

Versatic™ Acids and Derivatives



Veova™ Monomers
for Pressure Sensitive
Adhesives

Hexion Inc. (Hexion) is the leading global supplier of Versatic acids, vinyl esters, glycidyl esters and adducts for the coatings, adhesives and composite industries.

As a long-trusted supplier of Versatic derivatives to the construction and wood adhesive market, Hexion is now broadening the Veova product line for use in pressure sensitive adhesive (PSA) applications.

Behind the Veova brand is a one-of-a-kind monomer range which expands the acrylate toolbox to enable the development of 'all vinyl' systems for PSA applications.

Hexion – Partner for Innovation

Hexion continues to expand its range of monomer technologies and to strengthen its global presence with dedicated regional organizations and strategic manufacturing investments.

Focusing on functional monomers and unique building blocks for manufacturing high performance and cost efficient pressure sensitive adhesives, Hexion is committed to supporting customer innovation from development through commercialization.

The Veova Monomer Series

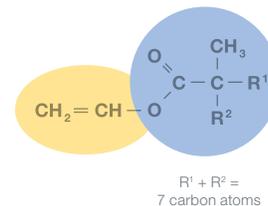
Vinyl Ester

- Easily copolymerisable with vinyl acetate, ethylene, acrylates and methacrylates.

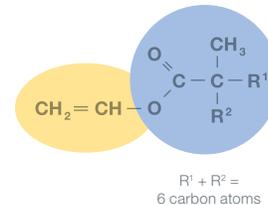
Aliphatic Bulky Structure

- Hydrophobic
- Low surface tension
- UV Resistant
- Hydrolytically stable
- Development of novel functional monomers
- Lab scale polymer synthesis
- Testing capabilities
- Transfer of starting polymerization recipes
- Strong technical service involvement

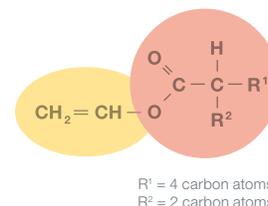
Veova 10



Veova 9



Veova EH

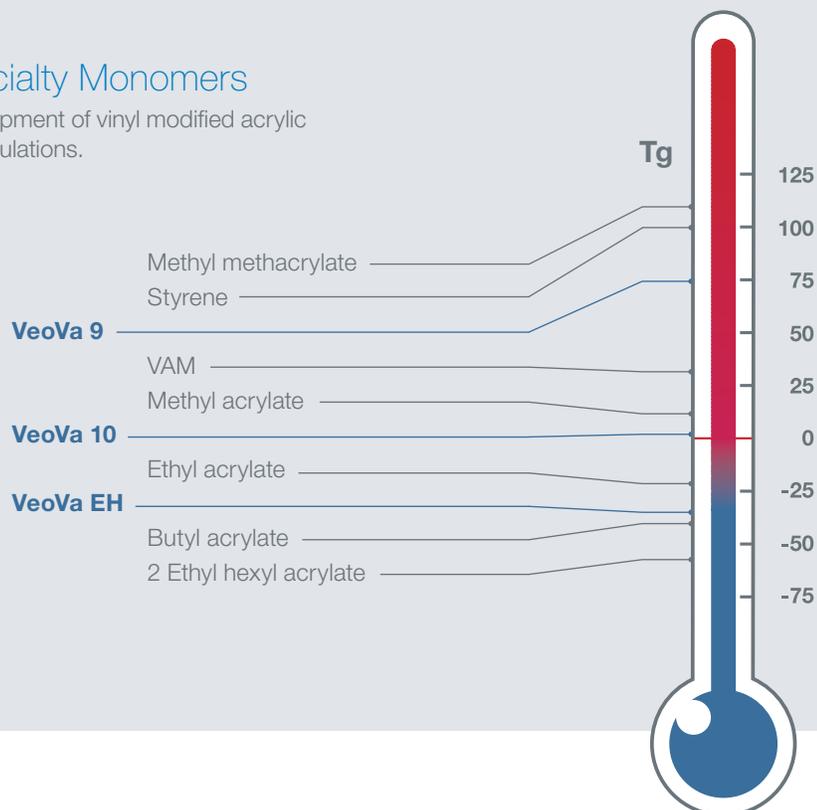


A Broad Range of Specialty Monomers

Veova monomers enable the development of vinyl modified acrylic PSAs and modified vinylic PSA formulations.

