Wax-Additives

Wax based surface additives that improve mechanical, optical and tactile properties

Deuteron®
ADDITIVES TO YOUR SUCCESS

Wax Additives by Deuteron

Wax based surface additives that improve mechanical, optical and tactile properties

Wax Additives:

Versatile products suitable for any application

Wax-based additives are a diverse and large product family with a broad application profile. All waxes have in common that they are crystalline, mostly brittle polymers that melt between 50°C and 160°C and have a low melt viscosity. Many of the waxes relevant for coating applications are organic polymers with a comparatively low molecular weight - usually between 500 g/mol and 2000 g/mol.

The specific properties of wax-based additives are primarily based on the basic wax type (e.g. polyethylene, polypropylene, etc...). In addition, the properties of the additives are influenced by a large number of other parameters. These are crystallinity, polydispersity, molecular weight, melting range as well as the preparation form and particle size.

In liquid coatings waxes usually lead to an improved touch and feel (waxy, soft touch), significantly improved abrasion resistance, higher scratch resistance and good block resistance. The sole use of waxes for matting usually leads to silky matt systems. Combining waxes with other matting agents is a common application and can lead to improved stabilisation (anti-settling), good polishing resistance and a pleasant / warm feel.

Selecting a suitable wax-additive:

Deuteron's wax additives represent a functional portfolio of selected specialities. For first trials **Deuteron Wax PE** can often be used as a starting point - polyethylene provides a well-balanced performance. Depending on the specific requirements, there are various wax options to specifically improve certain surface properties.

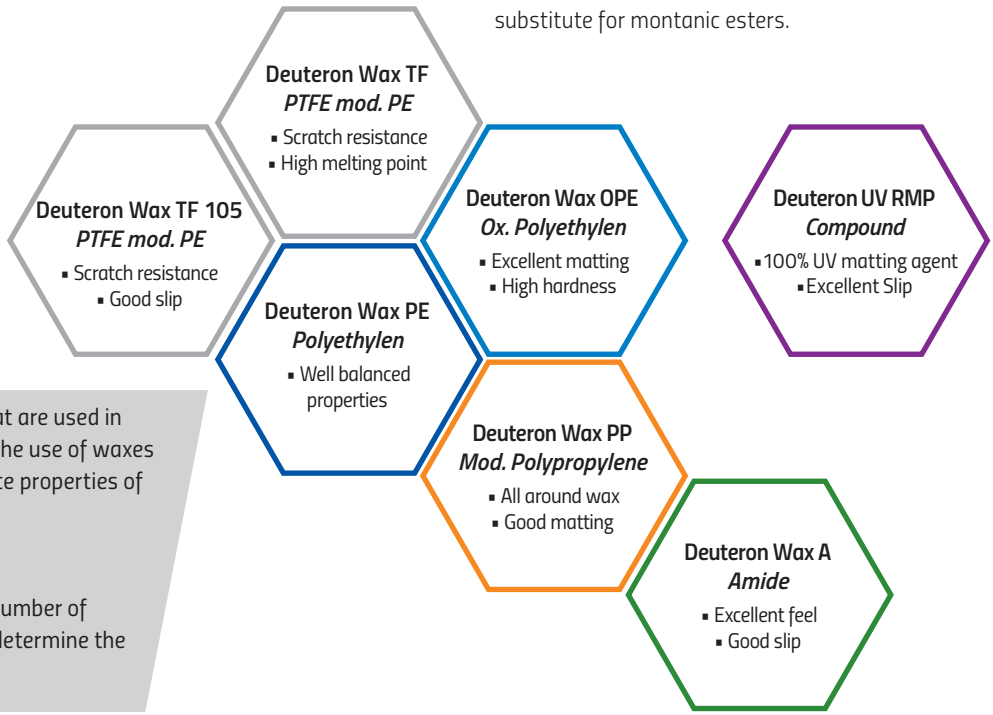
For example: compared to polyethylene, the smoothness and scratch resistance can be significantly improved by using a PTFE modified product **(Deuteron Wax TF types)**.

