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1 Adhesives

Ultra-fine coated SOCAL® and WINNOFIL® qualities are used in PVC and acrylic plastisols, silicone, silane terminated polymer, polyurethane and polysulphide sealants for the automotive, construction, aerospace, appliances and other industries. They will disperse readily into the sealant mix and will enable to control and optimize both pre-cure rheological properties as well as tensile properties of the cured sealant. This must be achievable while maintaining acceptable pot life and cure rate and obtaining good adhesion to the substrates in question. Finally this contribution of the PCC must be cost-effective.



In order to be able to process plastisols and sealants by means of coating, dipping, extrusion or other processes, the desired flow properties have to be achieved. Those rheological requirements can be achieved thanks to small particle size, the morphology and the amount of surface coating of ultra-fine SOCAL® and WINNOFIL® grades.



Ultra-fine coated SOCAL® and WINNOFIL® qualities are used in PVC and acrylic plastisol, silicone, silane terminated polymers, polyurethane and polysulphide sealants for the automotive, construction, aerospace, appliances and other industries.

1.1 PVC and Acrylic Plastisols: Plastisols are widely used in the automotive industry for underbody coating and seam or gap filling. For the last two decades PVC plastisols have dominated but acrylic plastisols are now also being used.

SOCAL® and WINNOFIL® play a major role in providing the time-stable rheology required and has a secondary benefit in its ability to remove HCl formed by any partial decomposition of the plastisols.

The well-controlled crystal properties (BET surface area and agglomerate size distribution) and surface coating of SOCAL® and WINNOFIL® coated PCC results in:

- Easy dispersion into the formulation
- Excellent balance of anti-slump and extrusion properties
- Good viscosity stability with time





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- High yield value and low high-shear viscosity (pseudo-plasticity)
- Fast recovery from high shear application (thixotropy)

1.2 Silicone: Silicone sealants are used in glass sealing, sanitary and industrial applications.

SOCAL® and WINNOFIL® are used in silicone sealants in the construction, sanitary, DIY and industrial sectors where high quality seals with high Joint Movement Tolerance (JMT) are required. Solvay's coated PCC provides:

- excellent rheological properties
- stability of rheological over time
- low temperature gunnability
- excellent long-term adhesion
- excellent post-cure physical properties
- movement capability

1.3 Silane terminated Polymers: Silane terminated sealants are based on silyl terminated polymers like polyethers (MS-Polymer), polyurethane (SPUR) and are very versatile. SOCAL® and WINNOFIL® coated ultrafine PCCs help to modify and control the pre-cure rheology of the sealant and enable good tensile properties to be obtained.

Silane terminated polymers cover a wide range of hybrid polymers, which include Silyl-terminated Polyethers ("MS" polymers), Silyl-terminated Polyurethanes and Silyl-terminated Polyisobutylene (SiPiB).

Competitive strongpoints are their environmental friendliness, adhesion to a range of substrates, paintability and stain resistance. Their deterioration in UV rules out glazing application but otherwise Silane terminated Polymer are used in a wide range of applications, especially construction and industrial assembly. In some situations the same silane terminated polymer formulation can be used as both an adhesive and a gap-filling sealant.

SOCAL® and WINNOFIL® coated ultrafine PCCs help to modify and control the pre-cure rheology of the sealant and enable good tensile properties to be obtained. As with silicone sealants the PCC is often the only or dominant mineral used.

Both 1-part and 2-part sealants and adhesives are available. For 1 part Silane terminated polymer, SOCAL® and WINNOFIL® PCC can easily be pre-dried or used with low content of moisture scavenger to obtain optimal properties.

1.4 Polyurethane Sealants: Polyurethane based sealants are characterized by a wide range of hardness and flexibility when fast cure is required.



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SOCAL® and WINNOFIL® coated PCC are used in 1- and 2-part systems. For 1 part Silane terminated polymer, SOCAL® and WINNOFIL® PCC can easily be pre-dried or used with low content of moisture scavenger to obtain optimal properties.

