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

Description

DuPont™ TYZOR® BTP, n-Butyl polytitanate, CAS:9022-96-2, titanium tetrabutanolate, polymer is a reactive organic polymeric alkoxy titanate with 100 % active content; it is a partial condensate of TYZOR® TBT. TYZOR® BTP is a yellowish organic flammable liquid. The main uses of TYZOR® BTP are for titanate based binder, cross-linking in nonaqueous systems, catalysis, and surface modification. TYZOR® BTP is soluble in or miscible with many organic solvents or products. Examples of solvents are aliphatic and aromatic hydrocarbons, alcohols, (>C_2), esters. To prevent undesired pre-reactions the products must be anhydrous.

Typical Properties of TYZOR® BTP *

Property	Value	Unit
Molecular weight	ca. 1000-1500	g/mol
TiO_2 content	ca. 34.5	%
Density (20 °C)	ca. 1.13	g/cm^3
Viscosity (20 °C)	ca. 2000-6000	mPa*s
Color/Gardner	max. 3	Gardner
Pour point	ca - 39	°C
Vapor pressure (20°C)	< 1	hPa
Flash point	ca. 32-38	°C

* 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® BTP reacts with water under hydrolysis forming butanol and reactive titanium oxide hydrate or titanium dioxide. With alcohols a quick exchange of alkoxy groups occurs. By reaction with chelating agents (e.g. acetylacetone, ethylacetoacetate or alkanolamine) the corresponding titanium chelates can be formed which have a lower reactivity. TYZOR® BTP acts as Lewis acid causing catalysis under mild conditions in many applications such as esterification / transesterification, polycondensation etc.

The high reactivity of TYZOR® BTP enables the interaction with low reactive functional groups such as OH or COOH groups of polymers, mineral substrates or metals effecting coating, adhesion promotion or cross-linking of polymers. By thermal treatment (> 350 °C) TYZOR® BTP is decomposed to TiO_2.

Advantages

TYZOR® BTP is an important or essential constituent in a wide range of products and formulations and delivers many advantages over not-in-kind products with similar function.

Transesterification and direct esterification: Advantages: *mild conditions, no by products, high yield, easy work up, low catalyst concentrations*

Coatings: *surface hardness, corrosion resistance, chemical resistance, adhesion promotion, improved dispersibility , coloring effects, heat and light reflection, iridescence, compatibility with solvents.*

Paints: *crosslinking of paint binders, adhesion promotion, binder for high temperature paints.*

Oxides via sol-gel process: *simple process for special oxides as coatings, as glasses or for encapsulating of different materials*

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

Applications

Catalyst: As an esterification catalyst, TYZOR® BTP is used in an amount of ca 0.01-1 %. The titanate is often added as the last ingredient of the reaction components to prevent undesired pre-reactions. Transesterifications can run already at low temperatures (> 100 °C). Higher temperatures are necessary for direct esterification of carboxylic acids and to complete the reaction.

Crosslinking: TYZOR® BTP is added to the polymer/binder in concentrations of ca. 0.1 - 3 % for cross-linking reactions.

Coating: Titanium dioxide layers form by thermal or hydrolytic decomposition processes. Thermal decomposition occurs at > 350 - 600 °C. By spraying, dipping or brushing of a substrate from

solutions and subsequent pyrolysis by heating the surface or hydrolysis by moisture (and heating) TiO_2 layers are formed. Control of humidity will limit surface powder formation and provide a continuous film. Desired humidity is 30-60% RH.

Primer: As primer TYZOR® BTP is applied normally in very low concentrations of ca. 0.1-5 % in a compatible organic solvent. Heating after application to ca. 80-100 °C for a short time might be of advantage. Control of humidity will limit surface powder formation and provide a continuous film. Desired humidity is 30-60% RH.

Sol-Gel: Total or partial hydrolysis of TYZOR® BTP (if necessary in the presence of chelating agents) sometimes in combination with other metal alkoxides affords via a sol-gel step metal oxides for use as binder or coating.

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