



UV Matting Agents

Matting and improved haptics for radically curing 100% UV systems

 **Deuteron**[®]
ADDITIVES TO YOUR SUCCESS



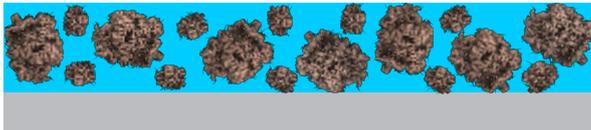
UV Matting Agents

Matting and improved haptics for radically curing 100% UV systems

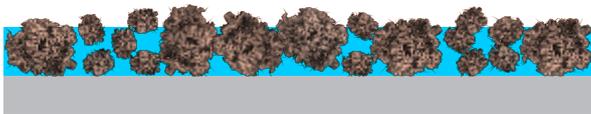
Matting of 100% UV systems

Radically curing UV systems have been in use since the 1970s. Since then, they have been continuously developed, the raw material base has broadened, the efficiency has been improved and the physical properties have been adapted to the various fields of application. Nevertheless, the matting of solvent-free, radically curing UV-systems has remained a particularly difficult task. Due to the lack of volatile solvents, film shrinkage occurs only to a comparatively small extent and plays hardly any role in the formation of the matting effect. Due to the high solid content, large quantities of matting agent are required. This can lead to an excessive increase in viscosity and negatively affects the flow behaviour.

Because of the high curing speed, particle movement and their alignment on the surface are limited – this also leads to very difficult to matt systems.



The lack of film shrinkage prevents particles from reaching the film surface.



Harmonizing film thickness and particle size enables particles to reach out of the film and create a matting effect.

In order to address these issues of traditional UV-matting, Deuteron has developed a series of specialized matting additives. The Deuteron UV RM product family is an alternative matting concept to improve matting and haptics of 100% UV-systems.

Based on specific wax combinations and a special manufacturing method, Deuteron's UV RM products deliver a unique matting effect by creating a controlled microstructure during the curing process.

Since comparatively small quantities are needed, our matting agents have little influence on the viscosity.

The use of traditional matting technologies (inorganic or organic particles) typically leads to a significant increase of the viscosity and is always a compromise between matting, viscosity and final film properties.

The use of Deuteron UV RM matting agents leads to a reduced overall viscosity and enables formulators to use less monomers or higher viscous resins.

Matting effects are usually based on surface toughness or micro-texture. Two basic mechanisms are in used in 100% UV-systems to impart a surface roughness and reduce the gloss:

- Particle-based matting effects; either by high addition levels or by using particle sizes similar (or slightly above) the film thickness.
- Impart a rough surface by utilizing either chemical or physical tweaks – extensive formulation knowhow as well as the right equipment (e.g. excimer curing) are mandatory



Deuteron's UV RM products utilize both effects with a stronger focus on the surface roughness during the curing process. As a result, the matted surfaces are highly mechanical stable and durable against abrasion and polishing. In addition, the wax particles lead to high hydrophobicity.

This matting effect is called
„controlled incompatibility“

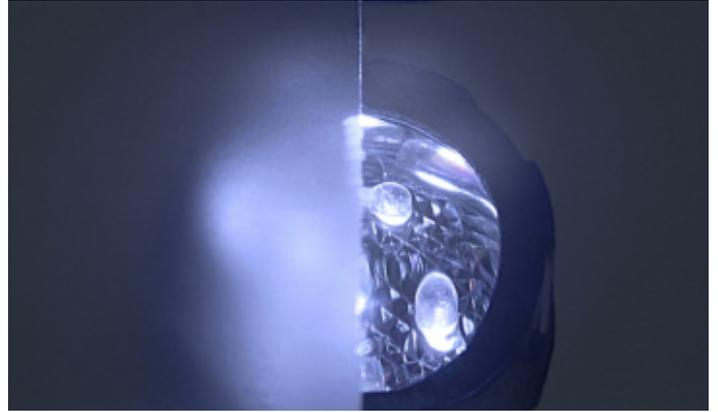
Unique ways to matt UV coatings

Deuteron's UV RM – matting agents induce a controlled incompatibility caused by a change in the coating's polarity during the polymerization. During the course of the reaction the liquid resin becomes increasingly incompatibly with the wax additive and starts to "flow away" from the particles. The continuing reaction finally fully cures and fixes this flow pattern. As a result, a microscopic texture is formed that appears matt.

