



® Mowital

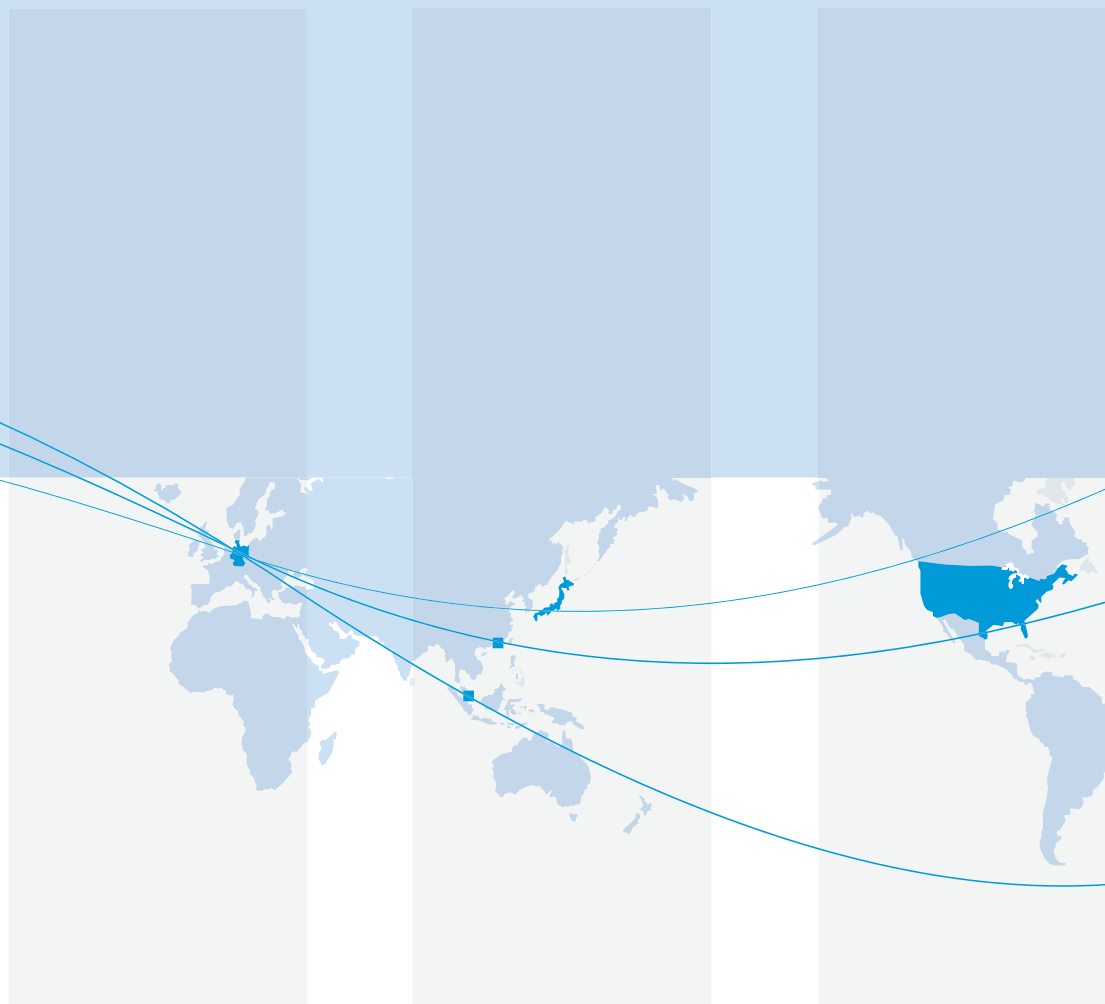
Polyvinyl butyral of
superior quality

Specialized in Specialities

Kuraray in Europe

Kuraray in Asia

Kuraray in North America



Kuraray in Europe. Four companies are in charge of the operative and financial activities of the Kuraray Group in Europe. Kuraray Finance Europe is primarily responsible for the Group's financial activities. Operative business, distribution, and production of chemical specialities are in the hands of Kuraray Specialities Europe, based in Frankfurt, and EVAL Europe, located in Antwerp. Kuraray Europe in Düsseldorf handles European distribution for all of the Kuraray Group's other business areas.

Kuraray in North America. In the United States, Kuraray has group companies concentrated in Kuraray

Holdings USA. Septon Company of America and Eval Company of America are in charge of production and operative business. Kuraray America Inc. is responsible for imports, and Kuraray Finance America takes care of the Group's financial activities.

Kuraray in Asia. Four companies handle the Kuraray Group's business in Asia. While Kuraray Hong Kong, Kuraray Singapore, and Kuraray Specialities Asia are mainly responsible for sales and market development, Poval Asia focuses on the production of polyvinyl alcohols, products for which Kuraray is the largest supplier world-wide.

Contents	
Production of Mowital	4
Product range	6
Nomenclature	7
Packaging and storage	7
Waste disposal	7
8	Mowital and its properties
10	Comparison of viscosities
11	Distinguishing features
12	Average molar mass and degree of polymerisation
13	Dynamic viscosity and softening range
	<hr/>
Solubility	14
	<hr/>
16	Cross-linking reactions
Mowital and its applications	18
Application areas	20
Primers	24
Lacquers and coatings	25
Printing inks	27
Films for laminated safety glass	29
Temporary binders	30
Adhesives	31
Special applications	32
34	Dialogue service



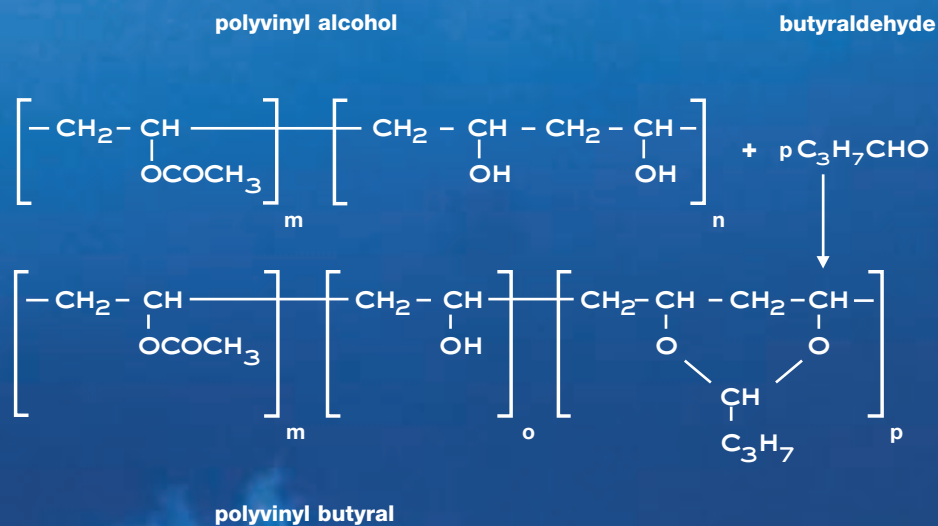
What is Mowital? Under the name Mowital, Kuraray Specialities Europe (KSE) produces polyvinyl butyral resins whose properties are determined by the presence of butyral, hydroxyl and acetyl groups. With its excellent adhesive and film-forming properties, its strong binding power and its outstanding optical transparency, Mowital is unquestionably a versatile thermoplastic material. Today the main areas of application of Mowital include safety glass inter-layers, paints, lacquers and varnishes (e.g. primers for metals and anti-corrosion paints), printing inks, temporary binders and adhesives.

Production of Mowital. The principal manufacturing processes for the production of polyvinyl butyral were developed in the years 1929 to 1939. Polyvinyl butyrals have been produced for more than 50 years at the Frankfurt-Höchst Industrial Park. This is a product tradition which KSE continues by constantly optimising existing applications and developing innovative new uses. The company currently produces around 20,000 metric tons of Mowital annually at the Frankfurt-Höchst production site.

Polyvinyl acetates with different molecular weights serve as the starting materials for the production of Mowital. Polyvinyl alcohols (PVA) are produced from polyvinyl acetates via transesterification. The reaction of the aqueous polyvinyl alcohol solution with butyraldehyde in the presence of small amounts of mineral acid yields polyvinyl butyral. The polyvinyl butyral precipitate is filtered off the aqueous liquor, washed and dried. Since not all hydroxyl groups (OH) of the polyvinyl alcohol react with butyraldehyde, however, Mowital invariably contains a certain percentage of hydroxyl groups. Moreover, a small percentage of acetyl groups always remains in the Mowital polymer chain from the upstream transesterification during which polyvinyl acetate is converted to polyvinyl alcohol.

