## 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

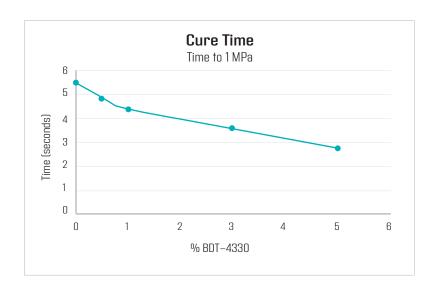


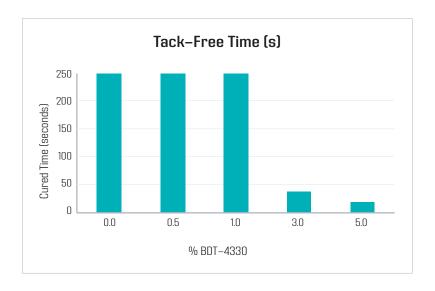
## **Cure Enhancement**

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

<sup>\*</sup>Formulated with 50:50 oligomer and TMPTA with 2%  $0 \mathrm{mnirad}^{\mathrm{IM}}$  481

Bomar® BDT-1006, BDT-1015, BDT-4330, & XDT-1018 are available for sampling now.

Custom dendritic oligomers are created upon request.

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