The use of an oxidized polyethylene **(Deuteron Wax OPE)** leads to a better matting performance and outstanding block resistance.

In case smoothness and soft-feel or improved sand-ability are a priority, the choice of an amide wax **(Deuteron Wax A)** can improve the system.

Similar to PE waxes, the group of modified polypropylenes **(Deuteron Wax PP**) lead to well-balanced properties, but with higher mechanical protection and further improved touch and feel.

Apart from the traditional wax additives **Deuteron UV RMP** takes a special place. This wax compound was specially developed for matting UV-curable systems. It can also be used as a substitute for montanic esters.



Waxes are versatile additives that are used in almost every paint formulation. The use of waxes can specifically improve the surface properties of lacquers.

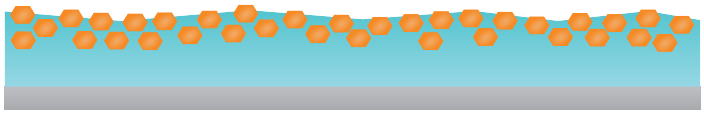
Wax additives are based on a large number of different polymers which ultimately determine the property profile of the additive.

Mode of action

The way wax additives work in the coating film can be described using three different models.

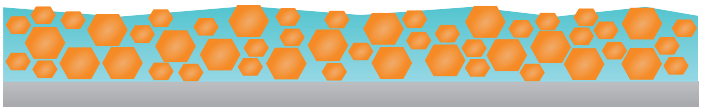
Floating

Two potential forces can help to bring wax particles to the top of the coating film. This floating process is supported by the comparatively low density of the waxes (usually below 1 g/cm³) and the dynamic flow within the coating layer caused by convection of evaporating solvents.



Overlay / Ball bearing

The idea behind particle overlay follows a high filling grade of wax particles in the coating layer. In addition, the volume loss while drying (solvent evaporation) leads to settling of the film and further increases the volume concentration of the wax particles. This ultimately leads to an overlay of the wax particles and brings the top layer to the coating surface. In addition, the interaction between the particles potentially acts like a ball bearing and helps to compensate external forces and stress.



Melting

The melting effect can only explain how wax additives work in heat curing systems (e.g. coil coatings, can coatings and powder coatings). The high temperature during the curing process automatically melts the wax particles in the film. Because of its density and polarity, the molten wax floats to the top and forms a more or less closed wax layer on top of the coating.

No matter what explanation is correct (in many occasions a mix of two or even three applies) ultimately the wax particles need to be present at the top of the coating layer to give a decent effect. Every wax acts as a multi-purpose surface modification additive and influences a broad range of different film properties – either positively or negatively. Depending on the wax type the surface feel, mechanical resistivity or slip can be influenced. In addition, wax particles are "spacer" and thus influence the polish ability and blocking.

Being surface active materials, the wax particles need to be present at the coating surface to work properly. The overall effects are defined by:

- Type of polymer
- Particle size
- Addition level

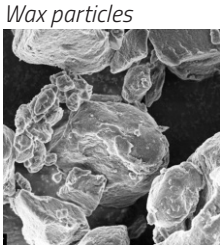
Waxes are multipurpose additives and influence several surface properties at once.

Important wax properties at a glance

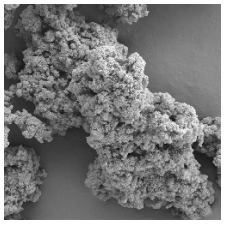
Matting

Waxes are not very efficient as sole matting agents. This is mainly due to the particle morphology. Typical wax particles are solid and do not have a large surface area. Compared to dedicated matting agents such as polymethylurea or silica, waxes have a much lower matting efficiency. Therefore, they are usually used in combination with traditional matting agents. The actual matting is achieved by the matting agent and the wax primarily fulfils the task of protecting the matting agent from mechanical influences.