1.5 Polysulfide Sealants: Polysulfide polymer based sealants are mainly used for insulating glass, joint sealing in construction and civil engineering as well as aerospace applications - often in cases where chemical resistance is required.

SOCAL® and WINNOFIL® are used as a rheology modifier in polysulfide and polythioether sealants for the construction, aerospace, glazing, assembly and automotive industry.

Polysulfide and polythioether sealants are available in both 1- and 2-part systems. They have excellent resistance to fuel, ozone and weathering together with excellent adhesion properties.

SOCAL® and WINNOFIL® coated PCCs offer easy dispersion into the formulation, highly effective pre-cure rheology modification and control for good viscosity stability, slump and extrusion rate. The ultrafine particles and the surface treatment enable low modulus products to be formulated.

1.6 Rubber/Preformed tapes: Hydrocarbon rubber-based sealants can be formulated as hot melts solvent-release or preformed tapes using polybutenes, butyl rubber or polyisobutylene.

Hydrocarbon rubber-based sealants can be formulated as hot melts, solvent-release or preformed tapes using polybutenes, butyl rubber or polyisobutylene. Butyl hot melts are used as edge sealants in insulated glass applications and the tapes are used in assembly and construction.

SOCAL® and WINNOFIL® coated ultrafine PCCs disperse readily into these materials and help to provide the required rheological properties to the compounded materials.



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2 Healthcare & Food

Our SOCAL® grades are widely used in pharmaceutical, cosmetic and food applications.

In pharmaceuticals they are working either as active principle (API) for their calcium content or as excipients in galenic preparations. In cosmetics, they are predominantly used for their thickening effect, low abrasivity, polishing qualities and alkaline pH. In food application they are an appropriate calcium source but also an effective anti-caking or deacidifying agents.

2.1 Food: in food applications SOCAL® grades are an appropriate calcium source but also an effective anti-caking or deacidifying agents.

The high purity and physiological safety of the SOCAL® grades make them suitable as a Calcium source in foodstuffs, vitamin tablets or beverages.

Besides, with their specific surface and associated high level of water absorption, SOCAL® grades are also used as anti-caking agents : for example, added to both rock salt and vacuum salt in the production of industrial and table salts.

Combining the high specific surface and their basic pH value, SOCAL® grades are used as deacidifying agents in wine production, where acid regulation is necessary to achieve a fully developed wine from musts with a high acid content.

2.2 Personal Care: in cosmetics, SOCAL® grades are predominantly used for their thickening effect, low abrasivity, polishing qualities and alkaline pH.

In the cosmetic industry, SOCAL® grades are widely used for their thickening effect, low abrasivity, polishing properties and alkaline pH, as well as their tendency to react with mono fluoro-phosphate salts as a caries inhibitor.

In toothpastes SOCAL® grades are predominantly used for their thickening effect and polishing effects with low abrasiveness, which is giving a good balance between polishing and cleaning effect.

The Socal grades show Mohs hardness of 3, which makes them a softer mineral than most alternative fillers used in toothpaste applications.

The high purity of the SOCAL® grades guarantees a high brightness of the toothpaste. The high specific surface and associated good water absorption property of SOCAL® make it an excellent functional filling agent for toothpaste.

2.3 Pharmaceuticals: in pharmaceuticals SOCAL® grades are working either as active principle for their calcium content or as excipients in galenic preparations.

The high level of flowability of our pharmaceutical grades SOCAL® make them a functional filling agent in galenic preparations and in pharmaceutical products like



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effervescent tablets.

The basic pH value and rapid reaction with excess acid makes it suitable as a neutralizing or buffering agent.

In accordance with legal requirements pharmaceutical SOCAL® grades are used as filtration aids for foodstuffs and pharmaceutical preparations.

The high speed of reaction of carbonates in presence of acids helps in the dissolution of PCC in effervescent tablets.