As this matting process is purely surface-related, a uniform and evenly matt surface can be created, regardless of the film thickness. At the same time high mechanical resistances (influenced mainly by the resin) can be achieved. All with minimal impact on viscosity.

Deuteron's UV RM products can be used as stand-alone additives or in combination with traditional matting additives to further boost the performance and maintain a low viscosity.

100 % UV-clear coat, 25 µm wire rod bar drawdowns.



10% Deuteron UV RM 10
(= 2.5% active content)

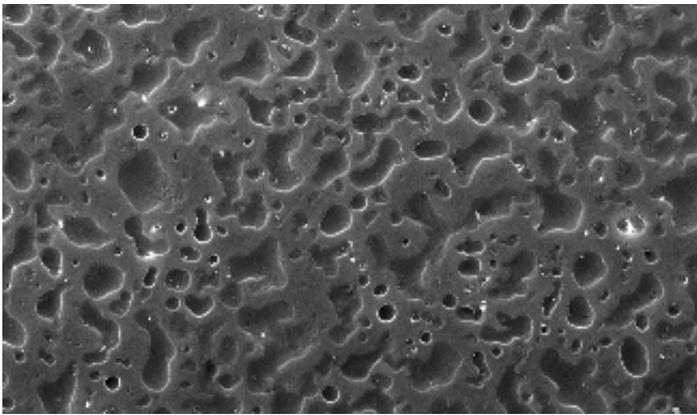
60° gloss: 12.3

85° gloss: 34.2

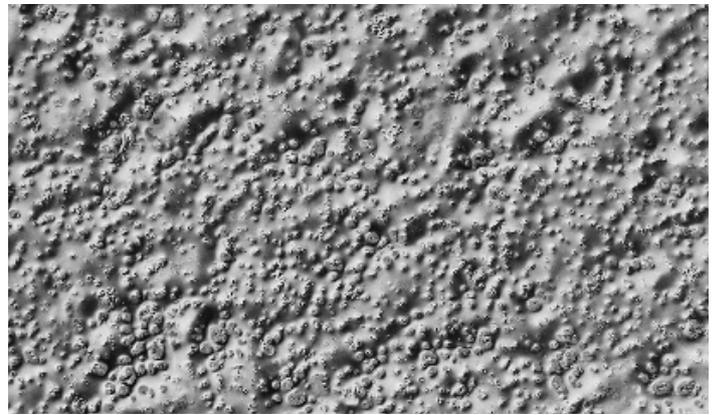
No matting agent

60° gloss: 92,5

85° gloss: 99,5



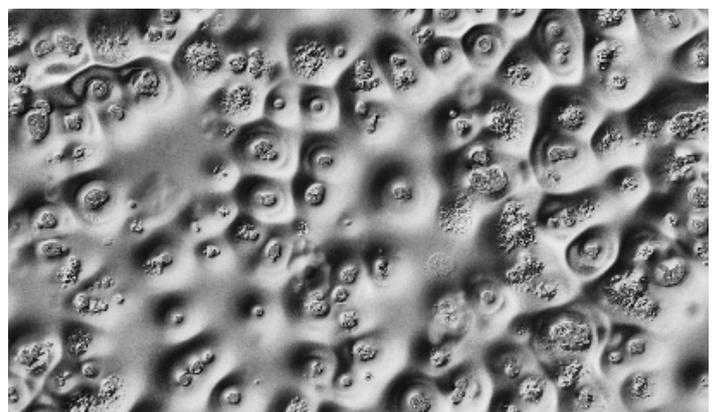
SEM picture of a matted surface containing Deuteron UV RM 15.
The particle-free surface structure is clearly visible.



Deuteron UV RM 10 and UV RM 17 show a comparably finer surface structure.



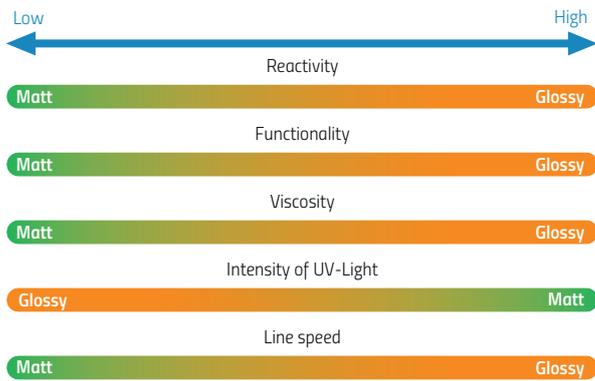
Deuteron UV RMP as a powdered version of our additives shows a rather coarse surface structure.