Comparison of Glass Transition Temperatures

Hexion is developing new Veova monomers to further expand the Tg range of the series.



Veova 10 monomer is the vinyl ester of Versatic Acid 10 (Tg -3 °C), a highly branched and saturated carboxylic acid containing 10 carbon atoms. Veova 10 monomer has a unique aliphatic bulky structure that affords polymers hydrophobic properties and a good balance of adhesive properties as well.

Veova 9 monomer is the vinyl ester of Versatic Acid 9. This monomer's significantly higher Tg (70 °C) helps to increase polymer strength.

Veova EH monomer is the vinyl ester of 2-ethylhexanoic acid. This monomer's significantly lower Tg (-36 °C) provides polymers with greater flexibility and tack.

These Veova monomers can be combined to design polymers for a variety of adhesive applications.

Comparison of PSA Properties for Different Emulsion Systems

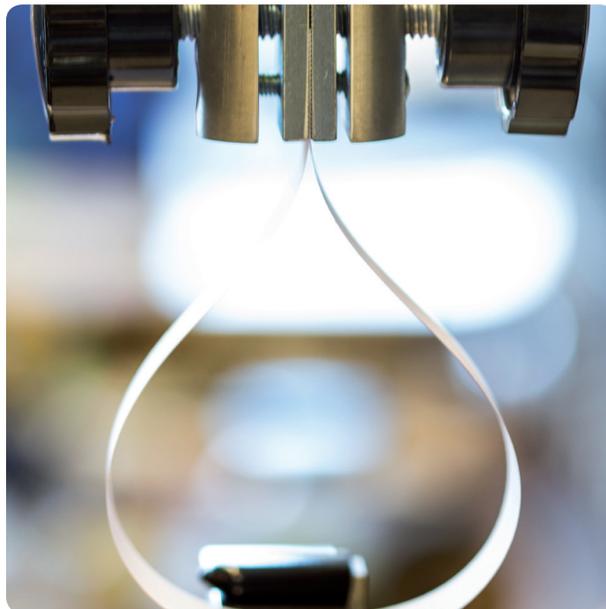
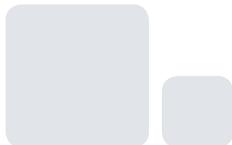
Emulsion Properties	Acrylic	Veova Modified Acrylic*	Veova Modified Vinylic*
Adhesive properties			
Adhesion to polar substrates	■ ■	■ ■	■ ■
Adhesion to low surface energy substrates	■	■ ■	■ ■ ■
Tack	■ ■	■ ■	■ ■
Shear strength	■	■ ■ ■	■ ■ ■
Adhesion / cohesion balance	■	■ ■ ■	■ ■ ■
Water resistance properties			
Water resistance	■	■ ■	■
Water whitening resistance	■	■ ■	■
Environmental properties			
Solvent / gasoline resistance	■ ■	■ ■	■ ■
High temperature resistance	■ ■ ■	■ ■ ■	■ ■ ■
Alkaline resistance	■ ■	■ ■ ■	■ ■

■ medium ■ ■ good ■ ■ ■ excellent

* Hexion can provide starting recipes, samples of emulsions and detailed technical data for polymer systems optimized towards a target application and property profile.

