Waxes for Powder Coatings

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Résumé: Dès les débuts, c'est-à-dire la fin des années 50, l'industrie des peintures en poudre a développée des produits et des procédés de fabrication présentant une alternative éprouvée aux peintures liquides. En principe, les peintures en poudre consistent d'un mélange de résines synthétiques, de pigments et d'additifs présentant des avantages économiques et écologiques par rapport à d'autres systèmes de revêtement. Les matières premières sont mélangées, extrudées et moulues en peintures en poudre.
Les cires jouent un rôle important comme additifs dans les peintures en poudre. Les différantes cires permettent d'influer favorablement aussi bien la fabrication, le stockage, la mise-en-oeuvre que les propriétés de la peinture en poudre appliquée. Les différantes cires et les avantages respectifs sont présentés à l'aide d'exemples pratiques.

Summary: Since the first beginnings at the end of the 50th, the powder coating technology has become a perfected alternative in product and procedure respect to liquid paints. Powder coatings are primarily a mixture of synthetic resins, pigments and additives offering economical and ecological advantages compared to other coating systems. The raw materials are mixed, extruded and ground to coating powders.
Waxes play an important part as additives in powder coatings. Production, storage and processing as well as the properties of the applied powder coating can be influenced positively by different waxes. Various waxes and their advantages are demonstrated by practical advantages.

Keywords: powder coatings; UV-systems; coating surface; compounds; extrusion; application

Since 1927, waxes are produced and finishes at the production site Gersthofen. The company originally belonging to Hoechst AG has become part of Clariant GmbH in 1997.

The term „wax" is a designation of merchandise origin for a number of naturally or synthetically produced substances having normally following properties:

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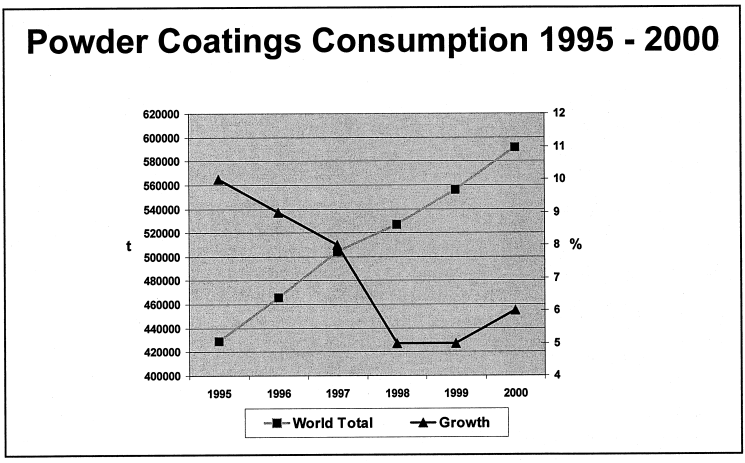
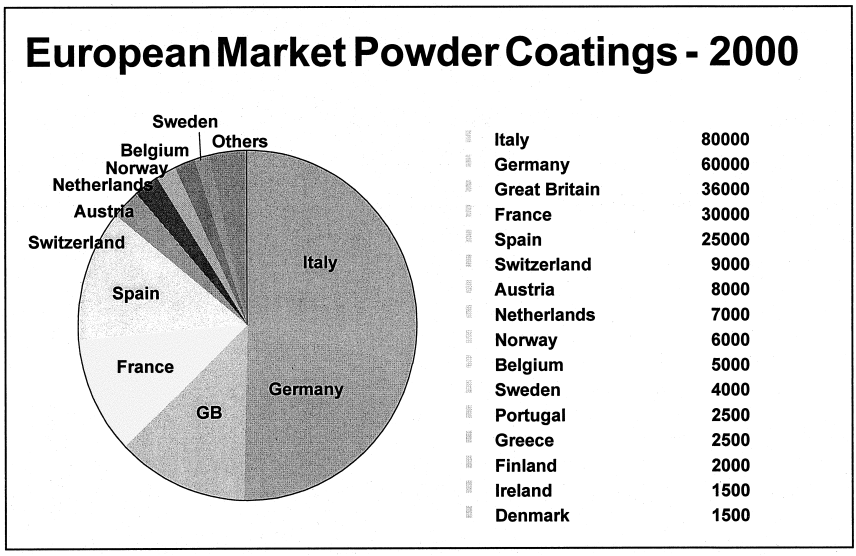
- workable at 20 °C
- firm to brittle hard
- coarse to fine crystallinity
- translucent to opaque but not glassy
- melts above 40 °C without decomposition
- relatively low viscosity even at slightly above the melting point
- strongly temperature-dependent consistency and solubility
- capable of being polished under light pressure

Since the first beginnings at the end of the 50th , the powder coating technology has become an economical and ecological alternative of liquid coating materials. With an annual growth rate of about 10 %, the world market demand increased from 270 thousand tons in 1992 to 590 thousand tons in 2000.