Wax particles

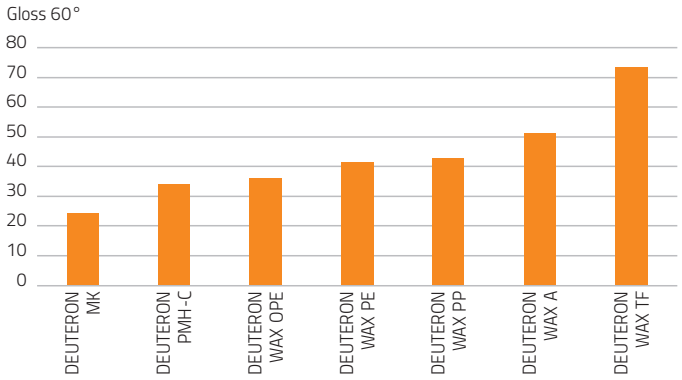


Deuteron PMH-C



Silica particles

Comparison of gloss levels PMU vs. Waxes /2% in w/b 2k Ac/PU System



Haptics / Surface feel

A major reason why wax additives are used is the excellent feel that can be created by the wax particles. Depending on the polymer used and the particle size, it is possible to create a wide range of haptics ranging from cold, smooth surfaces to warm, rough surfaces.

Surface slip (Coefficient of friction – COF)

The reduction of the surface slip is another major property of many wax additives. The COF reduction is typically achieved by the wax particles that look out of the coating surface. These protruding particles significantly reduce the contact surface area and thus the friction. In addition, the type of polymer (the majority of hard polymers are more slippery than the pure resin film) can significantly reduce the slip even further.

Scratch resistance

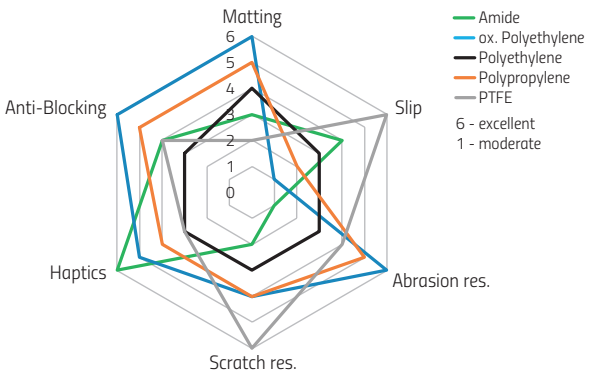
An increased scratch resistance is a direct result of the lower COF (or higher slip value). Penetrating objects simply need a higher force to overcome the surface slip and damage the resin film. If the force is too low the objects will glide over the surface without dealing damage. In addition to the slip rating the wax particles also need to be destroyed first before any object can reach the resin film.

Abrasion resistance

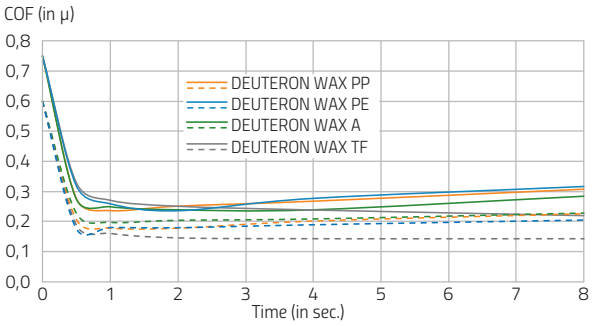
Similar to the scratch resistance the surface slip also positively influences the abrasion resistance. Even more important is the spacer effect of the wax particles that will significantly reduce the stress onto the resin film. Thus, especially coarse particles and high hardness polymers are used to improve the abrasion resistance.

Anti-blocking

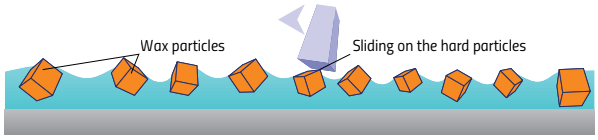
Blocking describes the tendency of coated surfaces to stick onto each other by direct contact. Blocking is especially critical for slow curing systems, w/b coatings and certain 2-pack systems where soft and flexible resins are used in the formulation. Anti-blocking – the reduction of the sticky character – is mainly achieved by coarse particles with high melting point and high hardness.