Deuteron UV RM 19 shows the coarsest surface structure.

Processing

The controlled surface disturbance / deformation induced by our Deuteron UV RM-products happens during the curing phase. This process is very sensitive and needs time. It is influenced to a large degree by the system's reactivity, viscosity and functionality. Monomers have a decisive influence on the matting effect – monofunctional and difunctional grades have shown the best results.



Correlation between matting efficiency and physical and chemical properties of the coating system and curing process.

Please note that surface active substances (e.g. defoamer, pigment dispersants, flow and levelling additives etc.) can negate the matting effect. It is therefore highly recommended to carry out first trials with an additive-free formulation. Once a good combination of monomers, resins and photo initiators is found, we recommend to continue with screenings for suitable additives.

Being wax based additives, the Deuteron UV RM products can stabilize foam. To prevent the incorporation and stabilization of foam it is highly recommended to add Deuteron UV RM-additives at the end of the formulation process. Alternatively, the products can be pre-diluted in a suitable monomer.

Suitability of photoinitiators

Type	Matting	Examples
α-Hydroxyketones	Very good	Irgacure 184, Irgacure 1173
Phenylglyoxylates	Good	Irgacure 754, MBF
Acylphosphinoxides	Good	TPO, BAPO
Aromatic Ketones	Moderate	Benzophenon, Irgacure 500
α-Aminoketones	Poor	Irgacure 369, Irgacure 907

Dosage

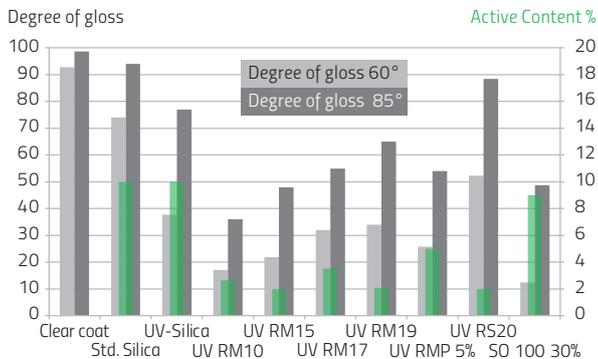
Due to their high efficiency, only low dosages are needed for a sufficient matting effect.

Typical addition levels of Deuteron UV RM-products are between 5% and 10% (equals ~1 – 4% active content) based on total formulation weight. In most applications it is not necessary to add more than 10%.

The powdered version Deuteron UV RMP is recommended at 2% to 15%, depending on the overall system.

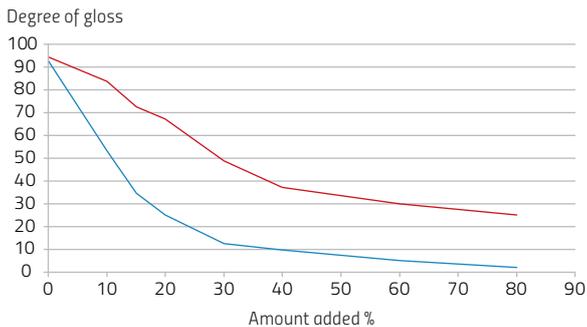
For haptic modification and slip improvement Deuteron offers a special wax preparation: Deuteron UV RS 20. Typical addition level between 1% and 15% depending on the desired effect.

The additional monomer content coming from our dispersions can be easily calculated into the total formulation.



Comparison of different matting agents

10% addition level, 12µm wire rod bar drawdowns



30% of Deuteron SO 100 (soft-touch additive) in a difficult to matt system. 25µm wire rod bar drawdown.

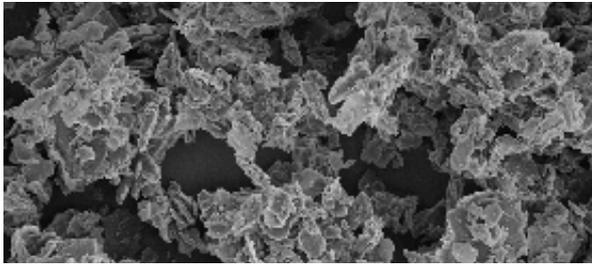
Additives to your Success.

Wax based dispersions

Deuteron UV RM 15 – Wax compound in DPGDA/LA. The matting effect is solely based on controlled incompatibility.

