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Eastman Texanol™ ester alcohol

As a carrier for benzophenone

Introduction

This technical tip outlines a method for dissolving benzophenone using Eastman Texanol™ ester alcohol as a non-VOC carrier. Using Texanol to dissolve benzophenone will help the customer incorporate benzophenone into their paint formulation while not increasing the VOC level of the paint.

Due to consumer awareness of health and well-being, formulators are looking for ways to improve paint performance while striving to reduce VOC level in the paint.

Benzophenone is widely used as a photoinitiator in UV-curing applications and in architectural exterior wall paint. It can also be used as a photoinitiator to initiate latex polymer cross-linking, increasing film hardness and resulting in improved dirt pickup resistance (DPUR) of the paint film.

Benzophenone is crystalline powder at room temperature and is not soluble in water. Conventionally, it is dissolved in a solvent like acetone first, then postadded to the paint. This approach will increase the VOC level of the formulation, especially in waterborne architectural paints where formulators are looking for ways to reduce VOC.

Texanol dissolves benzophenone in concentrations up to 40% while not contributing to the VOC level as Texanol is not a VOC in Asia and Europe. In this approach, the formulator can have a solution that easily incorporates benzophenone to improve the film's DPUR without increasing the VOC level of paint.

VOC status

With a boiling point of 254°C (vapor pressure 0.01 kPa @ 20°C), Texanol is not classified as a VOC according to European Union Decopaint Directive 2004/42/EC (commonly referred to as the Decopaint Directive); European Union Solvent Emissions Directive); and the China State Environmental Protection Administration. Due to its non-VOC status, low toxicity, and biodegradability, Eastman Texanol™ ester alcohol has been awarded Green Label Type II certificate (low toxicity, non-VOC, and environmental friendly biodegradable product) in China by the China Environmental United Certification Co. Ltd. (CEC), a wholly owned subsidiary of the State Environmental Protection Administration of China (SEPA).

Eastman Texanol™ ester alcohol—Key attributes

- Efficient
- Versatile
- Ease of use
- Excellent hydrolytic stability
- Low water solubility
- Low freezing point
- Low flammability rating
- Non-HAP
- Non-SARA
- Zero VOC under EU 2004 Decopaint Directive

Conclusion

Texanol is an ideal choice of carrier for benzophenone. As the gold standard of coalescent, Texanol will help maximize the film formation of your paint. The ability to dissolve up to 40% benzophenone in Texanol allows an easy way to incorporate this additive in the paint without contributing to the VOC level of the paint.

Appendix

Benzophenone is an organic compound with the formula (C6H5)2CO. Structure is shown below.

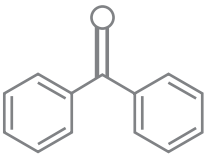

Table 1. Basic properties of benzophenone

Appearance	White crystalline powder
Melting point	48°C
Boiling point	305°C
Specific gravity (20°/4°C)	1.1146
Refractive index	1.6077
Solubility in water	Insoluble (<0.1 wt%)
Solubility in other solvents	Easily soluble in acetone Soluble in methanol, diethyl ether

Table 2. Typical properties of Eastman Texanol™ ester alcohol

Property	Typical value, units
Acidity, as acetic acid	0.05 wt% max.
Assay	98.5 wt% min.
Autoignition temperature	393°C (739°F)
Boiling point @ 760 mm Hg	254°C (489°F)
Color, Pt-Co	10 max.
Critical pressure	19.9 ATM
Critical temperature	391.9°C
Critical volume	718.6 mL/g·mol
Electrical resistance	>20 megohms
Empirical formula	$C_{12}H_{24}O_3$
Evaporation rate	
(*n*-butyl acetate = 1)	0.002
(ether = 1)	6051
Expansion coefficient per °C @ 20°C	0.001
Flash point, Cleveland Open Cup	120°C (248°F)
Freezing point	–50°C (–58°F)
Hansen solubility parameters	
Nonpolar	7.4
Polar	3
Hydrogen bonding	4.8
Total	9.3
Heat of combustion	–1607.7 kcal/g·mol
Heat of vaporization	15196 cal/g·mol
Liquid heat capacity @ 25°C	110.74 cal/(g·mol)(°C)
Liquid viscosity @ 20°C	13.5 cP (mPa·s)
Molecular weight	216.3
Nitrocellulose solubility	Active
Refractive index @ 20°C	1.4423
Solubility	
In water @ 20°C	0.1%
Water in @ 20°C	3.0%
Specific gravity @ 20°C/20°C	0.95
Surface tension @ 20°C	28.9 dynes/cm
Vapor density (air = 1)	7.5
Vapor pressure	
@ 20°C	0.0013 KPa (0.01 mm Hg)
25°C	0.00173 KPa
55°C	0.033 KPa
Wt/vol @ 20°C	0.95 kg/L (7.9 lb/gal)

Properties reported here are typical of average lots. Eastman makes no representation that the material in any particular shipment will conform exactly to the values given.

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