kuraray

kuraray poval
Here to Innovate

KURARAY POVAL™, EXCEVAL™ & ELVANOL™ Resins

Grade List for North and South America

Characteristics:

Polyvinyl alcohol (PVOH) has varying degrees of polymerization and hydrolysis.

Recommended use:

The characteristics of PVOH make it well suited for an extensive range of applications in products that individuals use every day. From an emulsion polymerization aid to a binder for pigments in paper applications, the versatility of PVOH is widespread.

Supplied in the following form: Granules / fine powder defined by grain size.

Specifications:

Kuraray's quality control team determines the data for each lot before its released.

Partially saponified grades

Grade name KURARAY POVAL™	Viscosity[1] [mPa•s]	Degree of hydrolysis [mol%]	Non-volatile content [w%]	Ash[2] [w%]	pH
5-74	4.2 - 5.0	72.5 - 74.5	97.5 ± 2.5	≤0.4	5.0 - 7.0
32-80	29.0 - 35.0	79.0 - 81.0	97.5 ± 2.5	≤0.4	5.0 - 7.0
35-80	32.0 - 38.0	79.0 - 81.0	97.5 ± 2.5	≤0.4	5.0 - 7.0
48-80	45.0 - 51.0	78.5 - 80.5	97.5 ± 2.5	≤0.2	5.0 - 7.0
5-82	4.5 - 5.2	80.0 - 83.0	97.5 ± 2.5	≤0.4	5.0 - 7.0
3-85	3.4 - 4.0	84.2 - 86.2	97.5 ± 2.5	≤0.5	5.0 - 7.0
4-88	3.5 - 4.5	86.7 - 88.7	97.5 ± 2.5	≤0.5	4.5 - 6.5
5-88	4.6 - 5.4	86.5 - 89.0	97.5 ± 2.5	≤0.4	5.0 - 7.0
22-88	20.5 - 24.5	87.0 - 89.0	97.5 ± 2.5	≤0.4	5.0 - 7.0
49-88	45.0 - 52.0	87.0 - 89.0	97.5 ± 2.5	≤0.4	5.0 - 7.0
100-88	90.0 - 110.0	87.0 - 89.0	97.5 ± 2.5	≤0.4	5.0 - 7.0
27-96	24.0 - 30.0	95.5 - 96.5	97.5 ± 2.5	≤0.4	5.0 - 7.0

1) of a 4% aqueous solution at 20°C JIS K 6726 / DIN 53015 / Falling needle viscometer
2) Calculated as Na_2O

KURARAY POVAL™, EXCEVAL™ & ELVANOL™ Resins

Grade List for North and South America

Ultra low saponified grades

Grade name KURARAY POVAL™	Viscosity[3] [mPa•s]	Degree of hydrolysis [mol%]	Non-volatile content [w%]	Ash[2] [w%]	pH
LM-10 HD	4.5 - 5.7	38.0 - 42.0	98.5 ± 1.5	≤0.6	No spec
LM-20	3.0 - 4.0	38.0 - 42.0	98.5 ± 1.5	≤1.0	No spec

Fully saponified grades

Grade name KURARAY POVAL™	Viscosity[1] [mPa•s]	Degree of hydrolysis [mol%]	Non-volatile content [w%]	Ash[2] [w%]	pH
4-98	4.0 - 5.0	98.0 - 98.8	97.5 ± 2.5	≤0.5	4.5 - 7.0
28-98	25.0 - 31.0	98.0 - 99.0	97.5 ± 2.5	≤0.4	5.0 - 7.0

Fine powder grades

Grade name KURARAY POVAL™	Viscosity[1] [mPa•s]	Degree of hydrolysis [mol%]	Non-volatile content [w%]	Ash[2] [w%]	pH
5-88 S2	4.6 - 5.4	86.5 - 89.0	97.5 ± 2.5	≤0.4	5.0 - 7.0
22-88 S2	20.5 - 24.5	87.0 - 89.0	97.5 ± 2.5	≤0.4	5.0 - 7.0
44-88 S2	40.0 - 48.0	87.0 - 89.0	97.5 ± 2.5	≤0.4	5.0 - 7.0
49-88 S2	45.0 - 52.0	87.0 - 89.0	97.5±2.5	≤0.4	5.0 - 7.0
28-98 S2	25.0 - 31.0	98.0 - 99.0	97.5 ± 2.5	≤0.4	5.0 - 7.0