Production of Mowital



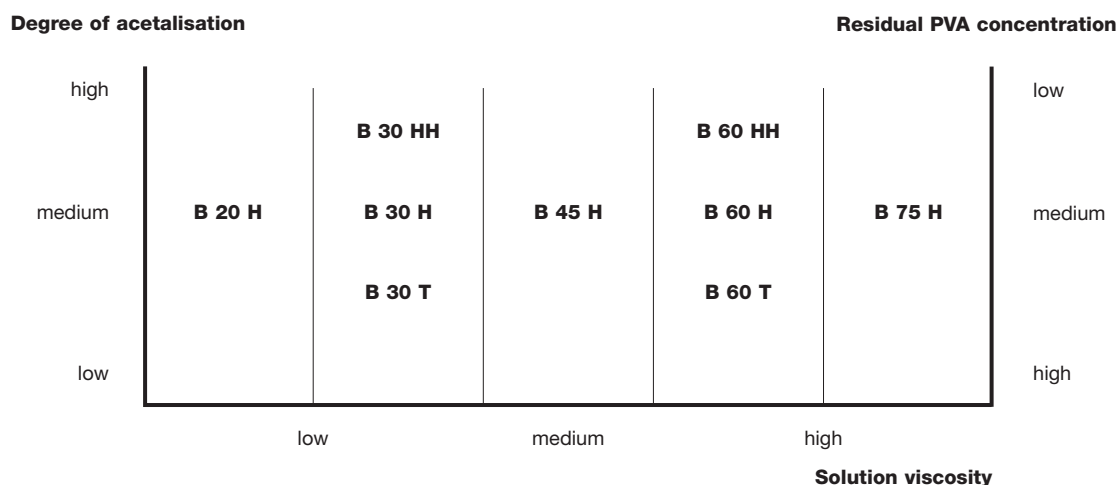


The product range. The constellation of properties displayed by the individual grades of Mowital, and thus the suitability of each grade for the particular application, is determined mainly by two factors:

- the degree of acetalisation
- the solution viscosity.

As relative measures of polarity and molecular weight of the polymer, the above parameters are characteristic values of prime importance.

The degree of acetalisation of Mowital correlates directly with the residual concentration of polyvinyl alcohol: the lower the residual PVA concentration, the higher the degree of acetalisation. In the following schematic representation, the different grades of Mowital are arranged according to the above-mentioned parameters.



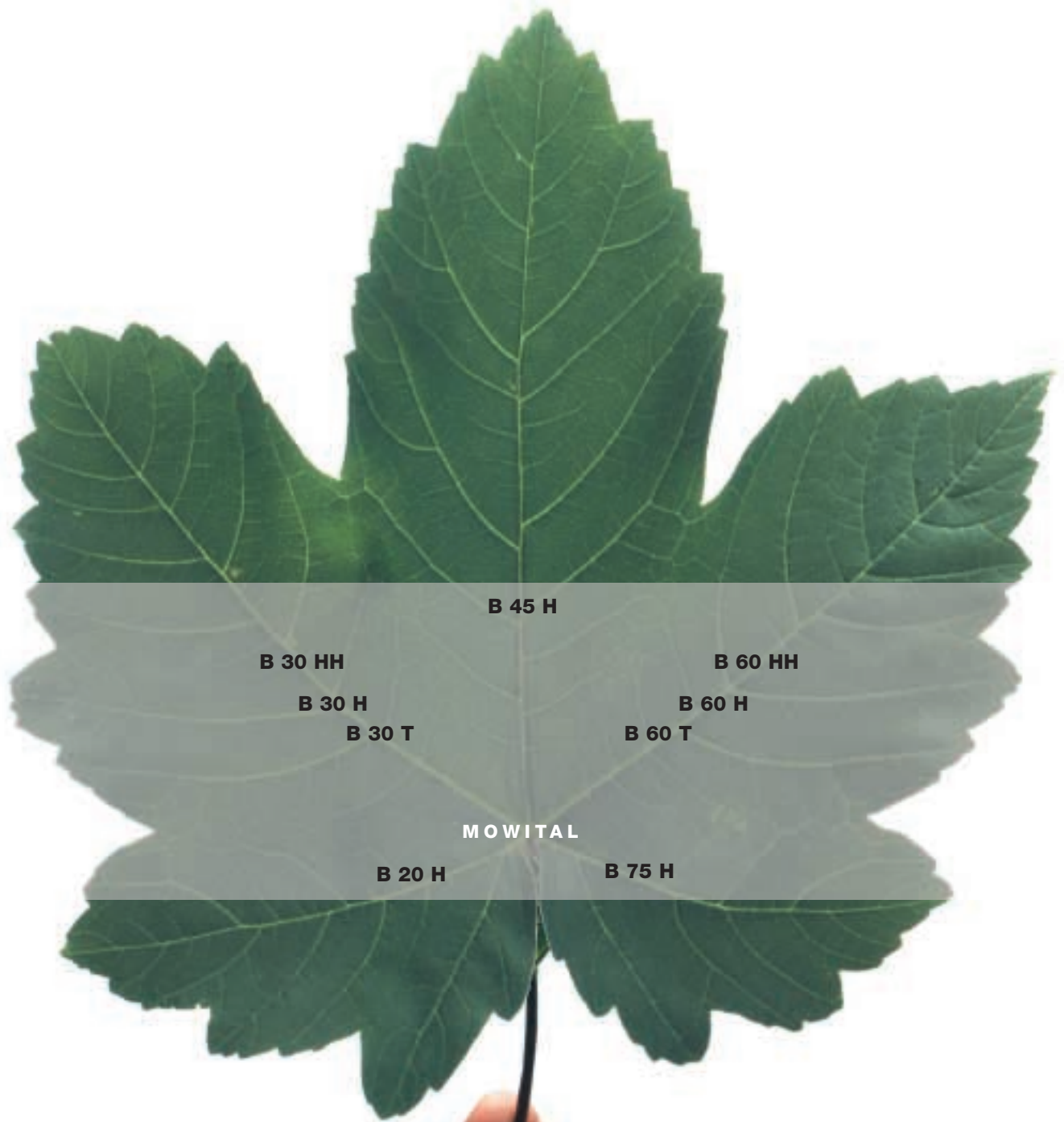
Waste disposal

Mowital consists of carbon, hydrogen and oxygen. Under free-air combustion conditions (I-value = 1), Mowital burns with virtually no residue to produce carbon dioxide and water (investigation performed in the VCI combustion apparatus). For this reason, Mowital is one of the waste products which poses no disposal problems.

Nomenclature. The numbers 20, 30, 45, 60, and 75 contained in the type designation for Mowital are relative measures indicating the increasing degree of polymerisation or molar mass and thus the rising solution viscosity. The alphabetical suffix points to the increasing degree of acetalisation ranging from the T grades over the H grades up to the HH grades.

Packaging and storage. The different grades of Mowital are supplied as a fine-grained free-flowing powder packed in paper valve bags delivered on pallets. We also supply Mowital in big bags upon request, of course. The product should be stored under cool and dry conditions. If the storage conditions are subjected to major changes, deviations in the specification values may result.

Packaging sizes	15 kg	12.5 kg
	<ul style="list-style-type: none"> ■ B 20 H ■ B 30 T ■ B 30 H ■ B 30 HH ■ B 45 H ■ B 60 T ■ B 60 H 	<ul style="list-style-type: none"> ■ B 60 HH ■ B 75 H



B 45 H

B 30 HH

B 60 HH

B 30 H

B 60 H

B 30 T

B 60 T

MOWITAL

B 20 H

B 75 H

Mowital grades at a glance

The different grades of Mowital are thermoplastic polyvinyl butyral resins supplied as fine-grained, free-flowing powders. The degrees of acetalisation and polymerisation largely determine important properties of these grades, such as their solubility, film properties and ability to combine and react with other binders. Mowital produces lightfast, tough-elastic films with a high inner strength.

The water resistance of the films rises as the number of acetal groups in the Mowital molecule increases. Accordingly, coatings based on the highly acetalised Mowital grades B 30 HH and B 60 HH display the greatest water resistance. Because the polarity of the molecule decreases as the degree of acetalisation rises, the HH grades (which have the lowest polarity) display the best solubility in non-polar solvents.

The glass transition temperature (T_g) of the Mowital grades declines as the number of acetal groups increases and the degree of polymerisation decreases. Values between 65 and 75 °C have been measured for the individual grades. (DSC; heating rate of 10 K/min).

The films formed by all the Mowital grades are heat-sealable. In addition, Mowital is non-toxic and therefore especially suitable for use in food packaging. The use of Mowital in this area is governed by:

- Commission Directive 2002/72/EC relating to plastic materials and articles intended to come into contact with foodstuffs (list of authorised monomers and starting substances in Annex II, Section A)
- Council of Europe Resolution AP 96 (5) on surface coatings intended to come into contact with foodstuffs (list of authorised monomers and starting substances in Appendix II, List 1)
- US Food and Drug Administration 21 CFR § 175.105 Adhesives, 21 CFR § 175.300 Resinous and polymeric coatings, 21 CFR 176.170 Components of paper and paperboard in contact with aqueous and fatty foods.

