



Plastorit[®] 000 and Plastorit[®] 0000

in high-performance low VOC coatings

- Reduced VOC
- Low viscosities in polar coatings
- Maximum filling rate

Introduction

This technical brochure describes the use of Plastorit® 000 and Plastorit® 0000 in high-performance low VOC coatings. Plastorit® is a natural coalescence of lamellar minerals which give low viscosities in polar coatings. Low-viscosity inert fillers are particularly useful because they allow a maximum filling rate while still achieving low solvent emissions.

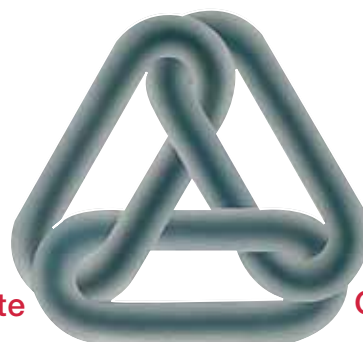
Plastorit® and talc in coatings systems

Reducing solvent emissions in coatings is basically a question of choosing the technology according to the performance criteria of the system. Water-borne and powder coatings are used in a number of applications, but there is still strong demand for solvent-borne systems such as those based on epoxy resins for high-performance metal coatings. Here, attention has been particularly focused on reducing the solvent content to reduce total VOC emissions.

Formulators of high-performance coatings need fine grind fillers that combine chemical inertness and lamellarity with low resin demand. Plastorit® 000 and Plastorit® 0000 are ideal solutions which reduce the amount of additional solvent required for application and provide a good filling rate.

Plastorit® is a natural mineral, recognised for its inertness and is consequently the product of choice for formulating high performance coatings.

Mica



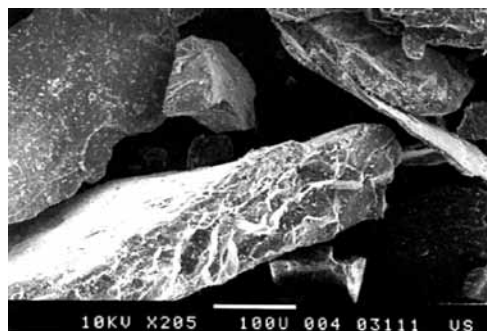
Chlorite

Quartz

Plastorit® is leucophyllite, a mineral combination of:

- mica: the most lamellar mineral, UV reflecting, resistant to high temperatures, but hard to disperse as a pure mineral,
- quartz: hard, easy to disperse and non lamellar,
- chlorite: similar to talc, lamellar and resistant to high temperatures.

The coalescence of these three minerals provides Plastorit® with its unique properties.





Plastorit® 000 and Plastorit® 0000

The following table shows the technical characteristics of these two products compared to a standard 20µm 'top-cut' talc.

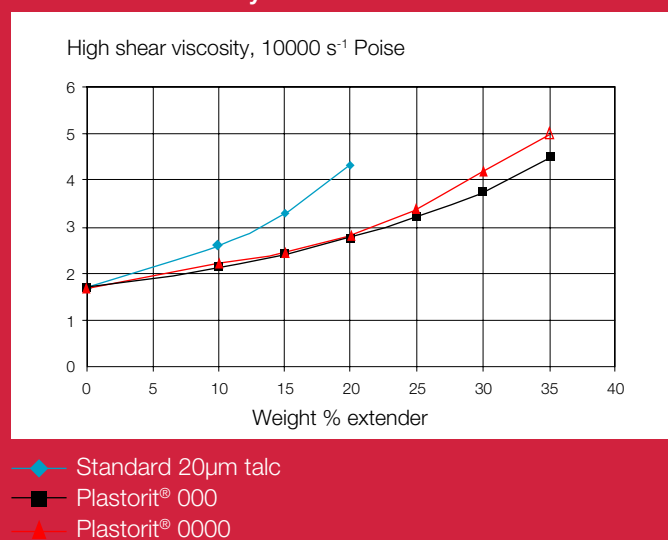
Technical characteristics of extenders

			Standard 20µm talc
Top-cut Sedigraph® (µm)	50	35	20
d50 Sedigraph® (µm)	10	7.5	4.6
Oil absorption (ml/100g)	28	29	48
Loss on ignition (%)	4.5	4.5	6.4
Talc/chlorite (%)	-	-	100
Mica/quartz/chlorite (%)	100	100	-

