

Dendritic Oligomers



Dendrimers are characterized as being perfect symmetrical star- or ball-shaped polymers that are built up layer by layer. They require a multi-stage polymerization process and have mono-disperse molecular weight distributions. Dendrimers have extremely interesting properties but are difficult to prepare and are prohibitively expensive for most applications.

Dendritic oligomers mimic the performance of dendrimers but have a slightly irregular shape and have polydisperse molecular weight distributions. One major benefit to using dendritics instead of dendrimers is that they are available at a significantly lower cost.

Dendritics in UV Light-Cure Coatings

Dendritic thioether oligomers form hyper-branched polymer networks when cured to themselves, to other monomers, and to oligomers. They are known to have an acrylated functionality of 6 or greater. Dendritic thioether oligomers can be incorporated into formulations as the primary oligomer component but can also be effective as additive levels of 0.5 to 10% to enhance cure or increase tensile strength and modulus. Dendritic oligomers are more spherical than rod-shaped, and because of this, they have significantly lower viscosity than typical linear oligomers of comparable molecular weights. This makes them ideal for use in high-temperature, low-viscosity applications for a variety of industries when exceptional mechanical and physical properties are needed.

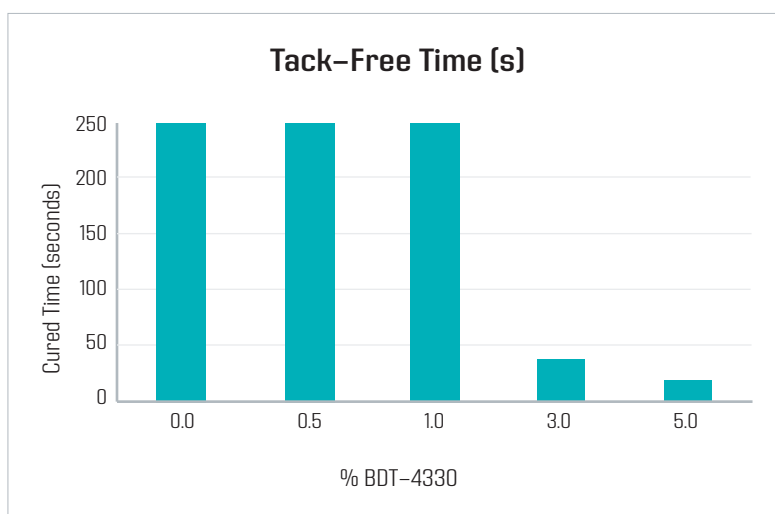
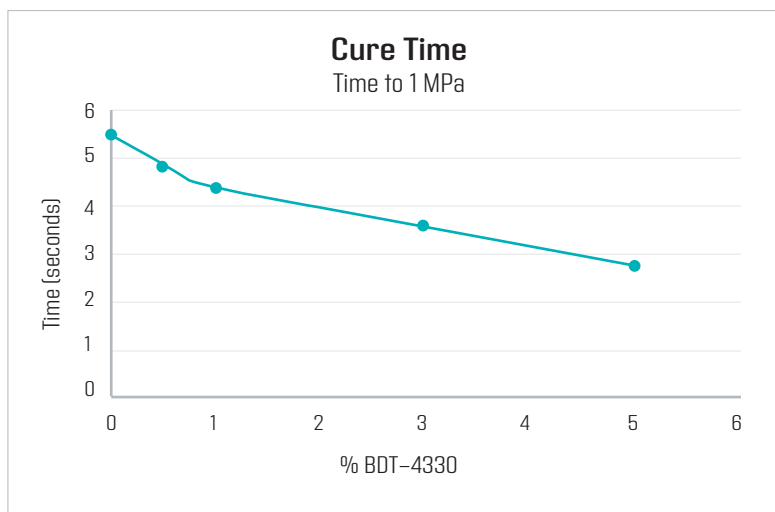
- High acrylate functionality
- Fast, tack-free curing for faster processing and no defects from early handling
- Low viscosity
- Low oxygen inhibition
- Comparative low shrinkage for complete and uniform coverage
- Superior acid and chemical resistance
- Elevated decomposition temperatures from 370°C to 420°C
- Excellent adhesion to a variety of substrates including ABS, SS, PC, PMMA, glass, and AL
- Scratch and abrasion resistance
- Tin-free material

Cure Enhancement

The highly functional BDT-4330 can increase cure speed and accomplish tack-free curing in oligomers that may not previously have these properties. Using an internal test method, cure time is defined as the amount of time it takes a curing formulation to reach 1 Mpa of modulus. Below is an example of the reduction in cure time that can be achieved when blending BDT-4330 into an otherwise slow-curing oligomer, BR-5541M. The oligomer is diluted with 30% IBOA as a base formula and increasing amounts of BDT-4330 are added to determine its effects on fixture time. A dramatic decrease occurs as more BDT-4330 is added, 5.5 seconds at 0.0% to 2.75 seconds at 5.0%.

A tack-free test is conducted using the same formulations described above with increasing amounts of BDT-4330. A droplet of material is cured by 385nm flood at 300 mW/cm² and smeared. A material that does not produce a visible smear is considered tack free. The material, BR-5541M, is an example of extreme conditions; much smaller amounts of BDT-4330 are needed for materials that cure almost tack free.

BDT-4330 in small amounts can be used to make a non-tack-free coating tack-free for Flexo printing press applications.



Bomar Dendritic Oligomers

Bomar's line of dendritic oligomers offers exceptional mechanical and physical properties along with excellent adhesion to a variety of substrates that include ABS, acrylic, aluminum, glass, polycarbonate, PMMA, polyester, and stainless steel. These oligomers are known to be resistant to decomposition at high temperatures with BDT-4330 being resistant up to 419°C. They also offer excellent acid and chemical resistance. When tested, BDT-4330 was unaffected after 24 hours of being in contact with Drano, nitric acid, yellow mustard, and hydrochloric acid.

Oligomer	Functionality	Uncured Properties	50:50 oligomer & TMPTA with 1% Omnirad™ 481			
			Mechanical Properties			
		Viscosity, cP	Tensile Strength	Elongation	Elastic Modulus	Durometer Hardness
BDT-1006	6	1,500 @ 25°C	2,500 psi	3%	105 ksi	94D
BDT-1015*	15	31,000 @ 25°C	3,400 psi	1.4%	284 ksi	93D
BDT-4330	30	4,000 @ 50°C	2,100 psi	2%	104 ksi	96D
XDT-1018	18	50,000 @ 25°C	8,100 psi	4%	218 ksi	83D

*Formulated with 50:50 oligomer and TMPTA with 2% Omnirad™ 481

***Bomar® BDT-1006, BDT-1015, BDT-4330, & XDT-1018 are available for sampling now.
Custom dendritic oligomers are created upon request.***