Mowital and its properties

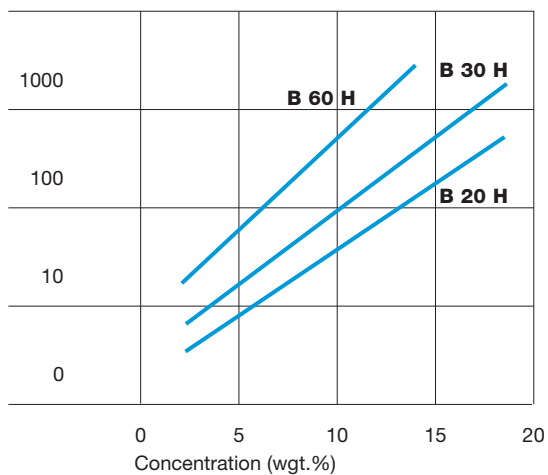
Comparison of viscosities

Average viscosity of various Mowital grades in different solvents as a function of the concentration

Mowital dissolved in butanol

Viscosity (mPa · s)*

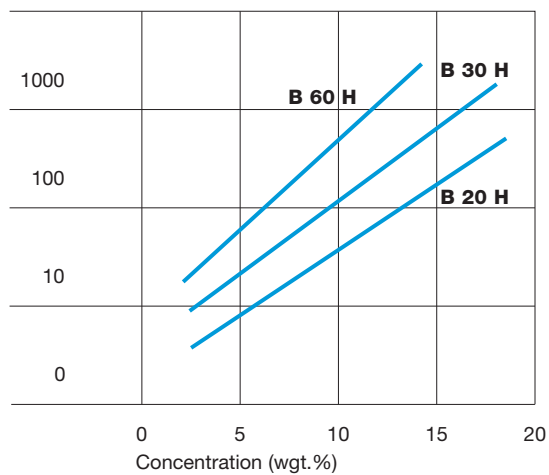
10000



Mowital dissolved in isopropanol

Viscosity (mPa · s)*

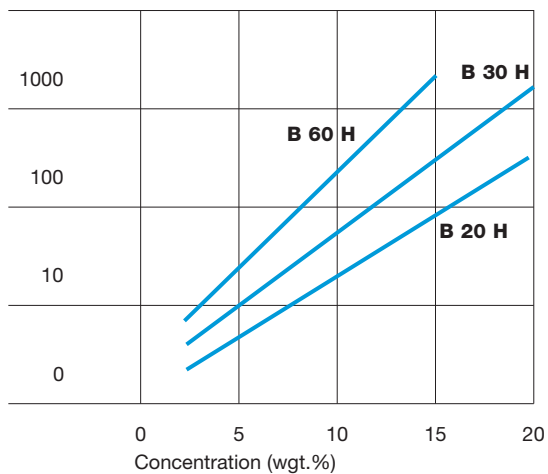
10000



Mowital dissolved in butanol/xylol blend 1 : 1

Viscosity (mPa · s)*

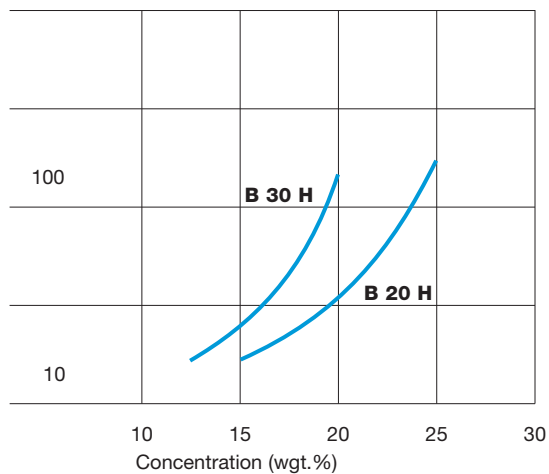
10000



Mowital dissolved in ethanol

Efflux time (s) (DIN 53211/Ford cup 4 mm, 23 °C)

1000



* dynamic viscosity (DIN 53015, 20 °C)

Distinguishing features

Depending on the degree of acetalisation, or the residual PVA content, the individual Mowital grades display different physical and chemical properties. The molar mass, or the degree of polymerisation, is of great importance for the thermal and mechanical properties and the viscosity in solution.

Of all the Mowital grades, Mowital B 20 H has the lowest solution viscosity. With this resin, the greatest film thickness can be achieved during each spray-applications step.

The good water resistance of Mowital B 60 H is topped by Mowital B 60 HH.

Mowital B 30 HH displays the best solubility in non-polar solvents and the best compatibility with aromatic components.

Mowital B 30 H has proven its worth as an 'all purpose' grade with a broad application spectrum. For the Mowital grades shown in the graphic on page 12, the average molecular weight

of the molar masses (\bar{M}_w) was determined via gel permeation chromatography (GPC) in combination with a molar mass calibration curve.

The molar masses determined for polymers always depend on the method of determination. Consequently, comparisons are permissible here only if the values were obtained using the same methods under identical conditions.

However, precise knowledge of the molar mass is frequently of only secondary importance. For most application areas, it is entirely sufficient to know the corresponding viscosity value of the alcoholic solutions at certain concentrations and the content of polyvinyl alcohol. It is thus vital that both the viscosity and the polyvinyl alcohol content remain within the limits set down in the stringent specifications for each grade; this is ensured for the Mowital grades by our quality assurance system.

Comparison of our polyvinyl butyrals and their properties

B 20... B 30... B 45... B 60... B 75...

increase in

- molecular weight
- solution viscosity
- melting and softening range
- toughness