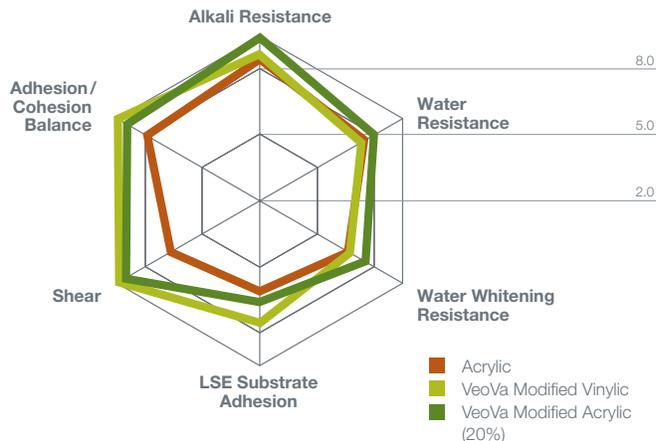
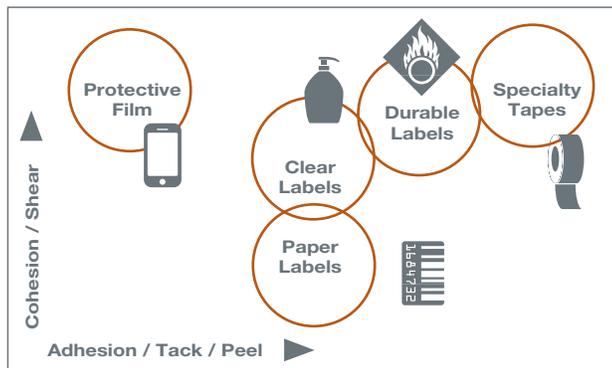
Benefits of Veova Monomers in Pressure Sensitive Adhesives

- Very high shear strength
- Optimal adhesion / cohesion balance
- Good water resistance
- Low water whitening
- High humidity resistance
- Reduced water vapor permeability
- Good adhesion to low surface energy substrates
- Grades suitable for indirect food contact



Your Solution to Create Change in Chemistry.

Veova Vinyl Ester Monomers for High-End PSA Applications.



The Perfect Balance of Adhesion and Cohesion

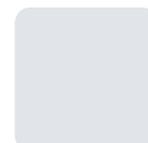
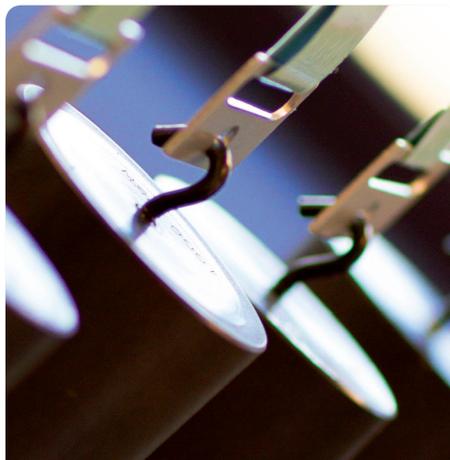
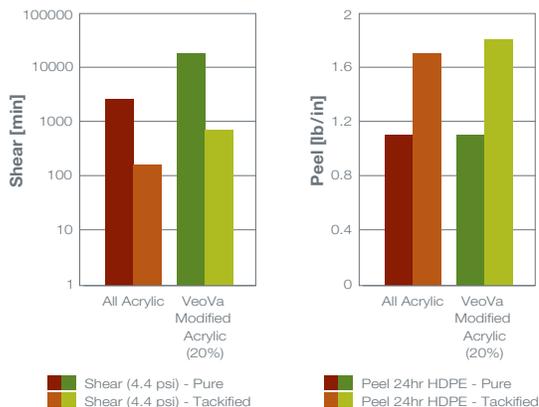
As an intrinsic property of pressure sensitive adhesives, adhesion is a particular challenge for tapes, filmic labels and in general for low surface energy substrates.

Veova vinyl ester monomers ease the design of high performing pressure sensitive adhesives by leveraging balanced adhesion and cohesion parameters. Veova monomers enable the creation of different PSA systems based upon end user requirements without compromising the adhesion / cohesion balance, all while minimizing the use of tackifiers.

Veova vinyl ester monomers allow for the formulation of **high tack PSAs with outstanding cohesion**, even at a relatively low coating weight.