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3 Paint

SOCAL® enables to increase the hiding power, the degree of brightness as well as the scrub and crack resistance of paints through better packing density. Coated SOCAL® and WINNOFIL® grades enhance also hydrophobic and thixotropic properties of solvent based paints.



The remarkable features of modern decorative coatings offer a wide variety of paints with excellent optical and mechanical properties and easy handling. To achieve this, the paint producer needs high quality raw materials. The functional minerals SOCAL® and WINNOFIL® help to perform high quality standards.

The permanent quality control of the products and the raw materials ensure constant high level quality.



High brightness and fineness, as well as the crystal shape and the structure, of SOCAL® are the keys to improve:

- Dry and wet hiding power
- Dry and wet brightness
- Low sheen in Matt paints
- Scrub resistance and washability
- Application behavior

The coated precipitated calcium carbonate grades SOCAL® and WINNOFIL® are ultrafine products with a high surface area. In solvent based systems they control the rheology and the thixotropic behavior.

3.1 Solvent and Water Based Paints: SOCAL®, as a functional mineral, improves the optical and mechanical properties of interior and exterior paints either water or solvent based. Moreover, SOCAL® enables to optimize the use of Titanium dioxide.



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Typical formulations of water-based emulsion paints and solvent-based paints

Emulsion paint	TiO ₂ (wt.-%)	Extender (wt.-%) incl. SOCAL	SOCAL P2 SOCAL P3 (wt.-%) *	Binder (50% solid) (wt.-%)	PVC (%)	Density (g/cm ³)
Matt indoor paints						
Wall paints, abrasion class 4 to 3 acc. EN 13300	2 – 4	56 – 62	8 – 18	4 – 8	80 – 92	1.6
Wall paints, abrasion class 3 acc. EN 13300	3 – 8	52 – 56	10 – 24	9 – 12	78 – 83	1.5
Wall paints, abrasion class 2 to 1 acc. EN 13300	8 – 12	45 – 52	10 – 20	10 – 16	74 – 76	1.5
One-coat paints, abrasion class 3 to 1 acc. EN 13300	10 – 20	22 – 48	8 – 18	10 – 18	62 – 72	1.5
Outdoor paints, matt						
Two-coat	15 – 20	20 – 35	8 – 12	18 – 32	45 – 70	1.5
One-coat	20 – 25	15 – 25	↓	25 – 30	45 – 60	1.4
Two-coat with solvent	15 – 20	20 – 35	↓	10 – 15	45 – 60	1.5
Elastic system	20 – 25	15 – 25	↓	40 – 50	35 – 45	1.4
Filling paints	10 – 15	40 – 50	↓	20 – 30	50 – 65	1.5
Facade plastic	5 – 10	45 – 55	↓	20 – 30	55 – 70	1.6
Silicate paints (DIN 18 363)	8 – 12	40 – 50	↓	<10	> 78	1.5
Siloxane paints	8 – 12	40 – 50	8 – 12	8 – 12	80 – 85	1.5
Glossy paints						
Satin matt <) 85° > 10 %	12 – 15	20 – 30	8 – 12	35 – 40	38 – 46	1,4
Medium gloss <) 60° < 60 %	↓	↓	↓	↓	↓	↓
Glossy <) 60° > 60 %	25	0 – 5	0 – 5	60	18 – 22	1.2
* Preferred quantities for SOCAL P2 and P3: 10–20 wt.-% for indoor paints; up to 10 wt.-% for outdoor paints; <10 wt.-% for glossy paints						

Paints are always a result of an optimization of the used raw materials. It is the same for the required quantity of SOCAL®.

Solvay can help you optimize your product. Our application service can assist you in finding your individual solution.



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4 Paper

SOCAL® grades are used in papermaking as functional minerals to confer opacity, brightness, bulk and porosity, to achieve significant savings on pulp and pigment. In coating applications, our grades provide high whiteness and opacity with enhanced printability.



The most significant progress in the paper industry during the last twenty years has undoubtedly been the move from acid to neutral sizing. This trend has encouraged the use of SOCAL® as a filling and coating additive to obtain very high quality paper at a reasonable price, replacing kaolin and titanium dioxide.

