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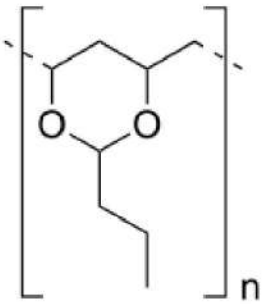
POLYVINYL BUTRYAL



Polyvinyl butyral - Molecular Formula : $(C_8H_{14}O_2)_n$

Polyvinyl butyral Properties

Appearance	White solid
CAS Number	63148-65-2
Density	1.08 g/cm^3
Melting Point	90-120°C
Solubility	In soluble
Boiling Point	660.6±65.0 °C at 760 mmHg
Flash Point	353.3±34.3 °C
Vapour Pressure	0.0±2.1 mmHg at 25°C0.0±2.1 mmHg at 25°C
Stability	Stable. Combustible. Dust may form explosive mixture with air. Incompatible with strong oxidizing agents
Synonyms	Poly(vinyl butyral);Poly[(2-propyl-1,3-dioxane-4,6-diyl)methylene];PVB;Polyvinyl Butyral Resin

The polyvinyl butyral is a hot-melt polymer compound in the form of white or yellowish powder particles. With high transparency, flexibility, high impact strength at low temperature, resistance to sun exposure, oxygen and ozone, wear resistance, resistance to inorganic acids and aliphatic hydrocarbons and other properties, and can and nitric acid fiber, phenolic, urea-formaldehyde, epoxy resins are mixed with the other phase to improve their performance. Soluble in alcohols, ethyl acetate, methyl ethyl ketone, cyclohexanone, methylene chloride and chloroform. It has good cold resistance and adhesion, and has good adhesion to metal, wood, ceramic, leather and fiber. Can be used for the intermediate layer and coating of safety glass.

Manufacture of polyvinyl butyral

The manufacture of polyvinyl butyral is described by reaction of polyvinyl alcohol in aqueous solution and butyric aldehyde comprising the following sequence of operations, an aqueous solution comprising between 8 and 15% by weight of polyvinyl alcohol, an acid catalyst and an emulsifier are incorporated therein, the mixture obtained is maintained maintained between 5 and 12 ° C. and with stirring butyric aldehyde in an amount sufficient to react with 75% at 88% of the polyvinyl alcohol of the mixture, the introduction of the butyric aldehyde being carried out gradually over a period such that the polyvinyl butyral precipitates between 10 and 90 minutes after the start of this introduction, the mixture is kept under stirring for a duration greater than 30 minutes at a temperature of 8 to 15 ° C, the temperature of the mixture is then raised to a value maintained between 60 and 80 ° C in a period of time between an hour and a half and 4 hours, when said temperature value is reached, a base is incorporated into the mixture until a pH of between 9 and 11 is obtained, the temperature is then maintained at said value for a period greater than a quarter of an hour, the precipitated polyvinyl butyral is separated from the mixture, and washed with water.

Polyvinyl butyral (PVB) is a clear, colorless, amorphous thermoplastic obtained by condensation reaction of polyvinyl alcohol and butyraldehyde. The resin is

known for its excellent flexibility, film-forming and good adhesion properties as well as outstanding UV resistance.

Polyvinyl butyral (or **PVB**) is a resin mostly used for applications that require strong binding, optical clarity, adhesion to many surfaces, toughness and flexibility. The major application is laminated safety glass for automobile windshields. PVB is also available as 3D printer filament that is stronger and more heat resistant than polylactic acid (PLA).

PVB is soluble in many organic solvents such as alcohol, esters, ketones, benzenes and many more, but the best is ethyl alcohol, commonly known as ethanol and it is non toxic and no side effects

you can dissolve PVB in ethanol solution containing 4-5% water at 60°C with stirring for few minutes (10 min). The solution can be cast into a mould and forme the final thin films. you can also use spincoater to deposit thin film .

APPLICATIONS

Polyvinyl Butyral resin has mainly used in the intermediate plastic film between security glasses for car and building, antirust primer, baking varnish, wood furniture paint, printing ink, adhesives of electronic ceramics and copper clad laminates. It can also be used as adhesives between metals, metal with plastic, and modifier of hot melt glue, and waterproof agent of textiles.

Use:

Binder for coatings.
Binder for printing inks.
Cobinder for powder coatings.
Temporary binder for ceramics.

