcohols. Examples are hard resins, many alkyd resins, and high aromatic grades of tar, soft resins, and plasticizers present in greater proportions.

Aromatic hydrocarbons or blends or aromatic and aliphatic hydrocarbons are best suitable for coatings that are to be exposed to water very soon after application.

High volatile solvents and/or diluents produce faster drying coatings. Coatings containing a blend of xylene and butanol instead of xylene alone will dry faster. Polymers release esters more easily than ketones and aromatic hydrocarbons of the same volatility. The most favorable low volatile solvent is ethoxy propyl acetate. Note that the solvent retention also depends on the other constituents of the recipe.

Gloss and flow of coatings can be improved by adding high boiling solvents such as ethoxy propyl acetate. High proportions of low volatile diluents, however, may result in precipitating of binder constituents, impairing both gloss and mechanical properties of the coatings.

Greater proportions (20 – 25%) of high boiling solvents such as ethoxy propyl acetate or blends of aromatic hydrocarbons with a boiling range of 150 – 190°C (302 – 374°F) reduce blistering which may occur in airless sprayed coatings, particularly those with a low pigment content.

High proportions of diluent in the solvent blend reduce the risk of previous coats pulling up.

Clear or almost clear solutions can be obtained in aromatic hydrocarbons such as toluene, xylene as well as in chlorinated hydrocarbons, anone, and tetrahydrofuran. Solutions with other solvents may be somewhat cloudy but will not adversely influence hardness and homogeneity of the film, provided the solution dries to form a clear film.

Viscosity Behavior of the Solution

The viscosity of Laroflex® MP 35 solutions not only depends on the concentration, the composition of *Solution* solvent blend and its temperature, but also on the conditions under which they are prepared.

The higher the temperature as well as duration and extent of shear forces, the lower the viscosity of the solution will be after cooling down to room temperature. After extended storage, the viscosity may increase again, an effect that is more pronounced the less the solvating power and the affinity between solvents and polymer.

Un-pigmented concentrated solutions of Laroflex® MP 35 in xylene may tend to gel – often only months after they have been prepared and without undergoing a gradual increase in viscosity. Adding ketones and esters reduces the tendency to gel, in particular if the binder concentration is high. By adding 10 – 20% of an alcohol to the solvent blend, gelling generally can be suppressed completely. Likewise, no gelling has been observed yet in formulations containing blends of high boiling aromatic hydrocarbons. The gel structure can be removed by intensive stirring, heating, or by milling with pigments.

This rheological behavior is scarcely noticed in Laroflex® MP 35 and not at all in Laroflex® MP 15 and Laroflex® MP 25.

Typical Solvent Blends

Coatings based on Laroflex® MP 35, without significant amounts of co-binders; flash point > 21°C

Solvent%	Solvent
100	Xylene
75 25	Xylene Aromatic hydrocarbons 145 – 185°C
85 15	Xylene White spirit 155 – 185°C
50 20 30	Xylene Aromatic hydrocarbons 145 – 185°C White spirit 155 – 185°C
80 10 10	Xylene isobutanol White spirit 155 – 185°C
70 4 13 13	Xylene isobutanol Aromatic hydrocarbons 145 – 185°C White spirit 155 – 185°C
70 10 5 15	Xylene isobutanol Ethoxypropyl acetate White spirit 155 – 185°C
65 5 5 25	Xylene Aromatic hydrocarbons 145 – 185°C Ethoxypropyl acetate White spirit 155 – 185°C

50	Xylene
35	n-butyl acetate
15	isobutanol

Coatings based on 1:1 combination of Laroflex® MP 35 and alkyd resins; flash point > 21°C

Solvent%	Solvent
70	Xylene
30	White spirit 155 – 185°C
70	Xylene
10	isobutanol
20	White spirit 155 – 185°C
50	Xylene
15	Aromatic hydrocarbons 145 – 185°C
35	White spirit 155 – 185°C
60	Xylene
5	Ethoxypropyl acetate
35	White spirit 155 – 185°C
60	Xylene
5	isobutanol
5	Aromatic hydrocarbons 145 – 185°C
30	White spirit 155 – 185°C
40	Xylene
10	isobutanol
10	Ethoxypropyl acetate
40	White spirit 155 – 185°C

Plasticizing

Since Laroflex® MP 35 is internally plasticized, coatings based on it are flexible and adhere well. Proportions of additional plasticizers can be kept comparatively low. In general, mass proportions of 10 – 25% are sufficient. Plasticizers – mostly low viscous ones – with good solvating power can be added in low proportions of 5 – 15%, soft resins such as Acronal® 4 F or polyester resins in larger proportions of 15 – 30%.

