DuPont™ Tyzor® Organic Titanates
Product Information - Tyzor® NPZ

Description

DuPont™ TYZOR® NPZ, zirconium tetra-n-propanolate CAS# 23519-77-9, is a highly reactive organic alkoxy zirconate containing ca. 28 % n-propanol.. TYZOR® NPZ is a yellowish brown organic flammable liquid. It is very sensitive to moisture. Main use of TYZOR® NPZ is for cross-linking in nonaqueous systems, catalysis, surface modification, and adhesion promotion. TYZOR® NPZ is soluble in or miscible with many organic solvents or products. To prevent undesired pre-reactions the products must be anhydrous.

Typical Properties of TYZOR NPZ *

Property	Value	Unit
Molecular weight	327 (solvent free product)	g/mol
ZrO_2 content	ca. 28	%
Density (20 °C)	ca.1.07	g/cm^3
Viscosity (20 °C)	ca. 80	mPa*s
Refractive index (20 °C)	ca. 1.445	
Pourpoint	ca. - 70	°C
Flash point	ca. 21-25	°C
solvent content (n-propanol)	ca. 28	%

* This table gives typical properties. DuPont does not make any express or implied warranty that these products will continue to have these typical properties.

Reactions

TYZOR® NPZ reacts very fast with water under hydrolysis forming n-butanol and reactive zirconium oxide hydrate or zirconium dioxide. With alcohols a quick exchange of alkoxy groups occurs. TYZOR® NPZ can be base material for titanates with higher alkoxy groups. By reaction with chelating agents the corresponding zirconium chelates are formed which have a lower reactivity. TYZOR® NPZ acts as Lewis acid giving fast catalysis under mild conditions in many applications such as esterification / transesterification, polycondensation, olefin polymerization (Ziegler-Natta), etc. The high reactivity of TYZOR® NPZ enables the interaction with low reactive functional groups such as OH or COOH groups of polymers, mineral substrate or metals effecting coating, adhesion promotion or cross-linking of polymers. By thermal treatment (> 350 °C) TYZOR® NPZ is decomposed to ZrO_2 giving very thin layers of ZrO_2 on different substrates such as glass, minerals, pigments, metals. Hereby the surface hardness, the chemical resistance and the adhesion properties can be improved.

Advantages

TYZOR® NPZ is an important constituent in many applications that demand decisive product and processing advantages. Examples are:

Polymerization
(Ziegler-Natta) (PE, PP, polybutadiene etc.): stereoselectivity, *low pressure, and effective process*

Esterification
(polyester, different esters) elimination *of by products, high yield, easy work up*

Transesterification
[(meth) acrylic esters / polyester for different applications such as fibers, films, UP resins, paint binder different esters] *mild conditions, no by products, high yield, easy work up, low catalyst concentrations*

Amide / polyamide formation
(carboxylic amide, polyamide from acid/ester) mild *conditions, high yield*, low catalyst concentrations

Coating
(glass, metal treatment, filler, pigment coating): *surface hardness, adhesion promotion, improved dispersibility , coloring effects, heat and light reflection, corrosion resistance*

Paints

crosslinking of paint binders, adhesion promotion, binder for high temperature paints

Oxides via sol-gel process:

simple process for special oxides as coatings, glasses or for encapsulating of different materials

Processing

TYZOR® NPZ can be used as additive, as coating/primer or in sol-gel systems as base material.

Applications

Catalyst: As esterification catalyst TYZOR® NPZ is used in an amount of ca 0.01-1 %. TYZOR® NPZ is often added as the last ingredient of the reaction components to prevent undesired pre-reactions. Transesterifications can be run at low temperatures, < 100 °C. Esterifications (e.g. polyester preparation) need temperatures of > 180 °C. TYZOT NPZ can be used for Ziegler-Natta catalysis but is mainly used in combination with Ti, Mg or Al compounds.

Crosslinking: For cross-linking reactions TYZOR® NPZ is added to the polymer or binder in concentrations of ca. 0.5 - 5 %. The reactivity of TYZOR® NPZ is very high.

Coating: Zirconium dioxide layers can be prepared by thermal or hydrolytic processes. Thermal decomposition occurs at > 350 - 600 °C. By spraying, dipping or brushing of the substrate from solutions and subsequent hydrolysis by moisture yields ZrO_2 layers.

Primer: TYZOR® NPZ can be used as a primer by applying in very low concentrations of ca. 0.1-5 % in an anhydrous organic solvent. Heating after application to ca. 80-100 °C for a short time will fix the ZrO2 on the surface.

Sol-Gel: Total or partial hydrolysis of TYZOR® NPZ preferably in the presence of chelating agents or in combination with other metal alkoxides gives a sol-gel that can be used as a binder, coating, artificial glass or ceramic.

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