The most important areas are Europe, North America and Asia covering more than 90 % of the world market. The largest producers in Europe are Italy, Germany, France and England with 73 % of the total quantity produced.

Powder coatings are applied today successfully in different areas of industrial coating. A substitution of liquid coating materials is possible in many cases without any problem. Plastics painting and wood coating often cause problems because electric conductivity is not good. Examples for the use of powder coatings:



Traditional applications:

- Electric appliances (white material)
- General mechanical engineering
- Steel furniture
- Engineering of services and technical equipment of buildings
- Facade facing

New application fields:

- Motorcar accessories (e.g. wheel boss caps, wheel rims)
- Motorcar serial paints (transparent cover paints)
- Bicycles and motorcycles
- Coil Coating with thin-coat powder coatings

Future prospects:

- Plastics coating
- Wood and furniture paints
- UV cross-linked powder coating

Waxes play an important part as additives in powder coatings. Following properties can be influenced positively during production, storage and processing as well as on the powder coating applied:

Action of waxes in powder coatings

During manufacture and storage of coatings powder

- Improves the grinding characteristics and the shelf life because the coating particles do not agglomerate during storage or transport.

During extrusion and processing of coating powder

- Act as lubricant during extrusion thus reducing wear and extending the life and maintenance intervals of the equipment.
- Increase dispersibility and wettability of the pigments during extrusion. It will be achieved an higher output and at the same time power consumption will be reduced strongly.
- Improve the flow properties of the powder in pipe lines and spray equipment during application.
- Act as degassing agent and can replace proportionately benzoin.

Influence on powder coating surface

- Promoting flow, levelling and film formation. A smoother surface results.
- Increase the scratch resistance because objects which may scratch slip more easily off the smooth slippery surface.
- The resistance of the coating to mechanical stresses will be significantly increased. The reason is the higher smoothness of the surface, the hardness of the coatings film is unchanged.
- Achieve a fine to coarse texture, depending from the film thickness.
- Resistance to marking by metals and abrasion resistance are significantly improved by the reduction in coefficient of friction.
- Improves dirt- and water-repelling characteristics.
- Improves anti-blocking properties.
- Gloss reduction is possible.

In a hybrid powder coating we have tested a number of waxes and wax compounds of different chemical composition. Dosage for these tests was 1 % wax. Test formulation:

39.3 %	Alftalat AN 770 (Vianova Resins)
16.8 %	Beckopox EP 303 (Vianova Resins)
3.0 %	Additol XL 493 (Vianova Resins)
0.3 %	Benzoin (DSM Special Products)
9.9 %	Blancfixe F (Sachtleben Chemie GmbH)
29.7 %	Kronos 2160 (Kronos Titan GmbH)
1.0 %	Ceridust XXXX

Following properties were achieved with the different waxes:

PE wax powder

prolongation of service life of machinery improvement of the flowability of the powder; improvement of levelling

economical product: Licowax PE 520 Powder

Amidewax d_{50} = 6,5 µm

- high melting point (140 °C)
- degassing agent
- entrapped air can escape

especially on porous substrates an partially replace Benzoin

Product: Ceridust 3910

Compound Amid / PE d50 = 7 µm

- improvement of levelling
- smoother surface
- increased scratch resistance
- better grindability
- no lumping during storage and transportation
- increased slip
- an addition up to 2% supports matting effect

Product: Ceridust 9615 A

Synthetic hydrocarbon wax d50 = 6,5 µm

- reduction of gloss
- good levelling
- good scratch resistance

Product: Ceridust 2051

Compound wax d50 = 6,5 µm

- extremely high slip
- no gloss reduction
- haze is being minimized

Ceridust 3831 is a Clariant unique product

Compound PE / TF d50 = 6 µm

- smoother surface, slip
- excellent scratch resistance
- prevention of metal markings
- abrasion resistance

Product: Ceridust 3920 F

Compound PE / TF d50 = 13 µm

- fine texturing / structuring
- anti blocking
- excellent soil repelling

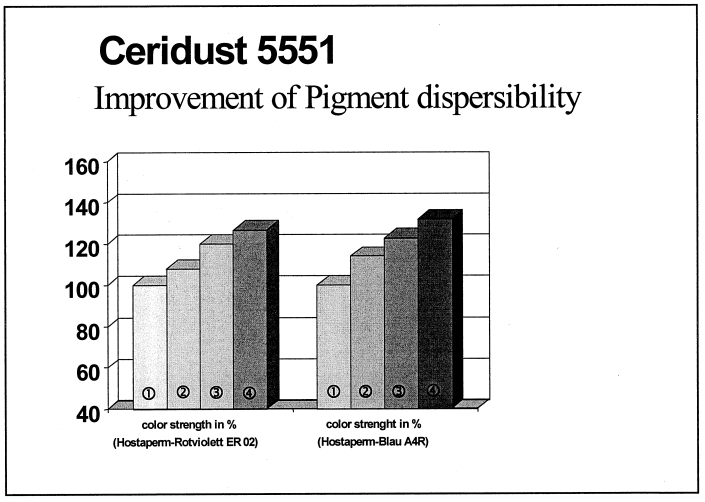
Product: Ceridust 3940 F

Polar waxes in particular can also clearly improve dispersibility of pigments as well as extruding ability of coating powders. This is shown by the example of a polyester primid system.

