

Dynasylan® 40

Ethyl polysilicate

Technical data

Properties and test methods	Value	Unit	Method
Flash point	> 62	°C	DIN 51755
Density (20 °C)	1.050 - 1.070	g/cm ³	DIN 51757
Viscosity (20 °C)	approx. 5.0	mPa·s	DIN 53015
SiO ₂ content	40.0 - 42.0	% by weight	AN-SAA 0851

Registrations

Dynasylan® 40

EINECS/ELINCS (EU):	Yes
AICS (Australia):	Yes
DSL/NDSL (Canada):	Yes
PICCS (Philippines):	Yes
TSCA (USA):	Yes
IECS (P.R. China):	Yes
ENCS (Japan):	Yes
ECL (South Korea):	Yes

Dynasylan® 40 is an ethyl silicate with a silicon dioxide content of approximately 40 - 42 % upon complete hydrolysis.

Dynasylan® 40 is formed in the presence of water from tetraethyl silicate (Si[OEt]₄) by partial hydrolysis of the ethoxy groups to hydroxyl groups and subsequent condensation with formation of siloxane bonds (-Si-O-Si-).

Dynasylan® 40 is a colorless, low-viscosity liquid with an SiO₂ content of 40%. The polysilicic acids still have a sufficient content of ethoxy groups which can be activated by acid- or base-catalyzed hydrolysis. Condensation starts even during hydrolysis, with the formation of relatively large polymeric molecules. During storage of these hydrolysates, condensation continues until a gel is formed, where the rate depends on the degree of hydrolysis.

The action of the hydrolysates as binders is based on the continuation of the hydrolysis with subsequent gelation and dehydration to give polymeric SiO₂ structures.

Safety and handling

Before considering the use of Dynasylan® and Protectosil® products please read its Material Safety Data sheet (MSDS) thoroughly for safety and toxicological data as well as for information on proper transportation, storage and use. The Material Safety Data Sheet is available after registration on our website www.dynasylan.com or upon request from your local representative, customer service or from Evonik Industries AG, Product Safety Department, E-MAIL sds-im@evonik.com.

Packaging and storage

In an unopened container **Dynasylan® 40** has a shelf life of 12 months. **Dynasylan® 40** is supplied ready to use in 25, 215 kg drums or in 900 kg and 1.000 kg containers.

Properties and application

Similarly to **Dynasylan® A**, **Dynasylan® 40** is used to deposit silicic acid formed as a result of complete hydrolysis. The resulting silicic acid bonds well to many inorganic substrates, such as glass, ceramic, metal, fillers, pigments and synthetic fibers. The deposition of a thin SiO₂ layer improves the chemical and thermal stability and mechanical properties.

Other applications are:

- crosslinker component in cold-curing silicone rubber systems
- binder, especially as a **Dynasylan® 40** hydrolysates for molds used e.g. in the precision foundry industry.
- hardening component in dentistry for impression materials and as binder for embedding material

Dynasylan® 40 is also used as starting material for sol-gel processes. It is usually used in conjunction with alkylsilanes (e.g.

Dynasylan® PTEO) organofunctional silanes and/or organic precursors (e.g. organic resins) to form siloxane networks. This makes it possible to obtain highly scratch-, abrasion- and chemical-resistant coatings.

Dynasylan® 40 is immiscible with water, so hydrolysis therefore requires a cosolvent as solubilizer. Mineral acids and ammonia are suitable as catalysts.

Dynasylan® 40 or its hydrolysates are also the binder component for 1- and 2-pack zinc dust paints, crucial for corrosion protection on steel.

Dynasylan® 40 as binder for 1-pack zinc dust paints

The hydrolysis and condensation reaction of **Dynasylan® 40** is catalysed through via basic compounds such as diethanolamin.

Dynasylan® 40 zinc dust paints or binders catalysed in such manner have an excellent storage stability (under exclusion of moisture). Through addition of a physically drying binder, such as an acrylate, the initial hardness of the coating can be improved dramatically.

Such zinc dust paints cure rapidly with ambient humidity through hydrolysis and condensation. Further information can be found in the product information of **Dynasylan® MKS** and **S 100**.

Dynasylan® 40 as binder in 2-pack zinc dust paints.

The binders are hydrolysates made by mixing of **Dynasylan® 40** with selected solvents (e.g. alcohols, ethers), water, and an acid.

Important for the reaction behavior and storage stability is the amount of water added to the system. 2-pack systems usually have an SiO₂-content of about 20 % and a degree of hydrolysis of about 85 - 95%. The higher the amount of water that has been added, the lower the storage stability of the hydrolysate system.

The pH of the system is changed through the addition of zinc dust, and condensation starts. The pot life of such a hydrolysate will be about 8-16 hours.

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