B ...T

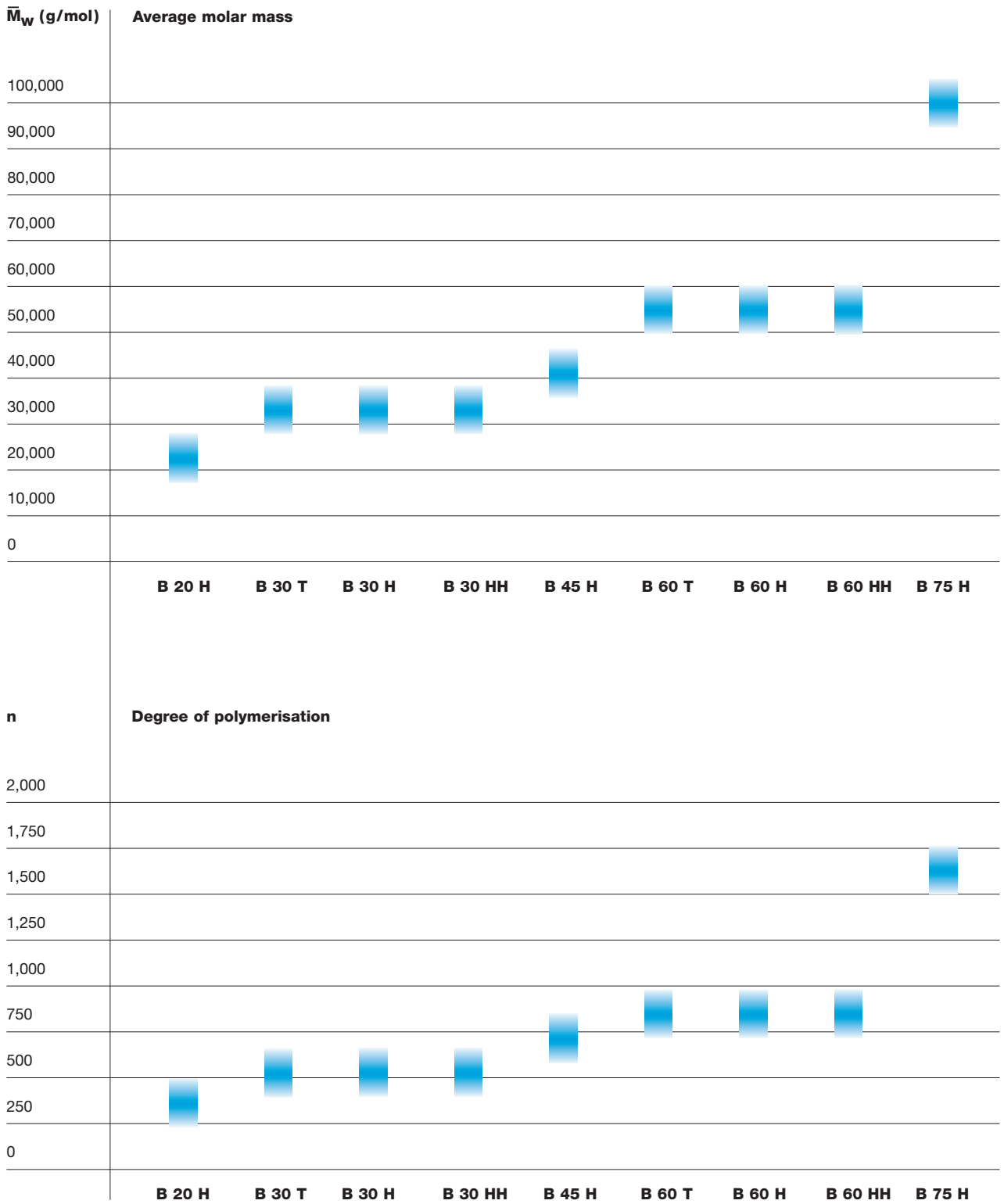
B ...H

B ...HH

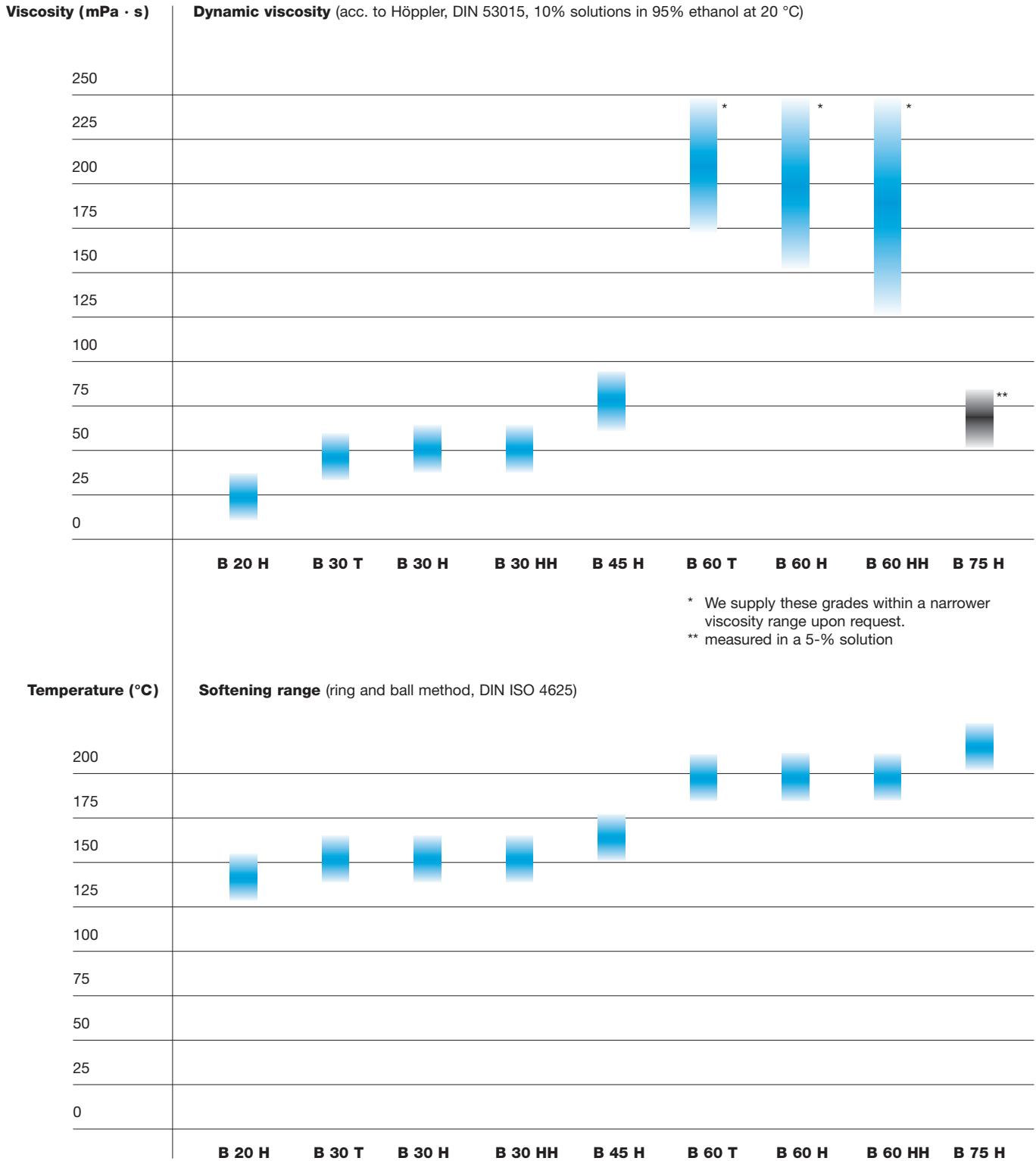
increase in

- water resistance
- solubility in non-polar solvents
- compatibility with non-polar polymers

Average molar mass and degree of polymerisation



Dynamic viscosity and softening range



Solubility of Mowital

	B 20 H	B 30 T	B 30 H	B 30 HH
Alcohols				
Methanol	●	●	●	○
Ethanol	●	●	●	●
Propanol	●	●	●	●
i-Propanol	●	●	●	○
Butanol	●	●	●	●
i-Butanol	●	●	●	●
Diacetone alcohol	●	●	●	●
Benzyl alcohol	●	●	●	●
Glycol ethers				
1-Methoxy propanol-2	●	●	●	●
Butyl glycol	●	●	●	●
3-Methoxy-butanol-1 (methoxy butanol)	●	●	●	●
Dowanol (DPnB)	●	○	●	●
Esters				
Methoxy propyl acetate	●		●	●
Methyl acetate	○		○	○
Ethyl acetate	○		●	●
Butyl acetate	○		○	●
Acetic acid-3-methoxy-n-butylester (Butoxyl)	●		●	●
Glycolic acid-n-butylester (Polysolvan 0)	●	●	●	●
Dibasic esters (DBE)	●		●	●
Ketones				
Acetone	○		●	●
Methylethylketone	●	○	●	●
Methylisobutylketone	○		●	●
Cyclohexanone	●	●	●	●
Hydrocarbons				
Aliphatic	○ ¹⁾	○ ¹⁾	○ ¹⁾	○ ¹⁾
Toluene	○ ¹⁾		○ ¹⁾	●
Xylene	○ ¹⁾		○ ¹⁾	●

unlimited solubility ●
 limited solubility ○
 insoluble +

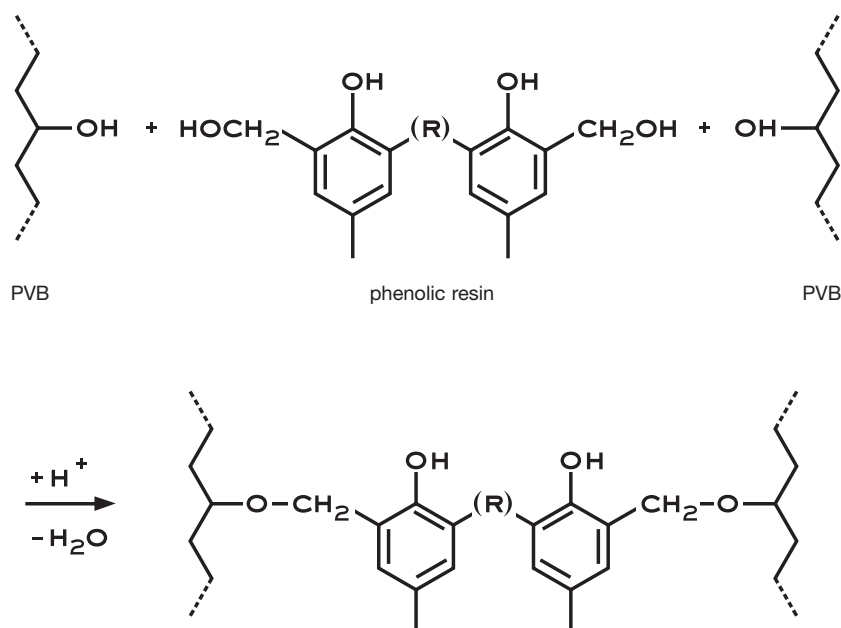
The solubilities stated here refer to the pure solvents,
 (determined in 10% solution – for B 75 H in 5% solution)
 In many cases solvent blends have superior dissolving capacity.

Cross-linking reactions

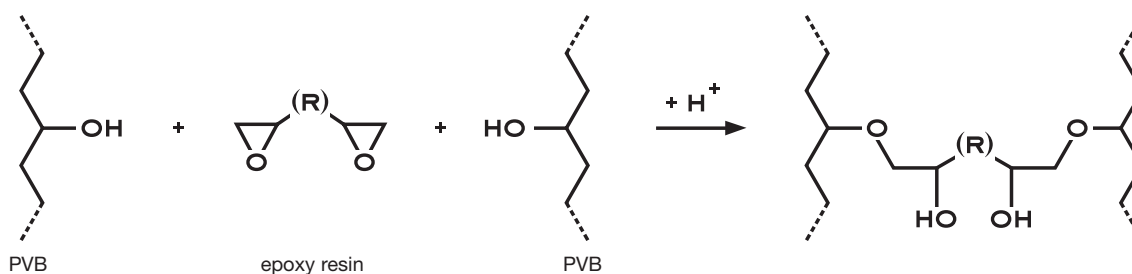
Mowital is a thermoplastic material that is soluble in a large number of organic solvents and can be cross-linked with other reaction partners. The cross-linking capacity depends on the number of OH groups available for the reaction. Phenolic, epoxy and melamine resins are used as reaction partners to produce high-

quality stoving enamels. For systems cured at room temperature, phenolic, urea and melamine resins as well as polyisocyanates are used in combination with acid catalysts. These reactions are shown in the following equations using structural formulas:

