HEXION
Responsible Chemistry

Information Sheet

Water-Resistant Wood Adhesives

VeoVa™ Vinyl Esters

Wood Adhesives for Non-Structural Applications

Polyvinyl Acetate Based Wood Adhesives

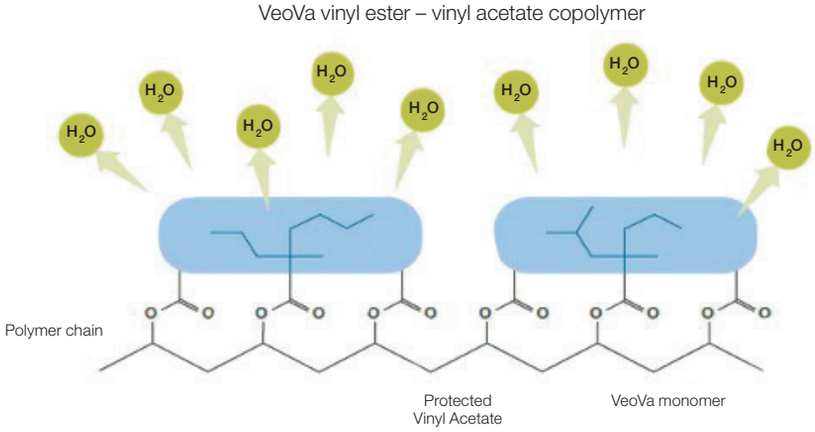
Waterborne wood adhesives for non-structural applications are commonly formulated with polyvinyl acetate (PVA) emulsions stabilized with polyvinyl alcohol (PVOH). Durability of wood adhesives is highly related to the performance of the adhesive bond under both dry and wet conditions. Self-crosslinkable polymers that offer high durability in 1K systems require carefull balancing of properties and storage stability of the formulated adhesives. Highly hydrophobic VeoVa monomers significantly improve the water and moisture resistance of polymers based on vinyl acetate, thus offering very high durability and excellent long-term storage stability.

PVA Emulsions Modified with VeoVa Vinyl Esters

VeoVa Vinyl Esters for Increased Performance

VeoVa vinyl esters are monomers with a unique bulky and hydrophobic structure. VeoVa monomers readily copolymerize in emulsion with hydrophylic vinyl acetate monomer (VAM) to yield polymers that are especially suitable for high-performance, water-resistant wood adhesives. The low Tg (-3°C) of VeoVa 10 vinyl ester furthermore reduces the need for external plasticisers and coalescing agents.

VeoVa vinyl ester – vinyl acetate copolymer



Crosslinkable 1K systems containing VeoVa vinyl esters offer a unique balance of properties such as high bond strength, excellent viscosity stability and a favorable rheological profile.

PVA latices modified with VeoVa vinyl esters and stabilized with PVOH are easily produced by a thermally initiated, semi-continuous manufacturing process.

Classification of Wood Adhesives

Durability Classes According to EN 204

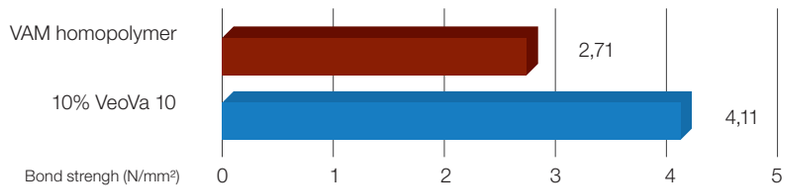
European Norm EN 204 classifies non-structural wood adhesives into durability classes from D1 to D4, based on the dry and wet strengths of bond lines measured after specified exposure conditions. The higher the D classification, the more resistant the adhesive bond is to moisture and humidity. Wood adhesives are classified as D3 if they are resistant to cold water and D4 if they are resistant to boiling water.

1K Hydrophobic Wood Adhesives

D3 with Broad Formulation Latitude

To fulfill the durability classification, adhesives are tested in accordance with EN 205 and need to reach defined adhesive strength for the various test sequences. Incorporation of VeoVa vinyl esters into the PVA backbone significantly improves the bond strength of the wood adhesive after immersion in cold water. Emulsions based on VeoVa vinyl esters enable the production of adhesives that can easily surpass the minimum requirements for D3 classification, resulting in broad formulation latitude.

Adhesive performance after water immersion (EN 205 – sequence 3 – cold water testing)

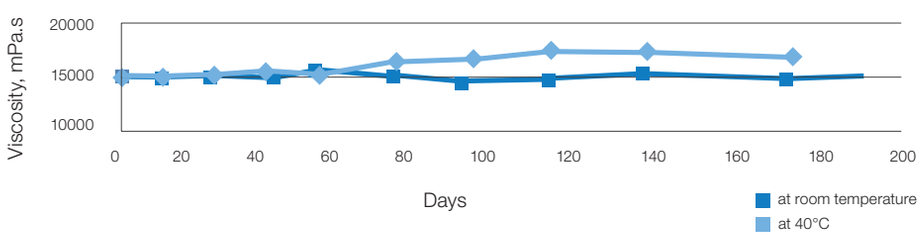


Stable Viscosity

PVA Emulsions Modified with VeoVa Vinyl Esters Exhibit Good Stability Upon Aging

Besides bond strength, another key requirement for wood adhesives is viscosity stability upon storage. 1K adhesives based on VeoVa vinyl esters exhibit good aging stability at room and elevated (40°C) temperatures. This can be achieved through emulsion polymer design, balancing low levels of internal crosslinkers (e.g. N-(hydroxymethyl) acrylamide) in combination with hydrophobic VeoVa monomers to develop excellent water resistance.

Aging of copolymers with 10% VeoVa 10 monomer (formulated)

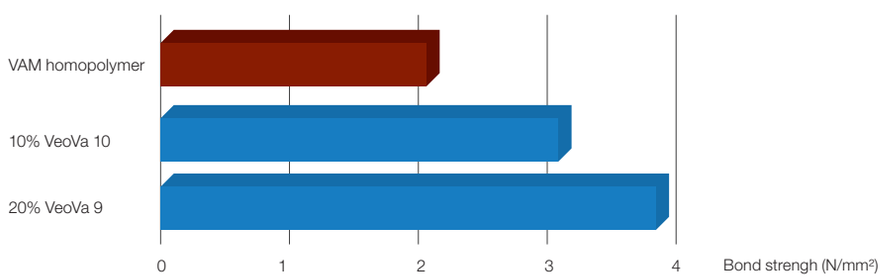


High Durability

Boiling Water Bond Strength

VeoVa monomers also significantly increase boiling water resistance, an indicator of an adhesive's performance in applications with long-term exposure to running or condensed water. VeoVa 9 monomer is very hydrophobic and has a high homopolymer Tg; thus, emulsions modified with VeoVa 9 monomer perform significantly better than vinyl acetate homopolymers.

Adhesive performance after water immersion (EN 205 – sequence 5 – boiling water testing)



Summary

Highly hydrophobic VeoVa vinyl esters are easily copolymerized in emulsion with vinyl acetate. The resulting latices can be formulated into high-performance water-resistant wood adhesives. Excellent durability and shelf life are achieved when using VeoVa vinyl esters.

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