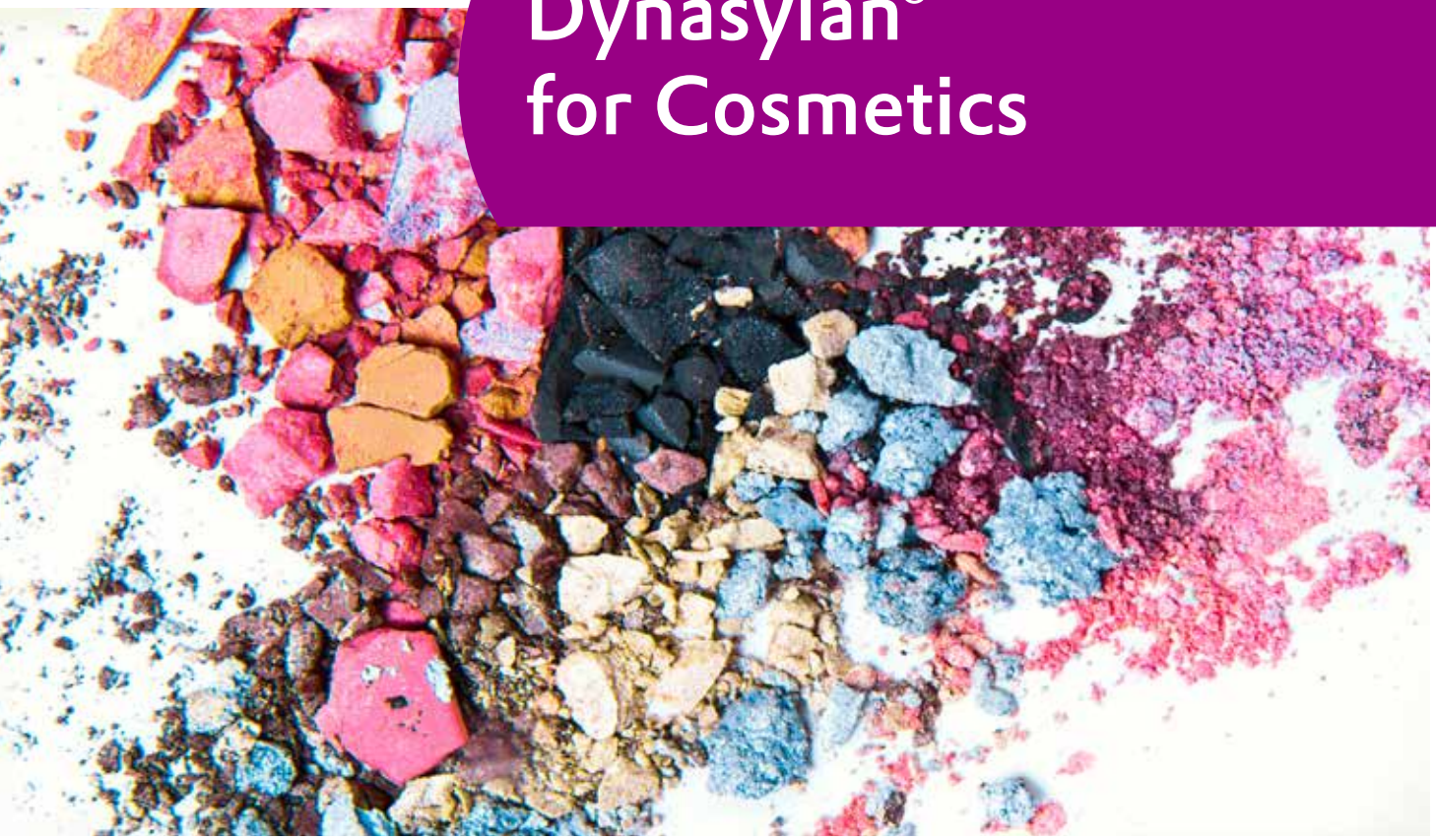
EVONIK INDUSTRIES

Dynasylan® for Cosmetics



Dynasylan®

Evonik. Power to create.

Dynasylan® as a high-performance additive in cosmetic formulations

Surface treatment of pigments and fillers is commonly used to improve the performance of a variety of cosmetic formulations. Such surface treated functional fillers are used in many cosmetic products in order to enhance:

- sensoric properties of the finished formulation on the skin (skin feel)
- physical properties (adhesion, oil absorption)
- optical properties (colour and gloss)

due to the customised surface energy and the smoothened surface of the otherwise rough filler particles.

