



**Owensboro Specialty Polymers, Inc.**  
Chemistry that Connects, People that Care

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# Custom Formulations for the Adhesives Industry

**Owensboro Specialty Polymers, Inc.**  
5529 US 60 E.  
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OSP\_TDS\_DaratakFactSheet2\_Rev.2

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# **Custom Formulations for the Adhesives Industry**

Owensboro Specialty Polymers, Inc. (OSP) is not a manufacturer of adhesives but a supplier of basic raw materials and technology for those who do manufacture adhesives. In our role as a supplier, OSP is proud of the high quality level of its adhesive emulsions and the performance of its polymers.

Daratak<sup>®</sup> polyvinyl acetate polymers produce useful, versatile, and relatively inexpensive adhesives. They offer excellent aging properties, fast setting speeds, good moisture resistance, obtain high bond strengths, and can be easily modified for use in specific bonding applications.

With the wide range of polyvinyl acetate emulsions available today, adhesive chemists can solve many adhesive problems better than ever before. However, the formulator must have adequate information to select the proper polymer for a particular formulation.

OSP can provide you with a wide variety of custom-prepared adhesive polymers. We offer vinyl acetate homopolymers and copolymers, vinylidene chloride, and acrylic copolymers manufactured with different types of emulsifier system (PVOH, HEC, surfactant, polymerizable surfactants) which impart special properties for the adhesive chemist.

## **Emulsifier Systems**

Daratak polyvinyl acetate homopolymers form tough, hard films with a slightly opaque clarity. The emulsifier system and particle size will generally have the greatest affect on water resistance, setting speed, viscosity, clarity, etc.

## **Polyvinyl Alcohol**

Polyvinyl Alcohol (PVOH) is the most widely used protective colloid in polyvinyl acetate polymerizations. It has excellent compatibility with polyvinyl acetates and, for this reason PVOH stabilized systems exhibit excellent mechanical stability and film consolidation properties. They can be easily compounded with standard adhesive ingredients. In addition, finished adhesives usually exhibit excellent machinability. PVOH is water-soluble and polymers based on it have a tendency to be water sensitive. PVOH stabilized emulsions are borax-sensitive, as well, which may be undesirable in certain application such as laminating, labeling, wood adhesives, etc. To address these problems, other emulsifier systems are used.

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## **Hydroxy Ethyl Cellulose**

Polyvinyl acetate emulsions polymerized with hydroxy ethyl cellulose (HEC) as their protective colloid are borax-tolerant and exhibit better water resistance. In many cases, they may be loaded with more pigments and fillers. Compounding is, usually, not as easy and more agitation is required. It is generally difficult to attain high molecular weight polymers with this system. There is, for example, no hydroxyl ethyl cellulose-stabilized counterpart to Daratak 56L, which is the highest molecular weight polyvinyl acetate emulsion produced by OSP. In addition to borax-compatibility, HEC-stabilized latexes exhibit excellent compatibility with starches, dextrans, fire retardant additives, and reactive pigments (Zn, MG, etc.).

## **Colloid-Free Emulsions**

Our third group of polymers is called micro-particles. That is the manufactured emulsions contain no protective colloid. The particle size is less than 10% of polyvinyl alcohol-stabilized products and 20% of the size of the common hydroxyl ethyl cellulose-stabilized products. The smaller particle size improves water resistance and penetration into materials to be coated or glued. In addition, some of our newer products contain polymerizable surfactants which not only react and become part of the polymer backbone, but also impart stability to the emulsion. This allows OSP to lower levels of surfactant and protective colloid below traditional levels. These lower surfactant levels result in improved setting speed, water resistance, and adhesion.

In addition to modifying the emulsifier system of our adhesive polymers, different copolymers provide various performance characteristics.

## **Acrylic as Comonomer**

There is a wide range of acrylates that can be copolymerized with vinyl acetate to bring about improved polymer performance.

Generally, as the alkyl group is extended (e.g., ethyl acrylate to butyl acrylate) the polymer becomes softer. In fact, poly 2-ethyl hexylacrylate is so soft it can impart tack (or pressure-sensitivity) to an adhesive dry film.

Daratak 90L is a pressure-sensitive emulsion which gains its tack from its acrylic components on the polymer backbone

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Frequently, a small amount of acrylic acid or methacrylic acid is polymerized into the polymer backbone to modify performance. The “carboxylation” can improve adhesion to polar surfaces as well as increase the cohesive strength of the adhesive by creating intermolecular bonds between the polymer chains. Carboxylation can also increase emulsion stability because of the polar nature of these groups.

### **Dibutyl Maleate as a Comonomer**

Dibutyl Maleate, when reacted with vinyl acetate, will result in a polymer that is often termed “internally-plasticized.” As post addition of a plasticizer to a PVAc softens the polymer, this comonomer also yields a “softer” adhesive. Internally-plasticized vinyl acetate copolymers offer many advantages (and some disadvantages) to an adhesive emulsion. Care must be taken to ensure the proper polymer emulsion choice is made.

#### ***Advantages of Internal Plasticization***

- Improved adhesion
- Improved film clarity
- Lower minimum film formation temperatures
- Lower heat seal temperatures
- Improved water resistance
- Improved elongation

#### ***Disadvantages of Internal Plasticization***

- Higher cost
- Lower heat resistance
- Decreased creep resistance
- Lower tensile strengths
- Lower resistance to blocking

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