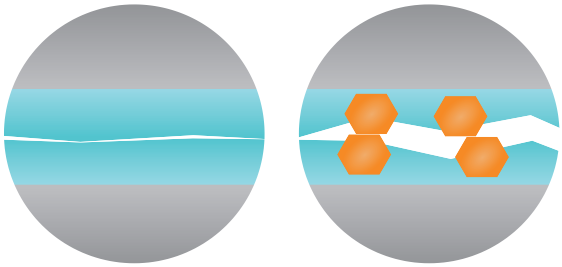
Most relevant properties at a glance



Comparison of the dynamic and static friction of different waxes. ***dotted line:*** *dynamic friction,* ***solid line:*** *static friction*



Schematic representation of the spacer effect of wax particles. Under load, a scratching or rubbing body does not rub directly on the sensitive paint film but initially slides over the hard and smooth wax particles. Only when this resistance has been overcome or the particles on the surface have been destroyed the resin film will be damaged.



Schematic representation of the spacer effect of wax particles when blocking two coated surfaces.

Left: *Without wax addition, both coating layers come in direct contact. This can result in slight adhesion up to destruction of the films. With 2pack systems further film formation and the formation of covalent bonding can occur. Separation of the individual parts is then no longer possible without causing severe damage.*

Right: *Because of the protruding wax particles there is almost no contact between the resin films. Due to it's high hardness, there is usually no significant adhesion between the layers. Another advantage is the „incompatible" character of many waxes, which also contributes to the separating effect.*

Wax powders

Due to their efficiency and broad compatibility across almost all coating systems, wax powders are by far the most common preparation form for wax-based additives. Another benefit of using powdered waxes is the absence of any additional additives or solvents.
On the other hand, a clear drawback of using wax powders is the need for proper dispersion. High shear forces are needed to disperse most of the wax-based powders and this potentially leads to foam formation and foam stabilization. This is especially true for modern water-based systems.

Deuteron Wax A
Deuteron Wax A is an amide wax which is used to improve the sand-ability and soft-feel as well as the degassing of powder coatings. Deuteron Wax A is a vegetable-based amide wax with a low yellowing tendency.
Typical addition level: 0,5 - 3 %

Deuteron Wax PE
Deuteron Wax PE is based on a medium-hard polyethylene wax. Polyethylene is the generalist among waxes - therefore PE is a good starting point for first trials. Deuteron Wax PE especially improves the scratch resistance, abrasion resistance and smoothness.
Typical addition level: 1 - 5 %

Deuteron Wax OPE
Deuteron Wax OPE is based on an oxidized polyethylene. The oxidization implements acidic groups into the polymer and increases polarity. As a result, the melting point and hardness are significantly increased. These properties ensure excellent block resistance, high abrasion resistance and a strong matting effect. Typical addition level: 1 – 5 %

Deuteron Wax TF
Deuteron Wax TF is based on a PTFE-modified high melting polyethylene. The PTFE-modification leads to a significantly improved smoothness which greatly improves the scratch resistance in particular. In addition, Deuteron Wax TF shows good gloss retention and block resistance.
Typical addition level: 0,5 – 2 %

Deuteron Wax TF 105
Deuteron Wax TF 105 is also based on a PTFE-modified polyethylene. The used polyethylene shows a wider melting range and is therefore somewhat softer. Depending on the system, this can improve intercoat adhesion and printability. In stoving enamels, a low COF can be achieved.
Typical addition level: 0,5 – 2 %

Deuteron Wax PP
Deuteron Wax PP is based on a modified polypropylene. Deuteron Wax PP is also a generalist in coating applications, but at a higher level compared to PE waxes. Particularly due to the higher melting point, the blocking resistance and abrasion resistance are further improved.
Typical addition level: 0,5 – 3 %

