



Water Soluble Resins

Waterborne UV coatings are not only gaining share in the wood segment but also in the ink and plastic markets. The waterborne UV chemistry allows to completely eliminate the VOC emissions and still provide some low viscosity coatings.

Three approaches can be used to design a UV water-based formulation:

- Emulsion (UV- resins dispersed into water with emulsifier and high shear forces)
- Dispersion (UV- PUD or UV-PAD)
- Water soluble UV resins.

In opposite to the first two water-borne UV technologies, the water-soluble chemistry has the main advantage of allowing the addition of water just before the application. In addition of having the cost advantage (no-water transportation and no use of anti-fungus), the formulator has also the flexibility in the solid content and has a better storage stability.

PRODUCTS:

The table below describes the Sartomer products which could be diluted with water:

Product	Product Description
CN132	Low viscosity aliphatic diacrylate oligomer
CN2555	Polyester acrylate
CN2560	Low viscosity polyester acrylate
CN9245	Aliphatic Urethane Triacrylate
SR344	Polyethylene glycol 400 diacrylate
SR610	Polyethylene glycol 600 diacrylate
CD9038	Ethoxylated ₃₀ Bisphenol A diacrylate
SR415	Ethoxylated ₂₀ trimethylolpropane triacrylate
SR9035	Ethoxylated ₁₅ trimethylolpropane triacrylate

CN132 is a low viscosity aliphatic epoxy acrylate. This product imparts a good reactivity and a good outdoor resistance to the inks or coatings.

The acrylated polyester oligomers **CN2555** and **CN2560** have been developed to be used in ink formulations. These oligomers impart good pigment wetting and cure speeds to UV/EB water-based inks. They can also be used for clear coats.

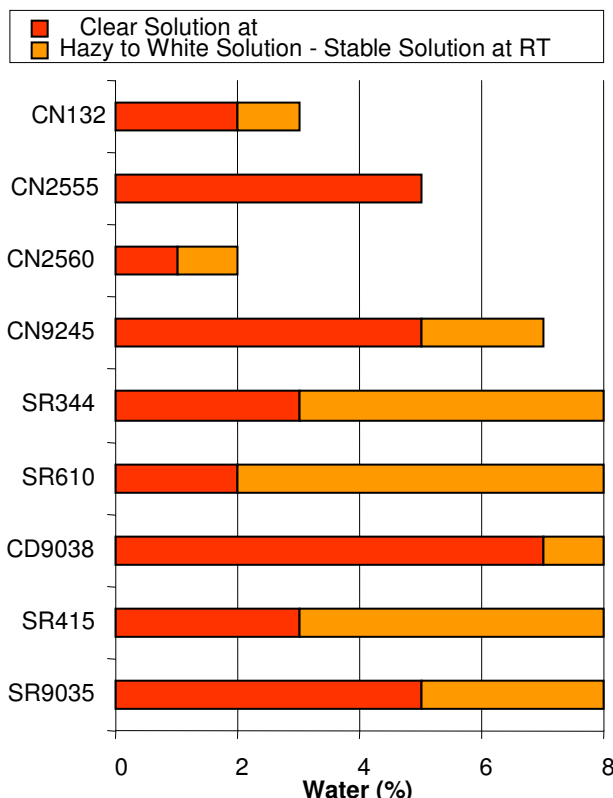
CN9245 is an aliphatic Urethane acrylate used for water-based wood primer.

SR344 and **SR610** are polyethylene glycol diacrylates producing soft and flexible films. The ethoxylated units improve the cure speed with a photoinitiator system containing some benzophenone.

CD9038, **SR415** and **SR9035** are highly ethoxylated multifunctional monomers. They are very reactive and flexible.

WATER SOLUBILITY:

The water-compatibility of these products mainly changes with their chemical backbone. One of the methods to determine the water-solubility is to measure the haze of these resins with water.





The haze increases when the compatibility between the UV product and the water starts decreasing. At that moment, there is formation of resins micro-droplets in the water giving a white aspect to the blend. The aqueous solution is still stable but opaque.

The monomers have a low viscosity. Nevertheless they can still be diluted with water as shown in the graph below.

VISCOSITY DECREASE:

In the case of water-soluble products, it is possible to achieve low viscosity formulations by diluting UV oligomers with monomers and also to use water as diluent, accepting the flash-off before UV cure.

As the UV curable oligomers are high viscosity products, the formulator is interested in getting their viscosity decrease versus the quantity of water. The below figure shows the viscosity curves of some oligomers versus water. When the mixture water/Oligomer starts to be unstable, it isn't possible to get a viscosity measurement.