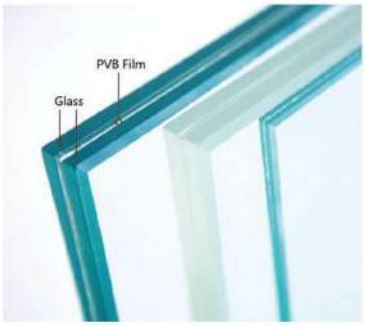
Binder for textile printing and non-woven.
Adhesives, pressure-sensitive adhesives,
hotmelts.

aerospace interior,

binder for abrasives and sandpaper ,
candle coatings,
cardboard packaging impregneations,
foundry aids ,
retro-reflecting films,
spot weldable paints,
welding rod impregnations ,
writing cores for pencils and
coloured pencils

AUTOMOTIVE AND ARCHITECTURAL

Laminated glass & Automotive Glass

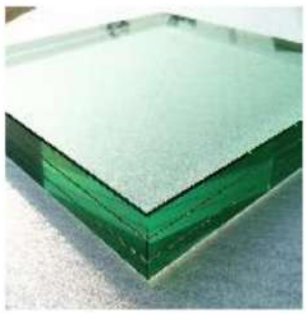


Laminated glass is a type of safety glass that holds together when shattered. In the event of breaking, it is held in place by a thin polymer interlayer, typically of polyvinyl butyral (PVB), between its two or more layers of glass. The interlayer, made through heat and pressure.

keeps the layers of glass bonded even when broken, and its high strength prevents the glass from breaking up into large sharp pieces. This produces a characteristic "spider web"

Cracking pattern when the impact is not enough to completely pierce the glass.

When laminated glass is broken, it is held in place by an interlayer, typically of polyvinyl butyral (PVB), between its two or more layers of glass, which crumble into small pieces.



The interlayer keeps the layers of glass bonded even when broken, and its toughening prevents the glass from breaking up into large sharp pieces. This produces a characteristic "spider web" cracking pattern (radial and concentric cracks) when the impact is not enough to completely pierce the glass.

Laminated glass is normally used when there is a possibility of human impact or where the glass could fall if shattered. Skylight glazing windshields typically use laminated glass. In geographical areas requiring hurricane-resistant construction, laminated glass is often used in exterior storefronts, curtain walls and windows.

The PVB interlayer also gives the glass a much higher sound insulation rating, due to the damping effect, and also blocks most of the incoming UV radiation (88% in window glass and 97.4% in windscreen glass)

PAINT

Wash primer

The best-known PVB resin application for metal paints is "wash primer".


It is widely used on a variety of metal surfaces, such as storage tank, ship, airplane, bridge, dam lock, electronic appliances etc. Wash primer is more effective than other corrosion inhibiting materials.

These anticorrosive primers adhere better and dry faster than conventional materials, and they are easy to be applied.

The good anchoring of the wash primer to metal is brought by a synthetic resin/ pigment/ phosphoric acid/ metal complex.

PVB films have low water absorption and good weather resistance.

Wood Paints

PVB is widely used as a component of wood sealers and finishes. It confers toughness, flexibility, impact resistance to the film and enables the coating to maintain adhesion under a wide variety of conditions. Combinations of PVB with phenolic resins, shellac and nitrocellulose are used commonly for wood coatings..
Leather Paints

PVB in combination with nitrocellulose and plasticizer have been used in paint for

leather. This paint has excellent adhesion, elongation, and crack-prevention properties.

Stoving Paints

Combination of PVB with hardening resins like phenolic, melamine and urea resin are suitable for stoving paints. A stoved film of phenolic resin without PVB is brittle and has poor leveling, but by adding 5-25% of PVB to the phenolic resin solid, the coating film will perform good flexibility, good leveling, free from pinholes, and good alkali resistance.

Powdery Paints

For powdery paints, PVB is blended with epoxy resins. It is effective in edge covering and in preventing from pulverization.

Printing Inks

PVB is used in manufacturing ink for gravure, letterpress and flexorgraphic printing. PVB offers good flexibility, adhesion and toughness.