Specialty grades

Grade name KURARAY POVAL™	Viscosity[1] [mPa•s]	Degree of hydrolysis [mol%]	Non-volatile content [w%]	Ash[2] [w%]	pH
25-88 KL	20.0 - 30.0	85.0 - 90.0	97.5 ± 2.5	≤1.5	5.0 - 7.0
3-86 SD*	2.4 - 3.4	83.0 - 88.0	97.5 ± 2.5	≤1.4	No spec
25-98 R*	20.0 - 30.0	98.0 - 99.0	97.5 ± 2.5	≤0.6	No spec
L-8	5.0 - 5.8	69.5 - 72.5	97.5 ± 2.5	≤1.0	5.0 - 7.0
L-9	5.5 - 6.1	69.5 - 72.5	97.5 ± 2.5	≤1.0	5.0 - 7.0
L-10	5.0 - 7.0	71.5 - 73.5	97.5 ± 2.5	≤1.0	5.0 - 7.0
L-11	5.5 - 7.5	71.5 - 73.5	97.5 ± 2.5	≤0.5	5.0 - 7.0
L-508W	6.0 - 7.0	71.5 - 73.5	97.5 ± 2.5	≤0.5	5.0 - 7.0
L-9-78	6.0 - 6.7	76.5 - 79.0	97.5 ± 2.5	≤1.2	5.0 - 7.0
105-88 KX SB	90.0 - 120.0	87.0 - 89.0	97.5 ± 2.5	≤0.4	5.0 - 7.0
105-88 KX	90.0 - 120.0	87.0 - 89.0	97.5 ± 2.5	≤0.4	5.0 - 7.0
200-88 KX SB	175.0 - 225.0	87.0 - 89.0	97.5 ± 2.5	≤0.4	5.0 - 7.0
200-88 KX	175.0 - 225.0	87.0 - 89.0	97.5 ± 2.5	≤0.4	5.0 - 7.0

1) of a 4% aqueous solution at 20°C JIS K 6726 / DIN 53015 / Falling needle viscometer
2) Calculated as Na_2O
3) 4% methanol/water (1/1) solution at 20°C
*For U.S., available only for paper application. For other regions, available for all applications.

EXCEVAL™ grades

Grade name EXCEVAL™	Viscosity[1] [mPa•s]	Degree of hydrolysis [mol%]	Non-volatile content [w%]	Ash[2] [w%]	pH
HR-3010	12.0 - 16.0	99.0 - 99.4	97.5 ± 2.5	≤0.4	5.0 - 7.0
RS-2117	25.0 - 30.0	97.5 - 99.0	97.5 ± 2.5	≤0.4	5.0 - 7.0

ELVANOL™ grades

Grade name ELVANOL™	Viscosity[1] [mPa•s]	Degree of hydrolysis [mol%]	Non-volatile content [w%]	Ash[2] [w%]	pH
71-30	27.0 - 33.0	99.2 - 99.7	97.5 ± 2.5	≤0.7	—
90-50	11.6 - 15.4	99.2 - 99.7	97.5 ± 2.5	≤0.7	—
80-18	17.0 - 23.0	99.2 - 99.7	97.5 ± 2.5	≤0.7	—
85-82	24.0 - 32.0	99.2 - 99.7	97.5 ± 2.5	≤0.7	—
75-15	11.6 - 15.4	99.2 - 99.7	97.5 ± 2.5	≤0.7	—

1) of a 4% aqueous solution at 20°C JIS K 6726 / DIN 53015 / Falling needle viscometer
2) Calculated as Na_2O

Additional data valid for all KURARAY POVAL™ grades:

Non-volatile content min. 95% (after 3 hours of drying at 105°C/DIN 53189). Methanol content is less than 3%. pH of a 4% solution in distilled water (DIN 19261): 5-7. Bulk density (DIN 53466): approximately 0.4-0.6 gcm-3, depending on grade. The first number in the nomenclature denotes the viscosity of the 4% aqueous solution at 20°C as a relative measure for the molar mass of KURARAY POVAL™ grades; the second number denotes the degree of hydrolysis of the polyvinyl acetate from which the KURARAY POVAL™ grade is derived.

Properties:

Polyvinyl alcohols are water-soluble polymers manufactured by alcoholysis of polyvinyl acetate. The properties of the various grades are mainly governed by the molecular weight and the remaining content of the acetyl groups.

KURARAY POVAL™, EXCEVAL™ & ELVANOL™ Resins

Grade List for North and South America

PARTIALLY SAPONIFIED GRADES

KURARAY POVAL™ resin as an adhesive promoter

KURARAY POVAL™ resin as an adhesive raw material used similarly to natural products such as casein, starch, and its degraded derivatives (for example, dextrins) as raw material for the production of aqueous adhesive solutions. Compared to dextrins and casein, KURARAY POVAL™ resin has the advantage of a more uniform chemical structure and greater adhesion, being obtained with minimum raw material requirements.