Higher cohesion means cleaner die cutting / slitting and reduced edge bleed, which benefit conversion processes and the storage of roll / sheet material.

Superior Shear Levels and Improved Cohesion / Adhesion Balance



Tapes

There are many demanding end-uses that require higher performance than those of general purpose tapes.

Specialty tapes intended for outdoor applications must be highly durable, resistant to temperature, water and UV exposure and adhere to plastics. When used in automotive, transportation or industrial applications, tape must also often be resistant to high and / or low temperatures.

For all tape applications, VeoVa vinyl ester monomers in waterborne PSAs deliver the most desirable combination **of high cohesion with a good balance of tack and peel.**

Chemical Resistance

Solvents can deteriorate PSAs, swelling, softening or even dissolving the adhesive. For labeling applications such as automotive (under the hood labels), drum labeling, laboratory chemical labels, etc., PSAs need good chemical / solvent resistance. VeoVa vinyl ester monomer based PSAs' **extreme cohesive strength** allows them to **withstand many different types of solvent, including gasoline**, extended periods of time.

As an example the **alkali resistance** of these pressure-sensitive adhesives exceeds industry standards. Alkali resistance can be easily assessed by measuring the percentage of ester bonds which are hydrolyzed in its presence. This property is beneficial in the development of durable labels.

Durable Labels

Industrial and commercial items including chemical drums, pharmaceutical packages, automotive surfaces, construction materials, and electrical appliances require labels which can withstand service in harsh environments or under rough handling conditions. Durable PSAs are needed to meet these challenging application requirements.

High performance binders based on VeoVa vinyl ester monomers allow formulation of waterborne PSAs able to achieve critical long-term performance for durable labels. Waterborne PSAs based on VeoVa vinyl ester monomers meet and can exceed resistance requirements for **high temperature, humidity, UV, alkalinity and exterior durability.**

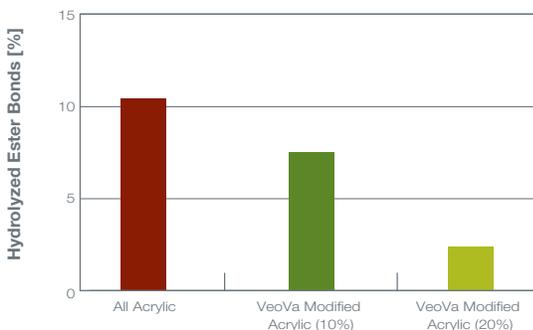
Temperature Resistance

PSA performance is highly temperature dependent. Tack decreases at low temperatures as polymer mobility is reduced. Conversely, high temperatures increase polymer flow and impair cohesive strength and the ability to withstand shear forces.

Several PSA applications can benefit from high and / or low temperature resistance. These include automotive labels for disc brakes and engine blocks, specialty industrial tapes, food packaging labels, etc.

PSAs based on VeoVa vinyl ester monomers withstand severe hot shear tests (65 °C for one week) and SAFT testing up to 205 °C. VeoVa monomers enable the development of waterborne emulsion PSAs with an **excellent balance of heat resistance and adhesion retention.**

Benchmark - Alkali Resistance



Filmic Labels

Clear labels are used in a variety of applications including packaging for the food & beverage and personal care industries. The pressure sensitive adhesive has to stick to low energy surfaces without sacrificing clarity or moisture resistance.

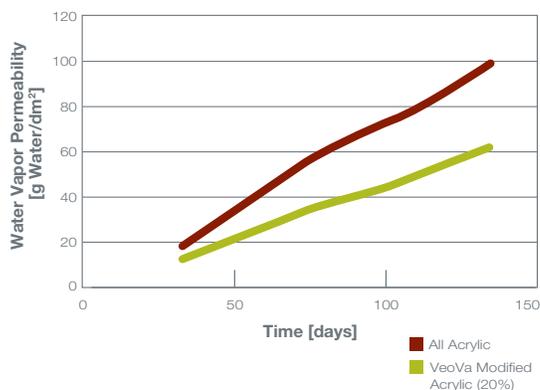
In a market driven by environmental regulations and performance improvements, Momentive's range of Veova monomers enables the development of low VOC, waterborne adhesives with enhanced performances at reduced system cost.