Too much plasticizer will adversely affect the hardness and thermostability of the dried coatings and can promote shrinkage, alligatoring, and soiling of outdoor coatings.

Coatings that have to withstand chemicals and salt water are formulated with plasticizers resistant to saponification, such as chlorinated paraffin waxes. Saponifiable plasticizers (phthalates, adulates, or phosphates) can be used when resistance to chemicals is less important. Plastigen® G is the plasticizer of choice for coatings on alkaline substrates (concrete) and for topcoats extraordinarily resistant to yellowing and chalking. Acronal® 4 F and its mixtures with phthalates are particularly suitable to increase adhesion to aluminum, its alloys, and other difficult substrates.

The flexibility and adhesion of films based on Laroflex® MP 35 at low temperatures can be increased by using low viscosity, high efficiency plasticizers such as Palatinol® 911 and Plastomoll® DOA. Plasticizers that are insoluble in aliphatic hydrocarbons such as Palamoll® 646, least impair the resistance of films based on Laroflex® MP 35 to lubricants and fuel oils.

Modification by other resins

Hard resins

Coating Raw Materials Solids content, gloss, and adhesion can be increased by adding hard resins. Hard resins that are compatible with Laroflex® MP 35 (Laropal® A 81) are often able to overcome any slight incompatibility on the part of other materials present in the formulation. Laropal® A 81 increases the diluent tolerance

of coatings based on Laroflex® MP 35 for aliphatic hydrocarbons.

Non-saponifiable hard resins are recommended for coatings resistant to chemicals and water. For non-pale coatings or when less emphasis is put on resistance to light and weathering, coumarone, indene, or hydrocarbon resins can be used. Saponifiable hard resins such as maleate or modified phenolic resins can be used if good resistance to chemicals is not required.

Air-drying binders
Air-drying binders reduce the thermoplasticity of Laroflex® MP 35. Combined with a predominant proportion of air-drying binder, Laroflex® MP 35 improves the coating's surface drying and thus its initial hardness resistance to chemicals and water, and outdoor performance, particularly in industrial environments.

If resistance to chemicals and water is essential, the proportion of Laroflex® MP 35 should be at least the same as that of the air-drying binder.

The most compatible alkyd resins are those containing about 45 – 55% drying or 25 – 50% semi-drying oils. The lower acid value and average molecular mass of an alkyd resin, the better compatibility, which should be checked in each individual case.

In combinations of Laroflex® MP 35 with alkyd resins, the amount of white spirit in the solvent blend can often be increased well above the proportion normally used in coatings solely containing Laroflex® MP 35.

Other compatible binders are bodied oils with modified phenolic resins, various urethane/alkyd resins, and some epoxy resins modified by oil fatty acids.

In many cases, air-drying binders can be made perfectly compatible with Laroflex® MP 35 by including other compatible components such as Laropal® A 81 or plasticizers.

If a hybrid binder coating is to be over-coated, care must be taken to ensure that oxidative drying has progressed so far that there is no risk of "pulling up" caused by excessive softening of the first coat by the solvent phase of the second coat. The tendency of pulling up can be reduced by increasing the proportion of Laroflex® MP 35. Equally, the solvent can be diluted with more white spirit. Solvent blends whose proportion of diluents increases gradually and only to a limited extent perform best. An example is a blend consisting of equal parts of xylene and white spirit.

Bituminous raw materials
Laroflex® MP 35 can be combined with many tars, pitch, bitumens, and asphalts. Bitumens with a low softening point are generally more compatible than those with a higher one. The components are mixed easiest in the form of solvents. Laroflex® MP 35 increases hardness, toughness, and resistance to weathering of tar or bitumen coatings. The proportion of the components depends on the desired properties.

Other binder types
Further, Laroflex® MP 35 is compatible with urea (Plastopal® grades) and melamine (Luwipal® grades) formaldehyde resins, or volatile liquid aromatic or aliphatic epoxy resins. Non-crosslinking poly (meth)acrylates and their co-polymers increase the coatings' film hardness and gloss rete

Pigmentation

Any conventional anti-corrosion pigment can be used in primers based on Laroflex® MP 35, as chemical reactions between the two are unlikely. Based on our current experience, the binder, if stored under normal conditions, does not need to be stabilized against attack by active metal powders such as aluminum bronze. If there are any doubts, small proportions of zinc oxide or epoxy compounds may be added.

High proportions of flake extenders or pigments in the pigment blend (talc, micaceous iron oxide, or aluminum bronze) improve the coatings' adhesion and impermeability to water vapor. They also facilitate airless spraying of thick coats.

Pigments and extenders resistant to weathering should be preferred for topcoats. Some extenders, including a few natural magnesium, aluminum, or potassium-aluminum silicates as well as barytes, contain impurities, which may cause yellowing of white topcoats. A small amount of zinc white generally prevents such discoloration.