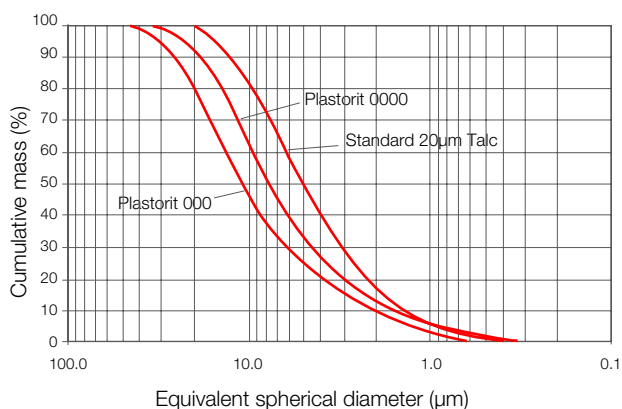
Epoxy resin viscosities: 'dilution' curves

An accurate indication of the viscosity of an epoxy resin coating, formulated with a filler, is best obtained by measuring the so-called 'dilution' curve of the filler in the resin itself. The values obtained are more representative of the real viscosity than the non-specific indications given by the oil-absorption values.

Viscosity 'dilution' curves



Particle size distribution curves



The above graph shows the viscosity values of the resin-filler mixture obtained as the weight percentage of the filler is increased from 0% to 35%. This illustrates the distinctly lower values obtained with Plastorit® 000 and Plastorit® 0000 compared to a standard 20µm talc.

Formulating epoxy coatings at low VOC

The performance of Plastorit® 000 and Plastorit® 0000 in a high-solid epoxy coating was compared with a standard 20µm talc in a standard two-component formulation shown in table 1. The formulations were made up from a mill-base containing the TiO₂ and barytes (dispersed in a resin-solvent mix on a pearl-mill) to which the extenders were incorporated on a high-speed disperser. The physical characteristics of this coating are given in table 2.

Table 1: High-solid epoxy coating formulation

Component A	Weight (%)
Liquid epoxy resin (EEW190)	19.35
Solvent mix (Xylene: 2, Butanol: 1, MEK: 1 and MIBK: 1)	9.76
TiO ₂ (standard rutile grade)	14.35
Baryte	7.08
Plastorit® 000, Plastorit® 0000 or standard 20µm talc	30.65
Component B	
Curing agent	13.54
Solvent mix	5.27

Table 2: Physical characteristics of the standard epoxy coating

VOC (g/l)	234
PVC (%)	35.6
Solids by volume (%)	75
Solids by weight (%)	85
Density (g/cm ³)	1.56

To compare the solvent demand (or the achievable filler content) with each of the three extenders, we measured the quantity of solvent required to reduce the viscosity of the 100% formulation (after mixing the two components) to an application viscosity of 3 Poise (on an ICI Cone and Plate). This viscosity is suitable for a conventional spray application.

The values obtained for the three extenders are given in table 3, expressed as a calculation of the total VOC of the coating at 3 Poise.

Table 3: Calculation of total VOC

	Total VOC (g/l)
Plastorit® 000	234
Plastorit® 0000	238
Standard 20µm talc	315

The choice between Plastorit® 000 and Plastorit® 0000 will depend on the resin system used and the required characteristics of the coating, such as film thickness and gloss.



Physical characteristics of low VOC coatings

Comparative values of standard parameters such as adhesion, gloss and colour are given in table 4. The higher gloss at 20° and 60° is linked to the effect of the lower resin demand of Plastorit® 000 and Plastorit® 0000.