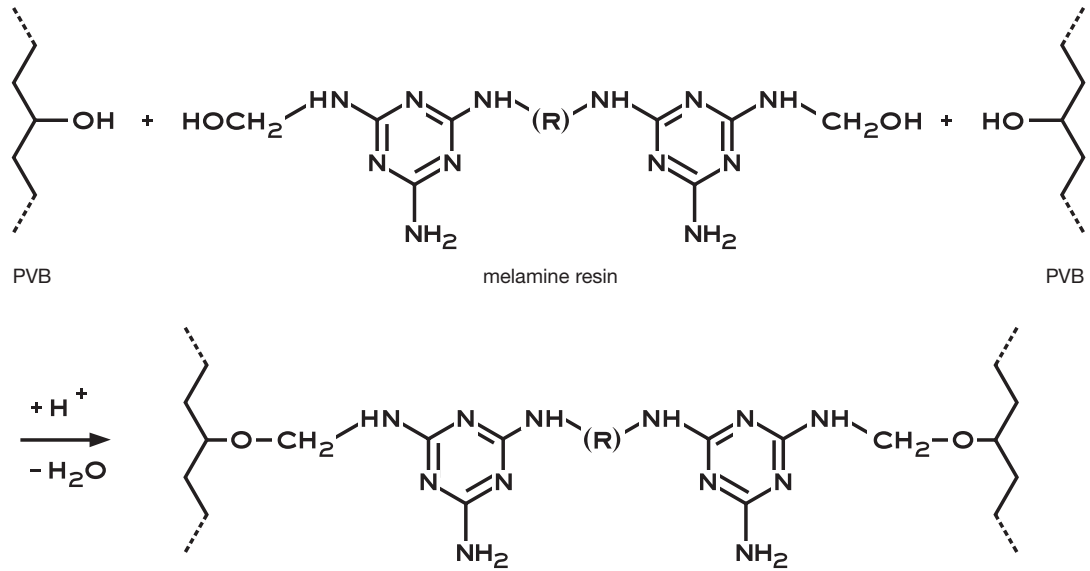
Reaction with phenolic resins



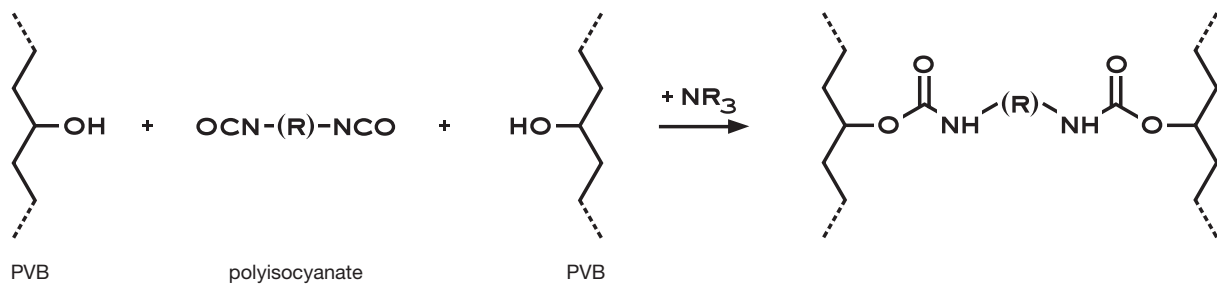
Reaction with epoxy resins



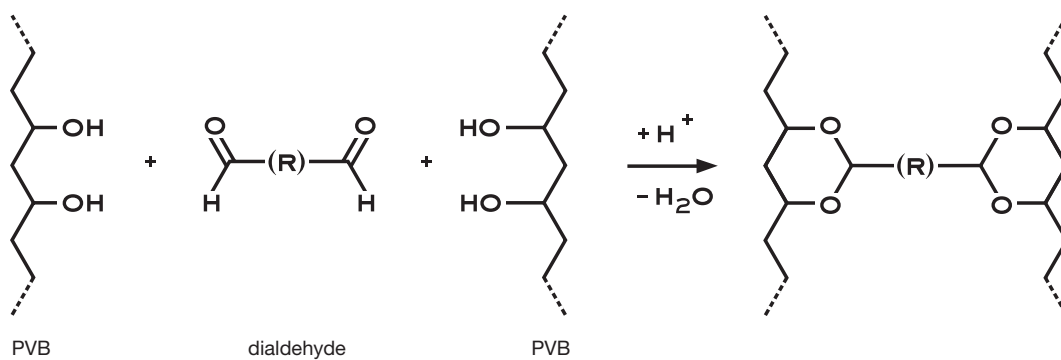
Reaction with melamine resins




Reaction with polyisocyanates



Reaction with dialdehydes



A photograph showing four hands of different skin tones clasped together in a circle, symbolizing unity and strength. The hands are positioned in the center of the frame, with the fingers interlaced. The background is a plain, light-colored surface. A semi-transparent rectangular box is overlaid on the hands, containing the text.

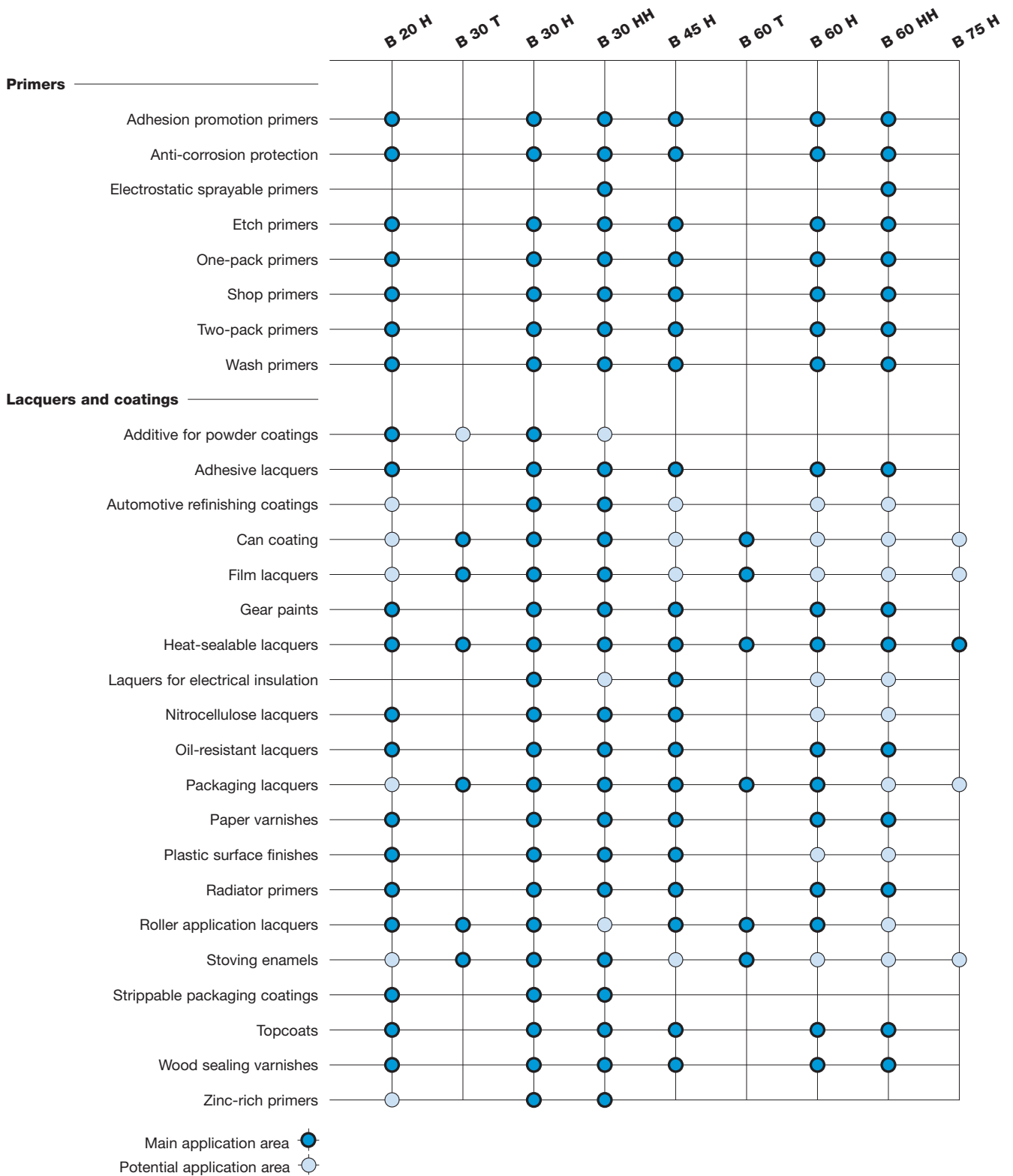
**Mowital –
a material that forms
a strong bond**