Deuteron UV RMP
Deuteron UV RMP is based on a functional blend of different waxes. The blend was specially developed for matting UV-curing systems and shows excellent matting with good polishing resistance and smoothness in 100% UV systems. In conventional systems, Deuteron UV RMP shows good matting and a pleasant touch. In powder coatings it can be used as an alternative to montane esters. Typical addition level: 1 – 15 %

Liquid preparations

Wax dispersions offer the great advantage of easy handling and dispersibility, thus eliminating many of the disadvantages of powder processing. In particular, the dust-free handling and the possibility to use auto-dosing units are mentionable.

A disadvantage of dispersions is the presence of the liquid carrier. Therefore, higher addition levels must be used to achieve similar effects as powders. Furthermore, most (water-based) wax dispersions contain additional additives for wetting and deaeration - these can lead to problems with compatibility or chemical resistance in the formulation.

Deuteron wax dispersions - A completely new technology

To address the above-mentioned disadvantages, Deuteron has developed a completely new dispersion technology. The new water-based dispersions of the DEUTERON WD series are formulated without foreign additives and thus drastically reduce the risk of unwanted interactions in the coating system.

Water and wax – it's that simple!

Deuteron WD A
Origin: Deuteron Wax A
Solid content: ~45 %
Typical addition level: 0,5 – 6 %

Deuteron WD PE
Origin: Deuteron Wax PE
Solid content: ~50 %
Typical addition level: 0,5 – 6 %

Deuteron WD OPE
Origin: Deuteron Wax OPE
Solid content: ~46 %
Typical addition level: 0,5 – 7,5 %

Deuteron WD TF
Origin: Deuteron Wax TF 105
Solid content: ~50 %
Typical addition level: 0,5 – 6 %

Wax Additives by Deuteron

Wax based surface additives that improve mechanical, optical and tactile properties

Properties at a glance

- Anti-Blocking
- Anti-Sedimentation
- Scratch resistance
- Slip
- Improved sanding
- Haptics / Surface touch
- Matting
- Lower dirt pickup

Dispersions

- Free of additives (no silicones or other additives)
- Easy to disperse
- Suitable for auto-dosage units

Powder coatings

- Air release
- Scratch resistance
- Matting
- Slip

Technical Data

	Delivery form	Type	Solvents	Solid Content	Melting Point	Particle Size µm		Density
				%	°C	dv50	dv90	g/cm³
Deuteron Wax A	Powder	Amide	-	100	143	6.5	15	0.99
Deuteron Wax PE		Polyethylene			101	5.5	10	0.94
Deuteron Wax OPE		ox. Polyethylene			128	8	15	0.99
Deuteron Wax PP		Polypropylene			138	6	11	0.94
Deuteron Wax TF		PTFE-modified PE			122	5.5	11	1.01
Deuteron Wax TF 105					107	5.5	10	0.95
Deuteron UV RMP		Compound			65 -110	8	17.5	0.92
Deuteron WD A	Dispersion	Amide	Water	45	143	6.5	15	1
Deuteron WD PE		Polyethylene		50	101	5.5	10	0.94
Deuteron WD OPE		Ox. Polyethylene		46	128	8	15	1
Deuteron WD TF		PTFE-modified PE		50	107	5.5	10	1.03
Deuteron OG 250		Paraffin		20	58	2.5	6	0.95
Deuteron AP 348	Prills	Polyethylen	-	100	85	~ 3 mm		1.01

Deuteron®
ADDITIVES TO YOUR SUCCESS

Deuteron: First-class products for the coating industry

Deuteron successfully develops and sells innovative additives since 1977. Our product range consists of matting agents, anti-static additives, texturing additives, thickeners and UV initiators. In the course of our company history we have become an important partner of the national and international paint, lacquer and coating industry with sales agencies around the globe.

Visit us on the Internet

Our documents such as product datasheets, safety datasheets, regulatory information and brochures are available in the download area of our website without registration.

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