Pressure sensitive adhesives based on Veova monomers meet or exceed filmic label requirements for **low water whitening, adhesion retention after water immersion, and adhesion to low surface energy substrates**. Veova based PSAs have **excellent clarity, good tackifier response and improved adhesion / cohesion balance** for labels as well as temporary and permanent protective films.

Water Vapor Permeability

Thanks to the hydrophobic nature of Veova 10 monomer, it can be used to develop PSA materials that act as **barriers against water vapor**. These, in turn, can form insulating sealants with superior atmospheric moisture resistance for modern, energy efficient buildings.

Water Vapor Permeability



Increased Hydrophobicity of Veova modified PSA



Water contact angle all acrylic PSA

Water contact angle Veova modified PSA (20%)

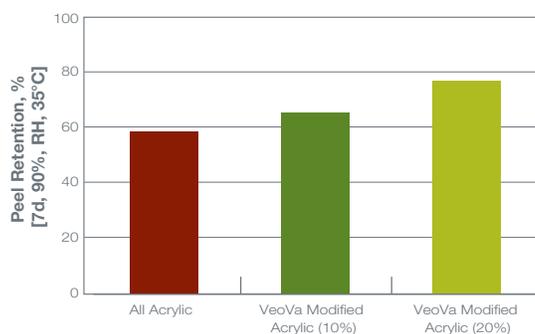
The water contact angle measurement is an easy way to assess the polar character of a PSA film surface. Hydrophobic Veova vinyl ester monomers modify acrylic backbones by reducing the polarity of the PSA film surface. Thus, Veova monomer greatly improves an adhesive's ability to wet out and adhere to low surface energy substrates.

Humidity Resistance

In wet environments, humidity and moisture may adversely affect performance of a PSA. If the adhesive film absorbs water, adhesion/ cohesion will be reduced.

When designed with Veova vinyl ester monomers, window, door or roof insulation tapes **retain peel even after prolonged exposure to high humidity**. **The enhanced humidity resistance** of Veova PSA systems make them suitable for appliance labels and outdoor graphics as well as building and construction applications.

Peel Retention



Paper Labels

PSA labels are used in almost every market segment to display information and for product decoration and branding. Labels produced in sheets and rolls must function reliably in every stage of processing with no loss of adhesion. A versatile adhesive is able to cope with varied surfaces, temperatures and service.

Veova vinyl ester monomers can deliver waterborne PSAs suitable for general purpose or specialty paper label applications. **Superior cohesive strength and heat / humidity resistance** offer performance benefits for die cutting and slitting processes. Sticky edges are reduced. Shelf life and adhesive stability meeting industry standards can be assured.

Cost effective high-tack formulations with good adhesion on polar and nonpolar substrates and rough or curved surfaces can be achieved using standard tackifier additions to tailor performance. Adhesives can be designed to satisfy label and packaging industry regulatory requirements. The performance advantages available in Veova monomer general purpose products can also be exploited for specialty paper label formulations.

Water and Whitening Resistance

Water resistance and low water whitening are very important properties for filmic labels used in high humidity and/or exterior applications such as shampoo bottle labels or printed self-adhesive films for graphic or decorative applications.

The water resistance of waterborne PSAs depends on the binder's chemical composition. Veova vinyl ester monomers enable the development of **highly hydrophobic PSAs with improved water whitening resistance.**

Excellent Water Whitening Resistance After 24h in Water



Your Solution to Create Change in Chemistry.

Hexion: Helping you make it in today's world.

Our global team produces the best in specialty chemicals and performance materials and provides the technical expertise to customize them to your exact needs. The result? Specific solutions, not generic products, leading to thousands of breakthroughs that improve bottom lines and enhance lives.

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