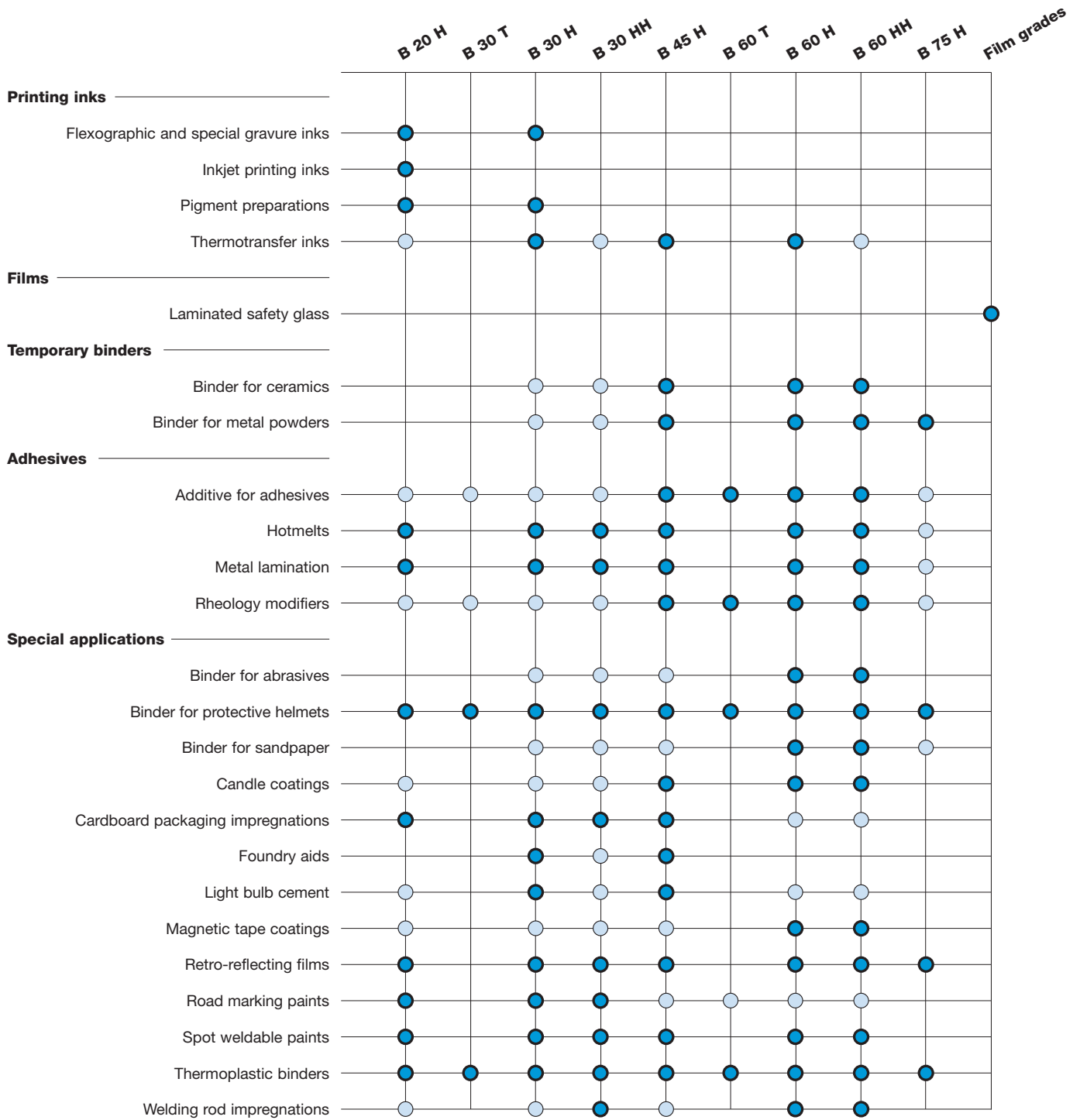
Mowital and its applications. Polyvinyl butyrals fit the bill for an enormous number of applications. Among other things, Mowital is an essential constituent of lightfast, highly transparent, elastic and tear-proof films. Mowital film is pressed between two glass panes to create fracture-resistant and shatterproof laminated safety glass used mainly in the building and automobile industries. The automobile industry is also where polyvinyl butyral grades exhibiting a long-lasting adhesive action are used; these grades are especially suitable as a component of stoving enamels. Used as a constituent of anti-corrosive primers, Mowital protects steel against rust and promotes the adhesion of the top-coat. In printing ink it ensures adhesion to a wide variety of surfaces, e.g. to plastic packaging for foodstuffs and heat-sensitive products. Furthermore, Mowital can be used to build up retro-reflecting layers in traffic signs and road markings – an application resulting in greater safety on our roads. Owing to its outstanding binding power and elasticity, Mowital is an excellent material for the manufacture of ceramic slip and green foil. Since it combusts with virtually no residue, it is an ideal temporary binder for the manufacture of high-performance ceramics.



Mowital fits the bill for a large number of applications

Application areas





Mowital in primers and lacquers

Modern primers and lacquers have to do more than adhere well. They should be easy to work with, harmonise with numerous binders, and serve additional functions such as corrosion protection. Mowital is the ideal basis for all these applications.

Combination with other binders. Owing to their excellent compatibility with phenolic resins, Mowital grades B 30 T and B 60 T are frequently used as combination partners for stoving enamels in the packaging industry. Whereas Mowital H grades exert a greater plasticising effect, the Mowital T grades achieve better crosslinkage.

Mowital B 30 HH is a binder that exhibits a high tolerance of aromatic solvents and a broad spectrum of compatibility with other raw materials used in coatings. As a result, it can be used to produce primers which can be cured with polyamine or isocyanates. For polyamidoamine or polyamine curing, Bakelite EPR 191 is an especially suitable combination partner. Mowital serves to accelerate the physical drying phase and does not react with polyamines at room temperature.

To produce high-quality coatings, Mowital B 30 HH can be combined with Bakelite EPR 191 in proportions ranging from 3:1 to 1:3 (solid:solid). As the percentage of epoxy resin rises, the water resistance increases while the elasticity decreases. When isocyanates, e.g. Desmodur N 75, are used, curing occurs via a reaction of the OH group of the polyvinyl alcohol part of the Mowital B 30 HH molecule. Plasticisation is advisable; it can be carried out, for example, with epoxy resins in the ratio of 1:1 to 1:2 based on polyvinyl butyral. In this case, however, the solvents used must not contain any OH groups or water. Frequently, 5–20% of the stoichiometrically required amount of Desmodur N 75 is sufficient for curing.

Adhesive strength. Mowital films display a very good adhesion to steel, iron, zinc, aluminium and other light metals. Nevertheless, adhesive strength and corrosion protection can be further improved via combinations with phenolic resins, epoxy resins and phosphoric acid. Adhesion and corrosion protection can be enhanced, moreover, via the addition of zinc phosphate or zinc chromate. Phenolic resins, e.g. Uravar FB 250, and epoxy resins, e.g. Bakelite EPR 191, boost the storage stability, body and pigment acceptance of the primer. Owing to the risk of discolouring, however, Uravar FB 250 should not be used under light-coloured stoving enamels.



Primers for light metals – getting a good grip on brilliant enamels

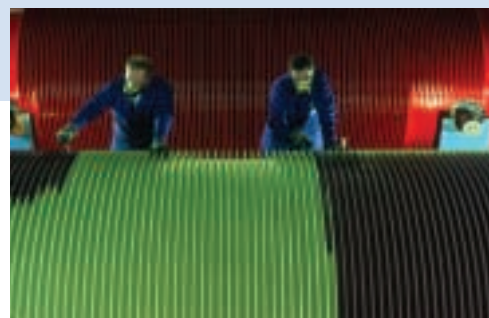
The risk of discolouring of the stoving enamel topcoat can be eliminated by replacing phenolic resins with urea resins. The good adhesion of these primers on metallic substrates is due to a binder-pigment-phosphoric acid-metal complex. Phosphoric acid reacts with zinc chromate to form 'inhibitor complex acids'. If the metallic substrate and the polyvinyl butyral are involved in the formation of the complex via the hydroxyl groups, this is known as an adhesion inhibitor complex. In addition, Mowital films have outstanding adhesion to glass and many plastics.

Processing. Prior to processing, Mowital has to be dissolved in a blend of suitable solvents such as butanol and – if necessary and possible – xylene and methoxy propanol. The primers can be coloured with suitable fine-grained, electrolyte-free pigments and fillers such as iron oxide red, titanium dioxide and talc each in combination with zinc-containing active pigments. When Mowital is combined with phenolic resins such as Uravar FB 250 or epoxy resins, it is advisable to disperse the pigments in one of these resins before adding the Mowital solution. These resins possess superior wetting properties and thus shorten the dispersing time for the pigments significantly. Mowital is mixed with phenolic or epoxy resins in the proportions of 70:30 to 30:70 (solid:solid).

In cases where the production process calls for Mowital to be dispersed along with the pigments, it is advisable to use ceramic grinding media or perl mills with stainless steel mixers. This is because prolonged contact between Mowital and iron may have a detrimental effect on the adhesion strength of the finished product. The amount of phosphoric acid added depends on the concentration of reactive binder. With both one-pack and two-pack primers, good experience has been gained with additional amounts of approx. 5% phosphoric acid (85%) calculated on the basis of Mowital and its particular combination partner (solid:solid). The phosphoric acid must always be diluted with alcohol, however, before being added to the primer.