Treated pigments compress more easily, permitting the formulation of pressed powders with low binder content, and allow maximum loadings with negligible viscosity increase by minimising their interaction with other formulation ingredients.

Besides modifying the surface characteristics of the filler, processing effects like de-agglomeration optimise the processability of formulations enabling new product forms, e. g. compressed cream powder formulations or other water-in-oil emulsion formulations.

The most effective surface treatment is via a covalent chemical bond between the filler and the surface treatment agent. This leads to a shear-resistant permanent surface treatment of fillers and pigments used in aqueous or anhydrous dispersed formulations.

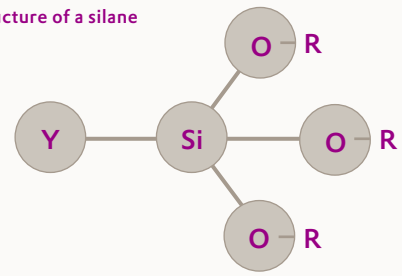
Dynasylan® Functional Silanes act as encapsulation binders as well as functional modifiers to adjust the water or oil repellency and optimise the handling and stability behaviour of cosmetic formulations such as dispersions or emulsions.

Silanes are the perfect fit as a treatment agent due to the ease of hydrolysis of the substituents bonded to a silicon atom. The silicon functional group (OR) reacts in the presence of water to form silanol groups (Si-OH) which can condense with the hydroxyl groups present on fillers, pigments and metal oxide surfaces or self-associate to form stable bonds (Si-O-filler or Si-O-Si). The organofunctional group (Y) can be tailor-made depending on the nature of the formulation vehicle and the properties that need to be achieved. Because Si-C bonds are stable and not subject to hydrolysis, silanes act as effective coupling agents for many common cosmetic fillers, including talc, mica, and silicates, as well as metal oxide pigments, such as titanium dioxide, zinc oxide, and iron oxide.

Alkylsilanes with a chain length of the Y groups from C1 to C16, with the majority of commercial functional materials being treated with C8, are commonly used to improve the compatibility of pigments with organic waxes and oils. Such treated pigments are more hydrophobic, can be wetted more easily by cosmetic oils, and can hence be used in anhydrous products or water-in-oil formulations like sun screens when water-resistance is targeted. They can without effort be homogenously dispersed in oils or silicones, so the active ingredients can spread rapidly and consistently on the skin or hair and can hence be used for example in mascaras and foundations. The excellent wetting behaviour allows extremely high pigment loads in order to achieve a powdery velvet touch sensation on the skin while allowing excellent handling due to the low melt viscosity, e.g. for hot filling. The effective coupling via an alkylsilane can hence be a benefit with regard to reduced tack in the formulation of lip sticks, eye shadows and blushes by utilising "non-sticky/non-tacky" inorganic pigments. In practice, silanes utilised in such an application are ethoxy-based silanes due to the relatively benign nature of their by-product ethanol.

					Applications						
Product	Chemical Name / INCI Name	Flash Point, degrees	Solidification Point	Viscosity (20 °C)	Dispersion	Encapsulation	Coupling	Hydrophilicity	Hydrophobicity	Oleophobicity	Example of available certificates
Dynasylan® 4150	Polyether-functional trimethoxysilane/ Methoxy PEG-10 Propyltrimethoxysilane	≥ 95 °C/ ≥ 203 °F	≤ –10 °C/ ≤ 14 °F	10–20 mPas	■			■			Certificate of Heavy Metals, Certificate of specified Microorganisms
Dynasylan® AMEO	3-aminopropyltriethoxysilane/ Aminopropyl Triethoxysilane	93 °C/ 199 °F	–	1.85 mPas			■				
Dynasylan® F 8261	Fluoroalkyltriethoxysilane/ Perfluorooctyl Triethoxysilane	85 °C/ 185 °F	–	3.5 mPas					■	■	
Dynasylan® MTES	Methyltriethoxysilane/ Methyltriethoxysilane	30 °C/ 86 °F	–	0.6 mPas		■					
Dynasylan® OCTEO	Octyltriethoxysilane/ Triethoxycaprylylsilane	≥ 93 °C/ ≥ 199 °F	–	2 mPas	■				■		
Dynasylan® 9116	Hexadecyltrimethoxysilane/ Cetyl Trimethoxysilane	165 °C/ 329 °F	–	7 mPas	■				■		

Simplified structure of a silane



Y = Organo-functional group
OR = Silicon-functional group

- **Adhesion** of organic resins on inorganic materials
- **Coupling** of inorganic particles in resins and polymers
- **Dispersion** of inorganic particles in organic matrices
- **Crosslinking** of polymers

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