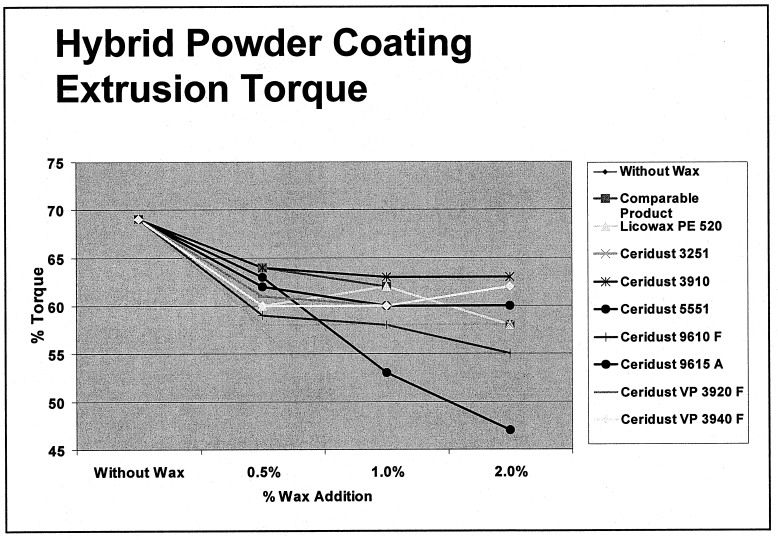
Montan wax d50 = 9 µm

- internal lubricant
- reduction of torque ⇒ energy saving
- good wettability and dispersibility of pigments

Product: Ceridust 5551

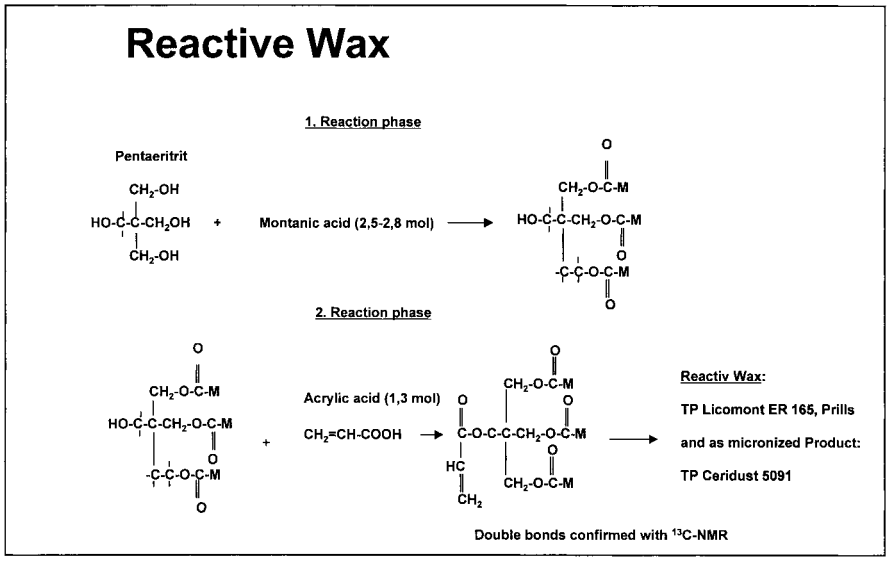


Besides the advantages of the use of waxes as additives for powder coatings, these explanations have also shown the versatile possibilities of the use of coating powders.



Due to the increasing environmental pollution by industrial paint and varnish plants resulting in solvent emissions, sewage contamination and volume of paint and varnish sludge, the importance of powder coatings as non-polluting alternative is constantly increasing. The production quantity in Germany has augmented continuously by about 6 % per annum during the past years.

New application possibilities, such as wood- or plastic coatings, can be realised more and more by formula optimisation. UV-reactive powder coatings are another direction of development. The potential of powder coatings to be achieved is estimated by experts to 30 % - 40 % of the entire demand of industrial paints and varnishes.



Waxes are an important part of powder coating formulations. They control a number of properties during production and processing of powder coatings and serve also to optimise the properties of powder coating. For UV-reactive powder coatings Clariant has marketed a new development under the designation **Ceridust TP 5091** which we would like to introduce to you in the following.

Literature:

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In particular I would like to thank Mr. Hans Dieter Nowicki – Clariant GmbH, Gersthofen – who has conducted all tests for this presentation.