Table 4: Properties of epoxy coatings applied at a dry film thickness of 200µm

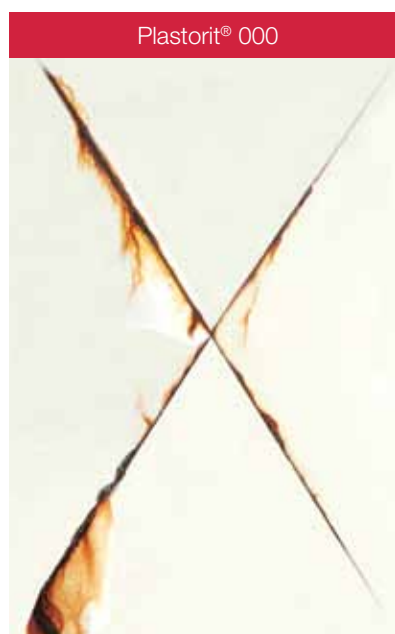
	Gloss 20°	Gloss 60°	Whiteness (Y)	CIE L*	CIE b*	Adhesion (ASTM 3359-87)
Plastorit® 000	26	76	80	92	8.5	4B
Plastorit®	19	62	78	91	6.7	5B
Standard 20µm talc	2	10	81	92	8	3B

The physical endurance of the coatings has been evaluated by measuring adhesion, which is satisfactory, and anti-corrosion behaviour (in a salt-spray test) for which the results are shown below.

For the anti-corrosion test, the coatings were applied to Q-panels, S-46 at a dry film thickness of 200µm. The results confirm the good performance of the coatings filled with Plastorit® 000 and Plastorit® 0000 compared to a standard 20µm talc grade.

Conclusion

The advantages of using Plastorit® 000 and Plastorit® 0000 extenders in high-performance coatings have been demonstrated in a standard epoxy resin-based formulation. These minerals allow formulation at lower VOC levels, and therefore higher filling rates than standard talcs without affecting the coating's anti-corrosion performance.



Anti-corrosion results after 1500-hour salt spray test

About Imerys Talc

Imerys Talc is the world's leading talc producer, employing 1,000 people on five continents and supplying around 15 percent of world demand from our mines and processing plants in Australia, Austria, Belgium, Canada, France, Italy, Japan, Spain and the United States.

We are the acknowledged leaders in product quality, supply reliability and technical support – the services that create value for our customers and set us apart from competitors.

With over a hundred year's experience in the extraction and processing of talc, we offer the highest quality talc products on the market today.

About Talc

Talc is a surprisingly versatile, functional mineral which possesses a unique combination of properties. Talc is soft, water repellent, chemically inert and highly platy and has a marked affinity for certain organic chemicals. Our industry experts have harnessed these properties to bring customers improved performance in a wide range of applications such as paper, paints, plastics, rubber, ceramics, cosmetics, agriculture, food, pharmaceuticals, cosmetics and soap.

Meeting today's needs. Securing tomorrow's.

We believe that running a successful business and sustaining quality of life and the environment go hand in hand. From implementing behavior-based safety training to rehabilitating the land, we think it's important that future generations' needs are not compromised by our actions today.

Our fundamental sustainability principles are:

- **Safety** - We promote the health and safety of employees, contractors, customers, neighbors and consumers through active caring.
- **Partnership** - We seek to understand the issues that are important to our neighbors, and to make a lasting contribution to the communities in which we operate.
- **Environmental protection** - We work to minimize our environmental footprint by using natural resources efficiently, preventing pollution, complying with applicable laws and regulations and continually improving our performance.
- **Accountability** - We conduct business in an accountable and transparent manner, relying on external auditing and reporting to understand and reflect our stakeholders' interests.
- **Product stewardship** - We are committed to ensuring that our products are safe for people and the environment, employing best available technology and following best-in-class procedures to ensure that our standards and practices meet or exceed safety requirements everywhere we do business.



We conduct life cycle assessments (LCA) at all our operations to quantify the environmental effects associated with producing our products from the mine to factory gate, and to identify areas for improvement.

Likewise, we compile life cycle inventories (LCI) of the energy consumption, materials used and emissions generated by each of our product ranges. These LCI can be made available to customers and research institutions on request.