Over-coating properties. Practically all of the common types of lacquers and paints adhere to cured primer films. Problems may occur when over-coating with nitrocellulose and certain copolymerisate or two-component epoxy resins. In such cases, the inter-coat adhesion can be enhanced by adding epoxy resins such as Bakelite EPR 191 and/or melamine resins.

Adhesive primers for steel – colour and protection for load-bearing structures



Primers for metal – for better appearance and a longer life

Primers

A distinction is made between one-pack and two-pack primers. In **one-pack primers** the curing agent is already added to the primer during manufacturing. These primers contain a relatively small percentage of phosphoric acid; this results in a longer shelf life and greater water resistance during the initial stage of drying. These primers must be supplied in containers which are either made of a material resistant to phosphoric acid or contain a liner made of such a material.

In **two-pack primers** the phosphoric acid curing agent is supplied in a separate container. This curing agent consists of phosphoric acid diluted with a solvent. The proportions of phosphoric acid and solvent have been adjusted such that the curing agent will contain the amount of acid calculated for the particular amount of resin after the two components have been mixed. After the curing agent has been added, the two-pack primer has a pot life of only a few hours. In two-pack primers the percentage of phosphoric acid should be between 5 and 10 % based on the binder. A further increase in the percentage of phosphoric acid may have a negative effect on the product's water resistance and over-coatability.

Adhesion promotion primers. Adhesion promotion primers offer excellent adhesion and a long-lasting anti-corrosive effect. This increase in quality is obtained by raising the solid content of the primer. This can be achieved by adding compatible low-

viscous phenol-formaldehyde resins or epoxy resins. Adhesion promotion primers with formulations of this kind can easily be applied in dry film layers with a thickness of 30 to 40 μm and a superior consistency.

Electrostatic sprayable primers. In comparison with the other Mowital grades, Mowital B 30 HH displays a distinctly higher solubility in aromatic solvents. Since only small amounts of alcohol are required, it is also possible to formulate electrostatic sprayable adhesion promotion primers without conductivity problems, for example.

Shop primers. Shop primers are primers that are applied to steel parts shortly after manufacturing and permit pore-free welding. The primer coat should protect the steel surface against corrosion for at least three months and, ideally, for a year. Combinations of Mowital B 30 H or B 30 HH with suitable epoxy resins, e.g. Bakelite EPR 191, or suitable phenolic resins, e.g. Uravar FB 250, satisfy these requirements.

Wash primers. Wash primers consist of combinations of polyvinyl butyral, phosphoric acid and active anti-corrosive pigments. Previously, they were applied with a sponge or rubber wiper – hence the name “wash primers”. Today they are applied with a spray gun in dry films with a thickness of 8 to 15 μm . The main purposes of wash primers are to promote adhesion between the substrate and subsequent coatings and to provide temporary protection against corrosion. Today the trend is toward adhesion promotion primers of such high quality that they obviate the necessity for additional primers (see adhesion promotion primers).

Shop primers for metals –
anti-corrosion protection during
transport and processing



Anti-corrosion protection for metals



Lacquers and coatings

Additive for powder coatings. Additives containing a few percent of Mowital are usually sufficient to plasticise powder coatings. Furthermore, Mowital can be used as a structuring agent for special-effect coatings.

Adhesive lacquers. Here, as in the stoving enamel sector, Mowital can be used to produce air-drying semi-glossy to glossy high adhesion topcoats. The preferred combination partners are phenol-formaldehyde resins, epoxy resins, plasticisers and nitrocellulose. The combination of Mowital B 30 HH and Bakelite EPR 191, cured with aliphatic polyamines, unites the rapid physical drying of Mowital with the chemical and mechanical resistance of epoxy resin two-component coatings in a single system.

Automotive refinishing coatings. During automotive repair work the paint is often sanded down to the bare metal, which then requires pre-treatment with a passivating primer. Simply spraying over the original paint may lead to serious intercoat adhesion problems; these can be exacerbated by automobile paint cleaning and polishing products. In either case, adhesion promotion primers based on Mowital-phenolic resin-epoxy resin combinations have proved to be highly effective.

Heat-sealable lacquers. Heat sealing of papers, foils and other materials coated with Mowital finishes does more than seal the package; it can also enhance surface quality, improve gloss and presentation, and create special effects via embossing. The heat-sealing temperature depends on the softening point of the Mowital grade used in the particular case (see graphic on page 13); heat sealing should not be carried out at temperatures much above this.

Nitrocellulose lacquers. Alcohol-soluble nitrocellulose displays a good compatibility with Mowital and improves the surface hardness of Mowital films. Mowital, in turn, increases the adhesion and flexibility of nitrocellulose lacquers.

Oil-resistant lacquers. Mowital B 20 H, for example, exhibits a good resistance to gear oil. Rapidly drying gear paints can be formulated by combining this Mowital grade with suitable body-enhancing types of Novolak.

Packaging lacquers, film lacquers and lacquers for electrical insulation. To ensure pore-free coating on large heavy containers, it is advisable to apply several coats. Stoving is generally carried out at temperatures between 160 and 200 °C for 10 to 20 minutes. If multi-layer coatings are applied, the first coat should not be fully stoved to ensure a good intercoat adhesion.

Automotive refinishing coatings – good adhesion for new shine



Adhesive lacquers – for a perfect finish from glossy to satin

Paper varnishes. Like foils, paper can be coated with plastified Mowital lacquers. Such lacquer coatings can be heat-sealed if necessary, display excellent light fastness and grease resistance, and enhance the brilliance of printing inks.

Plastic surface finishes. The main problems encountered when painting plastic surfaces are a) poor adhesion of the paint to the plastic and b) dissolving of the plastic surface by the solvent contained in the paint. Owing to its good solubility in alcohol, Mowital is an especially versatile constituent of plastic surface finishes. The most important applications in this area are the pre-treatment of PS, ABS, PMMA, PC and moulded phenol-formaldehyde compounds prior to vacuum metalisation. This pre-treatment is usually followed by a protective coating based on the same binder.

Radiator primers. The outstanding resistance to yellowing displayed by Mowital-stabilised films even when exposed to heat makes Mowital an ideal component of radiator primers.

Roller application lacquers. Foil coatings are applied predominantly with roller coaters. These lacquers must display a high flexibility and a good adhesion to various metals and plastics; in addition, they must be based on mild solvents which will not cause the rubber roller to swell or disintegrate. Lacquers based on Mowital H types satisfy all of these criteria.

Stoving enamels/can coatings. From our Mowital product range, both the H and T types are suitable for the manufacture of stoving enamels. The most important combination binders are amine, epoxy and phenol-formaldehyde resins. The Mowital fraction should be between 10 and 40 percent based on solid resin. Mowital boosts the adhesion, flow and elasticity of the films.

Strippable packaging coatings. Despite their otherwise good adhesion properties, Mowital B 20 H or B 30 H grades can also be used to produce strippable lacquers. Combined with approximately 1 to 3 % of a suitable separating agent and subjected to a suitable plasticising procedure, these grades of Mowital produce highly elastic lacquer films which can be stripped off without any difficulty after even longer periods of time.

Topcoats. Tars and nicotine from cigarette smoke tend to 'bleed through' when nicotine-stained walls or ceilings are painted with normal topcoat products. This unwanted effect can be prevented by applying a topcoat containing Mowital dissolved in alcohol.

Wood sealing varnishes. Cold-curing clear varnishes based on Mowital and melamine resin create light-resistant films with good elasticity and mechanical strength. The curing times can be shortened by adding phosphoric acid or para-toluene sulfonic acid. These single-component varnishes have a shelf life of 6 to 8 months at room temperature. Varnishes of this type can be used as clear or stained sealant for parquet or wood floors.

Zinc-rich primers. Owing to its neutral character, Mowital is highly suitable for the production of zinc-rich primers with high storage stability. Since a high pigment volume concentration has to be chosen to ensure cathode protection, a high degree of plasticisation is necessary. The addition of Mowital to zinc-rich primers based on tetra-ethyl silicate (TES) improves the film properties of these products. The amounts added may be as much as 10 % based on the amount of TES binder.



Wood sealing varnishes – the ideal basis for dirt-repellent and non-slip flooring



Printing inks


Low-viscous grades of Mowital, e.g. B 20 H and B 30 H, are frequently used as binders for **flexographic and special gravure printing inks**. If necessary, specially developed Mowital grades with even lower viscosity in solution can be made available for this application area.

Since Mowital is absolutely safe for human health, these inks can be used to print on food packagings. The use of Mowital in this application area is governed by:

- Commission Directive 2002/72/EC (list of authorised monomers and starting substances contained in Annex II, Section A).
- Council of Europe Resolution AP 96 (5) on surface coatings intended to come into contact with foodstuffs (list of authorised monomers and starting substances in Appendix 2, List 1).
- US Food and Drug Administration 21 CFR § 175.105 Adhesives, 21 CFR § 175.300 Resinous and polymeric coatings, 21 CFR 176.170 Components of paper and paperboard in contact with aqueous and fatty foods.