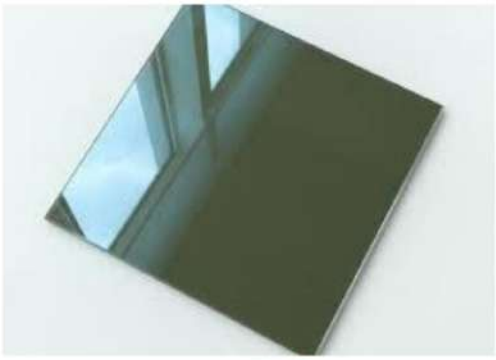
Low-viscous grades of PVB are frequently used as binders for flexographic and gravure printing inks. PVB based printing inks exhibit excellent adhesion to both organic and inorganic substrates. For this reason, they are suitable for printing on foils made of polyolefins, metal, cellulose acetate, polyester, cellophane, polyamide and polystyrene.

Owing to its good adhesive properties, PVB are used for printing on intermediate layers. If necessary, adhesion on difficult substrates can be improved by the addition of adhesion promoters.
Printing inks for heat sensitive packaging (hot sealing) are another important application area for PVB. Owing to their good solubility in alcohol, moreover, the PVB grades can be used to formulate alcohol-based printing inks. These inks do not corrode the printing plate and can be used on polymer based printing plates. Suitable solvents here are alcohols, e.g. ethanol, iso-propanol, n-butanol and diacetone alcohol, and esters, e.g. methyl, ethyl and n-butyl acetates.

Other Applications

Foil Coatings

To coat a metal foil (e.g. aluminum, brass, tin, lead, iron) with PVB solution, the foil strength and moisture-proofness is increased, and so its printability. The adhesion of the coating can be improved by stoving it at temperature up to about 140°C.



PVB 3mm Metallic Coating one way solar Reflective Glass

Adhesives

A mixture of PVB and phenolic resin may be used for bonding metal, glass, leather, wood, cloth, paper and other materials. After the solvent has been completely removed at room temperature or at a low bake, the surfaces are heated and pressed together. The curing time and temperature will depend on the material being bonded. For most applications, a treatment of 160°C for 15 to 30 minutes is suitable.

Owing to the excellent adhesion of PVB to glass and metals, various PVB grades are used to bond or laminate these materials to other substrates. PVB as adhesive can be applied as thin film, solid powder, solution or by fusion (hotmelt).

The adhesive compounds are first prepared by the PVB , the plasticiser and the appropriate additives in heated kneaders or extruders. These compounds are then applied to one of the substrates with heated rollers, nozzles or spray guns and are

finale bonded by applying heat and pressure. When -solvent-containing adhesives are used, the bond strength and -reaction time can be controlled by using phosphoric acid (metal lamination).

Printed-Circuit Board Adhesives

The most important properties of printed-circuit board adhesives are peel strength, blister resistance and dielectric properties and a mixture of PVB and phenolic resin can just be a good adhesive for this application. They are used in joining the prepregs of phenolic laminate with copper foil.

Hot-melt Adhesives

By fusing PVB with plasticizer and fluxing-extending resins, hot-melt adhesives providing a tough, clear film with good adhesive strength can be produced.

CERAMIC

Ceramic Binders

In the development of ceramic electronic component, PVB is used as the binder to give green strength to the ceramic powder.

PVB grades are outstanding temporary binders for the manufacture of high performance ceramics to be used in solid oxide fuel cells, piezo ceramics,

substrates or low temperature co-fired ceramics, and in passive components such as capacitors, inductors or resistors.

The extremely low ion content makes PVB most suitable for these special applications. During the sintering process, PVB combusts with virtually no residue.

metal pastes like in multilayer ceramic capacitator (MLCC)

PVB is acting as binder having already dispersing properties for the conductive metals. It is yielding paste (for internal electrode) which can be co-fired with green tapes in laminated ceramic substrates like multilayer ceramic capacitors (MLCC). Actually, the trend is towards thin films and conductor paths. Using PVB as binder for both, the ceramic green tapes reach best compatibility during co-firing and good dimensional stability before and after firing is observed.

TEXTILE

PVB applications in the textile field. By extrusion or dispersion coating, the polymeric material can be applied as a precoat to the pile-forming textile in order to secure the pile yarns. The backing functions as a cushioning material that compresses and recovers when loaded and released.

An early textile application of PVB was for use in military ponchos, in which two fabrics were bonded together by PVB. However, this interlayer would not be considered as a coating now. PVB was later used as a coating on nylon fabrics for the same purpose and also as sealant for seams. Ultimately, these techniques were

replaced by polyurethane coating. A niche application of PVB is the conservation of historic clothing.

PVB can be used to make the printing ink of transfer paper for textile.

PVB can be used for textile coatings, textile printings and textile yarn sizing agents.