

# Water-Dilutable Urethane Acrylate UV-Curing Technology

## Water-Based UV Oligomers, What Are They?

Water-based acrylate formulations can be made from either emulsions or water-soluble and water-thinnable urethane acrylates. Most waterborne polyurethane polymers are prepared through the inclusion of hydrophilic moieties within the polymeric structure. Unfortunately, this modification has been shown to have a negative impact on the polymer's physical properties, including water sensitivity and chemical resistance. Shelf stability of the water-diluted polymer is also a concern requiring the use of neutralizers, co-solvents, or a specific level of water dilution, limiting the options of the formulator.

## Waterborne UV Oligomers in Coating

Bomar™ XR-9416 oligomer represents a breakthrough in technology. This oligomer incorporates hydrophilic moiety within the polymeric structure that can be diluted into water up to 50% of the concentration without additives and will still possess good physical properties after cure. The most impressive breakthrough is that this material has substantial water resistance after cure, a property standard waterborne materials do not have. The oligomer's water resistance results in a water-barrier coating that has anti-fogging characteristics. In addition, these systems also offer the following desired benefits:

- saving on production, energy, and shipping costs;
- superior weathering, chemical, and solvent resistance;
- the substitution of water for solvents helps the environment by significantly reducing VOCs (Volatile Organic Compounds).



The 100%-solids, uncured material has a lower viscosity (7,000 cP at 25°C) when compared to standard waterborne materials, contains no water, and is infinitely dilutable. If desirable, this oligomer can be diluted with up to 50% water by weight in order to optimize the liquid viscosity and obtain the desired spray pattern and droplet size. All water-based systems require some oven drying that is dependent upon time, temperature, and substrate. Depending on the oven used, the flash time will vary; however, a typical flash time would be 5 to 10 minutes at 60°C in a lab oven.



Bomar™ XR-9416 oligomer provides similar properties to the broader range of urethane acrylates and is most often used in screen inks and coatings for paper, concrete, and wood. For wood coatings, there is a strong interest in water-based UV-curable coatings. When water penetrates the wood, the wood swells at the surface and improves the adhesion of the coating. With waterborne oligomers there is no need for a separate primer step to achieve the best adhesion. A 50:50 mixture of XR-9416 and IBOA shows good adhesion to a variety of substrates including ABS, acrylic, aluminum, wood, cold rolled steel, glass, and stainless steel. After cure, tack-free, tough, and flexible coatings are formed with excellent water, chemical, and stain resistance. Furthermore, XR-9416 can be formulated as both high- and low-gloss coatings.

Bomar Oligomer	Functionality	50:50 oligomer & IBOA with 2% Omnirad™ 481				
		Uncured Solution Viscosity	Cured Mechanical Properties			Cured Durometer Hardness
			Tensile strength	Elongation	Elastic Modulus	
XR-9416	3	175 cP at 25°C	5,160 psi	4 %	155.6 ksi	84D

***Bomar XR-9416 oligomer is available for sampling now.  
Custom water-dilutable oligomers and coatings are created upon request.***



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