4.1 Coating: SOCAL® is also widely used in paper coating (magazine paper, thermosensitive paper among others) to achieve good printability with high optical performance.

4.1.1 SOCAL® offers:

- High Opacity

The fineness of SOCAL® supports dispersion of coating pigments to achieve maximum light scattering for increased coverage of the base paper. This improves pigment efficiency.

- High Whiteness

SOCAL® provides high whiteness and brightness due to its high purity and fineness resulting from the advanced precipitation process.

- Printability

The micro-aggregate structure of SOCAL® resulting from the controlled precipitation process improves the porosity of the substrate providing enhanced ink reception.

4.1.2 Typical paper uses of our SOCAL grades:

Thanks to these properties, SOCAL® is used in LWC papers, carbonless and thermosensitive papers, and ink jet papers.



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4.2 Filling: Specific SOCAL® grades, used as functional fillers in paper pulp, make it possible to significantly increase whiteness, opacity, porosity and bulk. They also improve the ink receptivity of the paper. SOCAL® is widely used in fine and printing / writing papers.

4.2.1 As a functional filler, SOCAL® offers:

- High Opacity

SOCAL® improves the opacity of papers by increasing the light scattering coefficient of the filled paper by controlling

- the specific crystal shape (calcitic scalenohedral)
- the particular and well defined dimensions of the single crystal to values below 0.3 microns

Tailored aggregation of these primary particles leads to a regular rosette shape with a defined particle size distribution and D50 by granulometry of 1-2 microns providing high internal porosity.

The high level of opacity allows to reduce the amount of titanium dioxide or to have a high level of opacity at a limited content of SOCAL®.

- High Whiteness and Brightness

SOCAL® provides high whiteness and brightness due to its high purity and fineness resulting from the advanced precipitation process.

This allows the complete or partial replacement of expansive pigments like titanium dioxide.

- High Porosity and Bulk

SOCAL® influences paper porosity thanks to the well defined shape and dimension of the micro-aggregates. Porosity and bulk of the paper can be increased a lot.

4.2.2 Typical paper uses of our SOCAL grades:

Thanks to these properties, SOCAL® is used in fine papers like bible paper (SOCAL® allows low transvision with high whiteness), in cigarette papers (high optical properties associated with enhanced porosity) or in photocopy/laser/ink jet papers (high optical performance and bulk).



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5 Plastics & Rubber

Specially coated grades of SOCAL® and WINNOFIL® reduce porosity. Fineness and dispersibility of SOCAL® and WINNOFIL® unite to create high integrity surfaces, which are resistant to ageing and attack from natural elements in the environment.



Ultrafine coated SOCAL® and WINNOFIL® are surface treated precipitated calcium carbonates specifically designed for use in rigid and liquid polymers, natural and synthetic elastomers.

In rigid PVC they function as cost effective processing aids and also provide valuable improvements in final mechanical properties. Surface finish and weatherability are also enhanced through their use. In flexible PVC cables, their inclusion can significantly limit acid gas release on combustion.

In natural and synthetic elastomers their use allows improvements in tear and tensile properties beyond that possible with standard extenders.

Because of their high specific surface area and controlled morphology, they act as effective nucleating agents in rigid foam systems and anti compaction additives for improving the handling of problem powders.

High whiteness and positive effect on rheology are of benefit in liquid resin systems.

5.1 Cables: Coated ultrafine precipitated calcium carbonate (CPCC) improves the processing behavior in cables formulations.

Coated ultrafine precipitated calcium carbonate (CPCC) improves the processing behavior in cables formulations.

Benefits using CPCC in plasticised PVC :

- High surface gloss
- Smooth surface finish and white scratch marking resistance
- Resistance to white flex marking
- Efficient HCl acid gas absorption



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CPCC is used in both insulation and cable sheathing where it provides a high gloss finish and retained good electrical properties.

