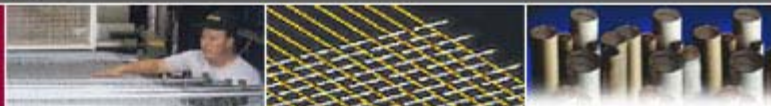




DuPont Packaging &amp; Industrial Polymers

## Product Information



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### Elvanol® in Water-Based Adhesives

The unique combination of properties inherent in Elvanol® has resulted in its use in a wide variety of industrial adhesives. Water solubility - combined with high tensile strength, flexibility, and tack or tackiness - makes it one of the most useful synthetic polymers in the adhesives industry. Elvanol® polyvinyl alcohol is widely used in industrial adhesives for paper and paperboard, and in general purpose adhesives for bonding paper, textiles, leather, wood, and porous ceramic surfaces.

Completely hydrolyzed grades are used in quick-setting water resistant adhesives including paper-laminating adhesives for use in the manufacture of solid fiberboard, spiral wound tubes, cores and drums, and laminated specialties. In many of these applications Elvanol® is combined with extenders such as clay. Elvanol® is also used as a modifier for adhesives based on resin emulsions, particularly polyvinyl acetate. In these applications, polyvinyl alcohol functions as a protective colloid, emulsifier, thickener, and film former. The higher molecular weight grades of Elvanol® permit the use of lower adhesive solids by contributing to higher solution viscosity; they also provide excellent mechanical stability properties.

#### Water Resistant Adhesives for Paper

Elvanol® - alone, and combined with extenders, clays, and insolubilizers - is used extensively in the preparation of high wet-strength adhesives for paper. Combinations of Elvanol® with starch or clay are especially effective and economical. When maximum water resistance is required, fully hydrolyzed grades - for example, Elvanol® 71-30 - are usually selected. Solutions of these grades tend to form a gel structure on long storage; therefore, where shelf life of the adhesive is important, the special gel-resistant grades Elvanol® 75-15 and Elvanol® 85-82 may be used. If maximum viscosity is needed, the fully hydrolyzed grades are usually the most effective and economical grades. The partially hydrolyzed grades, Elvanol® 50-42, Elvanol® 52-22, and Elvanol® 51-05, are often used for special applications where water resistance is not required.

Adhesive manufacturers have taken advantage of the cold-water insolubility of Elvanol® to produce water-resistant adhesives. Basically these adhesives contain Elvanol®, extended with an acid-type clay. These adhesives are used in manufacturing water-resistant solid fiberboard, for laminating paper, and fabricating paper bags.

Elvanol® 85-91 is a medium viscosity tackified polyvinyl alcohol for use in adhesives for cellulosic substrates where a high degree of wet back and/or water resistance is required. In addition to fast bonding speed, adhesives formulated using Elvanol® 85-91 have good flow properties at high machine speeds.

#### Remoistenable Adhesives

The partially hydrolyzed grades of Elvanol® are usually selected for this application since they are more sensitive to cold water than the completely hydrolyzed grades. When Elvanol® is used as a remoistenable adhesive, there is less tendency for the coated paper to curl, and problems due to blocking or sticking at high humidities are eliminated. Elvanol® 52-22 is generally selected for this application, but in some special cases Elvanol® 51-05 may be preferred because of its lower viscosity.

#### Binder Adhesives

Elvanol®-based adhesives are also used as binders for nonwoven fabrics, cementitious building products, and ceramics. For most applications where Elvanol® is used as a binder, excellent results can be obtained by using as little as a 3-5% solution.

#### Emulsions and Dispersions

Elvanol® polyvinyl alcohol is used widely as an emulsifier and protective colloid in the emulsion

polymerization of vinyl acetate and ethylene/vinyl acetate to form high-solids emulsions with outstanding stability and excellent adhesive properties. It is also effective in preparing stable polystyrene and styrene/butadiene copolymer latices, and in bead or suspension polymerization of vinyl monomers including vinyl acetate, styrene and vinyl chloride. Elvanol® can be used to control particle size and particle size distribution. Elvanol® polyvinyl alcohols function both as nonionic emulsifiers and protective colloids in the preparation of oil-in-water type emulsions and dispersions. The Elvanol® also retards creaming and settling by acting as a viscosity builder in the continuous phase. Both surfactancy and effectiveness as a protective colloid increase as the residual vinyl acetate content of the Elvanol® increases, i.e., with decreasing percent hydrolysis. The protective colloid property does not appear to be affected by molecular weight, while the viscosity-building effect increases with increasing molecular weight.

Thus, the partially hydrolyzed grades 50-42, 52-22, and 51-05 are preferred for emulsion applications. These grades can be used singly or in combination to obtain the desired balance between particle size, emulsion viscosity, and stability. A fully hydrolyzed grade, e.g., Elvanol® 75-15, is sometimes selected in preference to more surface active grades because of its lower water sensitivity. The concentration of Elvanol® used to produce stable emulsions or dispersions containing 30-50% of the dispersed phase is generally from 2 to 5%, based on the total weight of emulsion.

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