Pigments resistant to acids and alkalis must be used for coatings resistant to chemicals.

Effective corrosion protection is achieved with coatings having PVC of 16 – 35%. For coatings particularly resistant to chemicals, a lower PVC range of 16 – 22% should be preferred. Well-formulated high-build finishes, on the other hand, can be pigmented up to about 35%. In general, the pigmentation level should be limited to 90% of the critical PVC.

Stabilizers

Laroflex® MP 35 is sufficiently stable to dehydrochlorination. Thus, no stabilizers are normally needed. Exceptions are coatings that are either exposed to heat or un-pigmented or, in some cases of coatings based on transparent pigments, exposed to UV radiation for extended periods.

Note that chlorinated binders are less stable if moisture or some chemicals are present.

Generally, coating systems based on Laroflex® MP 35 should not be exposed to heat above 70 – 80°C for prolonged periods.

Heat stabilizers should be added for force drying at temperatures of up to 130°C. Adding 2% of Mark[1] 17 M and 3% Drapex[1] 39 (respective to Laroflex® MP 35), provides adequate stabilization.

Dispersants, Anti-settling Agents, Thixotropes

Some dispersants or anti-settling agents, particularly in higher proportions, may act with chlorinated Agents, Thixotropes binders to cause corrosion of metal containers and thus reduce the coatings' anti-corrosion protection.
Trials are recommended.

Further, suitable thickeners and anti-settling agents consist of an approximately 10% gel paste made from Bentone[2] 38 or 39 and Anti-Terra[3] U in aromatic solvents.

Thixotropes derived from hydrogenated castor oil can be used for high-build coatings. Manufacturer's instructions on their use should be observed.

Processing

Production of coatings
Laroflex® MP 35 dissolves very rapidly even without heating. Caking is avoided by immediately and uniformly distributing the powder: thoroughly stirring, it is slowly added to the diluent (aliphatic hydrocarbons, alcohols). Proportions of Laroflex® MP 35 powder and diluent should be approximately equal. Then, solvent(s) and other diluents are added while stirring. Subsequently, plasticizers and combination resins may be added.

Solutions of Laroflex® MP 35 that contain plasticizers and possible other binder components are used to paste and mill pigments. If alkyd resin co-binders are present in the formulation, these can be used to prepare the pigment paste.

Application techniques
Coatings based on Laroflex® MP 35 are suitable for all common application techniques such as high-pressure spraying, airless spraying, hot spraying, brushing, dipping, curtain or roller coating or paint roller.

No cob-webbing occurs during the application of coatings based on Laroflex® MP 35 even at high solids or if they contain highly volatile solvents.

Blistering and pore formation during airless spraying can be avoided by keeping the proportion of highly volatile esters such as ethyl acetate and butyl acetate in the solvent blend low. The inclusion of high boiling aromatic hydrocarbons or ethoxy propyl acetate is advantageous. Good results are also obtained with defoamers, especially in paints with low PVC.

1 Mark and Drapex are registered trademarks of Galata Chemicals LLC.
2 Bentone is a registered trademark of Elementis Specialties
3 Anti-Terra is a registered trademark of BYK-Chemie.

Drying

Coatings based on Laroflex® MP 35 surface-dry rapidly but require some length of time to through-dry since Laroflex® MP 35, like all polymers, tend to hold back residual solvent. Consequently, a drying time of one or two days should be left between coats to prevent pulling up. Coatings to be exposed to water or liquid chemicals must be allowed to through-dry thoroughly. In this case, polar solvents should be avoided as any residual solvent could absorb large amounts of water and cause swelling.

Drying time can be reduced by choosing suitable solvent blends, reducing the plasticizer proportion, higher PVC, or adding voluminous extenders or diatomite. Excessive quantities of these extenders and inadequate pigment dispersion can lead to porous coatings with greater permeability to water vapor.

For further detailed application information please contact our Technical Support Department.

Safety
When handling this product, please comply with the advice and information given in the safety data sheet and observe protective and workplace hygiene measures adequate for handling chemicals.

Note
The data contained in this publication are based on our current knowledge and experience. In view of the many factors that may affect processing and application of our product, these data do not relieve processors from carrying out their own investigations and tests; neither do these data imply any guarantee of certain properties, nor the suitability of the product for a specific purpose. Any descriptions, drawings, photographs, data, proportions, weights, etc. given herein may change without prior information and do not constitute the agreed contractual quality of the product. The agreed contractual quality of the product results exclusively from the statements made in the product specification. It is the responsibility of the recipient of our product to ensure that any proprietary rights and existing laws and legislation are observed.

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