The most significant interest concerning the utilisation of CPCC in cable compounds relates to the ability of the high surface area CPCC to effectively retain HCl gas released under a combustion situation. Practical cable formulations have been developed that rely on this high surface area activity of synthetic calcium carbonate for HCl capture and in combination with other additives this allows workable formulations for use in this sector.

5.2 Extrusion CPVC: PCC improves the surface finish and increases the impact strength in rigid CPVC.

PCC improves the surface finish and increases the impact strength in rigid CPVC.

PVC compounds, with high heat distortion temperatures, and high impact strength, are often formulated with from chlorinated

PVC resins (CPVC) and impact modifiers. The melt extrusion behavior of such compounds can prove difficult due to the rheology of the compounds from these resins and additives. A poor surface finish is often observed.

The inclusion of CPCC improves dramatically the surface finish, and increases the impact strength. With the addition of PCC, the impact modifier levels can be reduced.

5.3 Injection molding: PCC acts as a processing aid in PVC injection molding.

The inclusion of coated ultrafine precipitated calcium carbonate (CPCC) in rigid PVC formulations improves the processing behavior by increasing the rate of gelation and improving melt behavior.

Benefits of using CPCC:

- Faster more controlled fusion.
- Improved surface gloss and elimination of surface defects
- Elimination of gates marks from the molding process.
- Improved impact strength properties.

5.4 PVC Pipes: PCC acts as a processing aid in pressure pipe.

Coated ultrafine precipitated calcium carbonate can be included in formulations intended for use in pressure pipe applications where addition of 2-3 phr will improve the processing properties and ensure a more complete gelation.

Plate out is also reduced due to the improved dispersion of lubricants and other additives used in the formulation.

Some specifications limit the inorganic content of such formulations and under these circumstances the limit of addition may be only 1 phr. However even at this level,



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beneficial processing effects can be observed.

5.5 Rigid Foam: Coated precipitated calcium carbonate (CPCC) provides an unique combination of beneficial processing properties to the manufacture of rigid cellular PVC.

In order to obtain an optimum level of density reduction, formulations need to feature a compromising set of melt properties. The melt strength and elasticity have to be high but the melt viscosity low. Without these rheological characteristics the generated gas cannot be retained and cell structure will collapse forming voids and even surface bubbles.

CPCC has the effect of providing melt reinforcement which manifests itself as improved melt elongation and elasticity. Some benefits in rapid set up after the die together with possible nucleation effects have also been observed.

Benefits of CPCC in rigid foam:

- Melt rheology improvement resulting in improved melt extensibility which reduces the need for high levels of expensive processing aids.
- More efficient dispersion and distribution of all additives including blowing agents allowing possible reduction in phr of these additives.
- Significant improvement in impact strength.
- Improved surface finish

5.6 Window profiles: Coated precipitated calcium carbonate (CPCC) improves gelation and processing, surface finish and impact resistance in extrusion profile PVC compounds.

Coated precipitated calcium carbonate (CPCC) improves gelation and processing, surface finish and impact resistance in extrusion profile PVC compounds.

CPCC is a unique additive which can provide both a processing aid and impact modification function without any adverse effects.

To achieve the high impact strengths required, most formulations contain organic impact modifier. These modify the physical properties of the PVC but also have to be used at high loading which has a negative effect on the processing melt rheology. This has a negative effect on processing and surface finish properties. CPCC used to replace the natural calcium carbonate in the formulation will improve all the processing properties and allow reduction in impact modifier and process aid levels.

The surface finish of extruded profiles can be very important (especially in window systems) and the incorporation of CPCC provides a high gloss, high integrity surface finish without the need for additional effort. The ultrafine particle size of the synthetic calcium carbonate and the melt reinforcement effect are the explanation for this observation.



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6 Printing Inks

SOCAL® and WINNOFIL® allow ink rheology to be controlled for high-speed printing and control of ink transfer properties. Dispersion of coloured pigments is improved leading to higher color strength in formulated inks.