Mowital-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, Mowital B 20 H, in particular, is used for printing on intermediate layers. If necessary, adhesion on difficult substrates, e.g. OPP films surface-treated with homopolymer and ethylene-propylene copolymer coatings, can be improved by the addition of adhesion promoters. Mowital-based printing inks exhibit low solvent retention, good flow properties, and high resistance to water and low temperatures.

Printing inks for heat sensitive packaging (cold sealing) are another important application area for Mowital. Owing to their good solubility in alcohol, moreover, the Mowital grades can be used to formulate alcohol-based printing inks. These inks do not corrode the printing plate and can be used on solvent-sensitive plastic surfaces. Suitable solvents here are alcohols, e.g. ethanol,



isopropanol, n-butanol and diacetone alcohol, and esters, e.g. methyl, ethyl and n-butyl acetates.

Inkjet printing inks. By virtue of their low solution viscosity, low-viscous Mowital grades are suitable for the manufacture of inkjet printing inks.



Pigment preparations. Organic pigments and special pigment preparations can be used for this purpose. The good flow properties and pigment wetting properties of Mowital B 20 H and B 30 H make these grades highly suitable for the manufacture of predispersed pigment preparations. When Mowital-based pigment preparations are used, the printing ink is made by simply diluting the preparation with varnish.

The following substances have proved to be effective plasticisers: dioctyl phthalate, dibutyl phthalate and Reactol AC 11 or

Rokraplast R-520. In addition to exerting an elastifying effect, the latter substances result in a further increase in pigment wetting and enhanced gloss.

Mowital can be used alone or in combination with alcohol-soluble nitrocellulose.

Furthermore, additional resins can be worked into the formulation. Mowital displays a good compatibility with ketone resins, alkyd resins, maleic resins and natural resins such as shellac and dammar. Appropriate trials need to be conducted to evaluate the suitability of such resins for particular applications.

Thermotransfer inks. Mowital grades with a high viscosity in solution are suitable as binders for thermotransfer printing processes. Mowital can be used alone in this context or in combination with other resins such as maleic or ketone resins. The thermotransfer motif is initially printed on paper; the print is then transferred to the textile fabric while applying heat and pressure.

Flexographic printing inks for food packaging – attractive protection for a fresh taste





Films for laminated safety glass

The manufacture of PVB films for laminated safety glass is one of the most important applications of Mowital. Mowital grades with a high molecular weight are combined with special plasticisers in a thermoplastic extrusion process to produce safety glass films. The outstanding properties of these films include toughness, good adhesion to glass, good light resistance and excellent transparency. The films are responsible for the special safety advantages of laminated safety glass: if an object hits a glass pane made of laminated safety glass, the bulk of the object's kinetic energy will be consumed by the expansion of the tough PVB film. As a result, the object will not go through the glass in most cases. Furthermore, the glass splinters created by the impact will adhere to the film. This effect minimises the danger of injury from glass fragments and splinters. In the automotive industry, films less than 1 mm thick are pressed between float glass panes to form laminated safety glass for car windscreens.



A safe view through the windscreen – Mowital films for laminated safety glass



Temporary binders



Fuel cells – a decentralised energy supply for single-family and multi-family houses

Binder for ceramics and metal powders. Mowital is an outstanding temporary binder for the manufacture of high performance ceramics to be used in fuel cells and in passive electronic components such as capacitors and inductors. Owing to the very good solubility of the Mowital H and HH types in mixtures of aromatic and polar solvents (e.g. toluene, methylethyl ketone and ethanol), binders can be selected with the required slip viscosity. Mowital displays very good compatibility with the commonly used plasticisers (e.g. phthalates, phosphates, adipates) and dispersing agents (e.g. fish oil or phosphates). The resulting green foils exhibit outstanding strength and flexibility. At temperatures between 350 and 500 °C Mowital combusts with virtually no residue; the ceramic powder sinters at high temperature with only slight shrinkage. Mowital-based ceramics display a uniform shrinking behaviour. Upon request we can also supply Mowital grades with a low salt content (i.e. ion content of less than 100 ppm) for this application area. In addition, Mowital grades B 30 H and B 45 H are suitable as temporary binders for the granulation of metal powders.

Adhesives

Additive for adhesives. During the manufacture of epoxy resin adhesives, Mowital is employed as a **rheology modifier** to improve the elastic and rheological properties of the products. Owing to the excellent adhesion of Mowital to glass and metals, various Mowital grades are used to bond or laminate these materials to other substrates. The Mowital adhesive can be applied as a solution or by fusion (hotmelt). When solutions are used, at least one of the materials to be bonded must be sufficiently absorbent.

Hotmelts. The adhesive compounds are first prepared from the binder (Mowital), 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; later they are 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**).

Plastic packages sealed with hotmelt adhesives – protecting the fresh taste of sweet and salty foods



Special applications

Magnetic tape coating – a protective layer for stored data



Spot weldable paints – for pore-free welding



Binder for abrasives and sandpaper. Mowital is used to bind abrasives and to adjust the viscosity of abrasive pastes.

Binder for protective helmets. Mats made of Kevlar or other suitable fibres are impregnated with a combination of Mowital and a phenol-formaldehyde resin, pressed into shape by applying heat and pressure, and then cured. These helmets are onequarter as heavy as steel helmets but provide comparable protection!

Candle coatings. Candles are dipped in a highly diluted plasticised Mowital solution to reduce a tendency to dripping or to colour the outside surfaces.

Cardboard packaging impregnations. The water resistance of cardboard packaging can be raised by applying an alcoholic Mowital solution with brush or curtain coaters.

Foundry aids. During metal casting Mowital is used as a binder of mineral powder; in particular, it is applied as an alcoholic sizing agent to the interior surfaces of foundry moulds. The pre-treatment of the foundry moulds with Mowital-based coatings leads to good casting results.

Magnetic tape coatings. Mowital exhibits good binding and adhesion-promoting properties for magnetised powders and is therefore used for the coating of high-quality recording tapes.

Retro-reflecting films. Mowital is used as a binder for retro-reflecting films; these are used, for example, to produce traffic signs and licence plates.

Road marking paints. In hotmelt compounds used for road markings, Mowital serves as a melt-flow regulator and flow agent.

Spot weldable paints. If adequately pigmented with electrically conductive pigments such as zinc dust and aluminium bronze, Mowital is a suitable binder for the production of spot weldable paints. These paints can be welded perfectly via either direct or indirect spot welding. Owing to the thermoplasticity of the binder, the scorched area around the welded spot is small and free of blisters.

Thermoplastic binders. Owing to its high binding capacity for powders and fibres, Mowital is suitable for a wide variety of applications as a thermoplastic binder in flooring, insulating boards or parts formed by compression moulding. Mowital can be shaped, under the combined action of pressure and temperature of approx. 160 to 240 °C, into compression moulded parts.

Welding rod impregnations. The sheaths surrounding welding rod take up water easily and thus often detach from the welding device while the diver is still working underwater. Impregnating the rods with a Mowital solution substantially prolongs their service life under water without detracting from their welding properties.

Writing cores for pencils. The largest pencil in the world is 20 m high and stands in front of the administrative building of Faber-Castell in Malaysia. The giant pencil contains a fully functional graphite core containing Mowital. The ingredients of Mowital, graphite and filler were mixed at around 140 °C and subsequently extruded to form a writing core with a thickness of approximately 10 cm.



Binder for the writing cores of pencils – and an entry in the Guinness book of records.



Retro-reflecting films – for more safety on our roads

Dialogue service

This brochure illustrates the wide range of possible applications for Mowital. Among its numerous applications, Mowital is used in paints, lacquers, primers, varnishes, or impregnating agents, printing inks for use on plastic or metal films, adhesives, shatter-proof glass and temporary binders. And this list is by no means exhaustive! Many of our customers have carried out development work on the known applications and come up with a wealth of interesting new applications for Mowital.

How are you using Mowital – and how can we help you use it better? We have set up the Mowital dialogue service to provide you with expert advice on the numerous possible applications of Mowital. Please use the enclosed reply form to send us your questions by fax or mail. Or simply send us an e-mail. You can find the name of the right person to contact on our website (www.kuraray-kse.com). We will help you to select the most suitable grade of Mowital for your application and help you put your ideas into practice.



**Mowital dialogue service
- Reply form -**

Kuraray Specialities Europe GmbH • Fax +49 69 305-853 98 • www.kuraray-kse.com

1. We already use Mowital and would like to contact you to obtain technical advice on the following topic:

2. We have a new idea on how to use Mowital and need the following information:

3. We would like to test Mowital. Please send us samples of the following products:

Address:

Name

Company

Department

PO box or street address

Zip or postal code/Town or city

Telephone

Fax

E-mail

Specialized in Specialities



What is important for us:

In today's fast moving world, it is especially important for us to be available to our customers as a reliable and competent partner. Our customer- and market-oriented business activities, together with our innovative solutions, help you gain the kind of global reach you need to safeguard your company's success. Take advantage of our services to create a solid foundation for your business – a foundation allowing you to plan, develop and create added value.



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