Deuteron UV RM 19 – Wax compound in TMP(EO)3 TA for highest reactivity and low migration. Leads to the coarsest matting structure of all UV RM products.

Deuteron UV RS20 - Slip additive, without strong matting effect. Based on a fine PE-wax in DPGDA. Friction values similar to PTFE-based products can be achieved.



Modified wax dispersions

Deuteron UV RM 10 – Wax compound with inorganic modification in DPGDA/LA. Highest efficiency and especially suitable for thin film applications.

Deuteron UV RM 17 – Wax compound with organic/inorganic modification in DPGDA/LA. Broadest application profile.

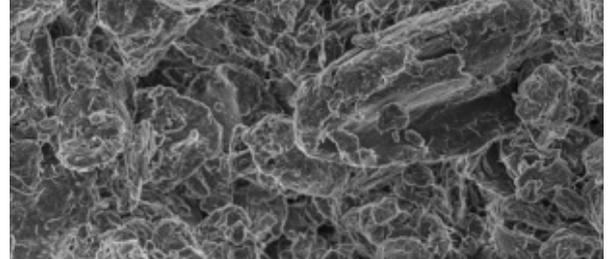
Effect

Deuteron	Matting via				
	Surface disturbance	Particles	Slip Improvement	Soft/Grip	Ink-Jet, Digital Printing
UV RM10	***	***	*	*	*
UV RM15	***	*	**	*	*
UV RM17	***	***	*	*	*
UV RM19	**	*	**	*	*
UV RS20	*	*	***	**	*
UV RMP	***	***	***	**	*
SO 100	*	***	**	***	*
MM 100	*	***	**	*	***
MM 110	*	***	**	*	***

* Slightly ** Good *** Very good

Powder

Deuteron UV RMP – micronized wax compound. Broadest compatibility also in non-100% UV systems.

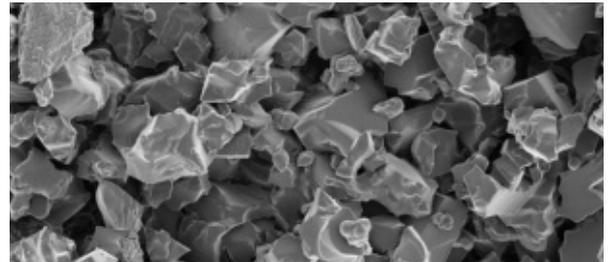


Ultra-fine dispersions

Deuteron MM 100 & MM 110 – Ultra-fine preparations of our polymethylurea particles in DPGDA. Especially designed for matting of digital inkjet systems and other digital printing applications. Also suitable for conventional UV systems.

Fine elastomeric dispersion

Deuteron SO 100 – Preparation of a soft elastomer particle in DPGDA. Primary designed as a soft-touch additive in UV systems Deuteron SO 100 can also be used to create a broad range of matting effects, from silky-smooth surfaces to low gloss soft-touch effects.





UV Matting Agents

Matting and improved haptics for radically curing 100% UV systems

Properties at a glance

- Low influence on the viscosity
- Compatible with all acrylic resins and monomers
- Matting independent of the film thickness
- High mechanical resistivity
- Silicone and halogen-free
- Suitable for thin layer applications as well as high film weight
- Freedom to formulate; either as stand-alone additive or in combination
- Wide range of gloss levels possible
- Viscosity adjustment without increasing the gloss through combination with traditional matting agents

Technical data

	Delivery Form	Viscosity mPas	Active content %	Inorganic modified	Reactive thinner	Reactivity	Particle sizes μm		
							d50	d90	d99
DEUTERON UV RM10	Dispersion	Wax compound	26.4	X	DPGDA/LA	slow	2.5	10.5	-
DEUTERON UV RM15			20	-		medium	4	11	-
DEUTERON UV RM17			35.1	X			2.5	9.5	-
DEUTERON UV RM19			21	-	TMP(EO)3TA	fast	7.5	16.5	-
DEUTERON UV RS20		Wax	25		DPGDA	medium	4	9	-
DEUTERON UV RMP	Powder	Wax compound	100		-	-	8	17	-
DEUTERON SO 100	Dispersion	Elastomer	30		DPGDA	medium	7	15	-
DEUTERON MM 100		PMU	17				0.6	0.8	1.2
DEUTERON MM 110			25	0.6			0.8	1.2	



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.

This leaflet intends to give technical advice without warranty and does not claim to be complete.