Ultra fine SOCAL® and WINNOFIL® are surface treated precipitated calcium carbonates used to impart rheological properties to most lithographic and many gravure ink systems. They require no activation unlike conventional rheology modifiers and therefore offer improved control and consistency. They improve the dispersion of problem pigments which leads to higher color strengths being developed without adversely affecting gloss. Similar benefits are also gained in water based flexographic inks.

Fine SOCAL® grades are used in printing inks to enhance their optical properties. In screen-print inks the use of SOCAL® provides a low sheen surface with excellent brightness, hiding power and printability.

Specific coated, ultra-fine SOCAL grades are recommended in offset printing ink systems (heat-set/cold-set). It provides an excellent and reproducible approach for rheology adjustment to generate high YV. By improving inks elastic properties, SOCAL PCC's reduce misting on high-speed printing machines. As a result of low Mohs hardness, mechanical wear of printing plate is reduced, which ensure printability and long life-cycles. Gloss, transparency and color strength are enhanced by improved pigment dispersion.

6.1 Offset: Ultrafine precipitated calcium carbonate can be used to control the rheology of offset printing inks systems. Their incorporation has a positive effect on the runnability of such inks and helps to reduce misting with high speed printing applications.

Ultrafine precipitated calcium carbonate can be used to control the rheology of offset printing inks systems. Their incorporation has a positive effect on the runnability of such inks and helps to reduce misting with high speed printing applications.

Inks containing Solvay PCC also have shorter grinding times through improving the dispersibility of difficult pigments by increasing the tack and inducing higher shear forces in the milling process.

The improvements to dispersion can also allow the reduction of costly coloured pigments without affecting the colour strength.

The less abrasive nature of precipitated calcium carbonate in comparison to naturally



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derived extenders also has a positive effect on plate wear that can be important for some computer to plate generated processes.

The coated ultrafine grades combine the above properties without significant effect on the gloss property that can often be important.

6.2 Other ink applications: Solvay precipitated calcium carbonates are also used in gravure applications where their fine particulate nature reduces any adverse effect on cylinder wear and also allows more flexible formulation changes during long runs.

Solvay precipitated calcium carbonates are also used in gravure applications where their fine particulate nature reduces any adverse effect on cylinder wear and also allows more flexible formulation changes during long runs.

In some UV ink applications the incorporation of the coated ultrafine products can have a positive effect on ink rheology without too adverse an effect on surface gloss. Developments are continuing to optimise products for this application.

6.3 Screen ink: Fine SOCAL® grades are used in printing inks for good optical properties. The usage of SOCAL® gives matt surfaces with excellent brightness, hiding power and printability.

Fine SOCAL® grades like N2R, P2, P2V, N2 and 92E are used in printing inks for good optical properties. The systems where these grades are used are PVC-plastisols for screen-printing and water-based systems for screen and size based printing. The usage of SOCAL® gives matt surfaces with excellent brightness, hiding power and printability.

The fine nature of these synthetic calcium carbonate crystals and their crystalline morphology allows the promotion of early surface drying times beneficial for high speed printing processes. The surface finish that is generated has high brightness and low gloss and forms an excellent primer or final finish surface.

6.4 Water based flexo: Solvay precipitated calcium carbonates can be used in water based inks for flexographic printing applications.

Solvay precipitated calcium carbonates can be used in water based inks for flexographic printing applications. The small particle size, the low hardness and non-abrasive properties, high chemical purity and rheological contribution make these products a useful addition for formulating water based flexo inks.

When dispersed, these products can exhibit excellent transparency that allows their use in extender varnishes production. Varnishes adjust the colour strength without adverse effect on rheology or colour shade. Other surface ink properties are improved and anti-blocking, anti-slip, surface hold out and ink lay-down all benefit from the inclusion of precipitated calcium carbonate.

Coated ultrafine grades of SOCAL® and WINNOFIL® provide improvements in stability, transparency and surface smoothness without adverse effect on gloss.