Water-activated adhesives:

Remoistenable adhesives are employed mainly in the paper processing industry. Very familiar uses are the gumming of paper on the reverse side (e.g. postage stamps and labels) and the application of gum to the flaps of envelopes and Jiffy®-type bags. Partially saponified KURARAY POVAL™ grades with low to medium viscosity, e.g. KURARAY POVAL™ 5-88 are particularly suitable for this function. To produce the adhesive, KURARAY POVAL™ solutions of up to 30% are applied according to the viscosity requirements, these solutions containing additions of preservative and defoamer if necessary. The open time of the adhesive depends on the grade of KURARAY POVAL™ employed. Increasing viscosity of a 4% KURARAY POVAL™ solution is generally accompanied by decreasing open time. An applied quantity of some 10 g KURARAY POVAL™ 5-88 solid per m^2 allows the production of coatings with very good remoistening properties and the following advantages:

- high degree of flatness during storage under fluctuating air humidity
- colorless, flexible coatings
- minimal blocking tendency, even in high air humidity
- fast setting after reactivation

Modification of emulsion adhesives:

Aqueous solutions of KURARAY POVAL™ resin can be added to polymer emulsions already stabilized with polyvinyl alcohol. These emulsion adhesives affect the:

- extension of the open time
- increase the setting speed
- influence on the rheology

The open time is very important in such operations as the manual or mechanical bonding of wood and paper. In a number of polymer emulsions, the addition of KURARAY POVAL™ solution increases the bonding speed considerably. Additions of up to 10% of an approx. 15% solution of KURARAY POVAL™ resin to the polymer emulsion have proved to be suitable for this purpose.

The choice of KURARAY POVAL™ grades is primarily dependent on the viscosity required in the ready-to-use adhesive. Generally speaking, preference should be given to partially saponified KURARAY POVAL™ grades on account of their faster solubility at lower temperatures. In emulsion adhesives suitable for application by dip wheel or roll-on applicator machines, the addition of a KURARAY POVAL™ solution has the advantage of largely preventing skin formation during processing.

KURARAY POVAL™ resin as a protective colloid:

KURARAY POVAL™ grades, preferably of the partially hydrolyzed range, are used as protective colloids in the polymerization of polymer emulsions. Because of their ability to anchor to the surface of the polymer particles that form, they help to stabilize the polymer emulsion during and after the polymerization. Those KURARAY POVAL™ types influence not only particle size distribution but also the application properties such as viscosity, stability to stirring, the freeze/thaw stability, pigment compatibility, electrolyte stability and open time of the emulsion.

FULLY SAPONIFIED GRADES

KURARAY POVAL™ resin as a binder in textile sizes:

A binder in sizes is based on its good penetration capacity and good adhesion properties on all types of fibrous material. The excellent film characteristics of KURARAY POVAL™ resin like high cohesion and toughness, low electrostatic charging and redissolving capacity of the dried film in water complete the characterization of this polymer as a suitable agent for this purpose.

KURARAY POVAL™ resin as a versatile auxiliary aid in paper applications:

Due to its broad property profile, KURARAY POVAL™ resin is frequently used as a co-binder in paper coatings. The particular suitability of KURARAY POVAL™ resin in pigmented coatings is based on:

- its outstanding carrier properties of optical brightening agents
- its excellent colloidal protection becoming effective in high solids pigment formulations which establishes a smooth viscosity profile
- its good water retention in coating colors
- its high binding strength in paper coatings which can be related to polymer cohesion as well as to good adhesion to the fiber and the pigment particles, respectively

Low molecular weight KURARAY POVAL™ grades such as KURARAY POVAL™ resin 6-98 are the preferred polyvinyl alcohols to be used in paper coatings. KURARAY POVAL™ resin possesses remarkable barrier properties. Due to its insolubility in most organic solvents, surfaces treated with KURARAY POVAL™ resin repel hydrophobic products such as oil, grease, and fat. Furthermore, KURARAY POVAL™ resin displays excellent mechanical strength properties if applied as a film on paper or paperboard. Therefore, it fits well as a surface sizing agent. Many special paper grades are produced using KURARAY POVAL™, such as:

- silicon base paper, to be used as release paper for PSA labels
- banknote paper and grades with high folding endurance
- thermoreactive paper for barcode labels or facsimile machines
- film casting (release) paper
- ink-jet paper

KURARAY POVAL™, EXCEVAL™ & ELVANOL™ Resins

Grade List for North and South America

SPECIALTY GRADES

Properties and use:

At the same degree of hydrolysis, the carboxylate polymer (K Grades), has stronger hydrophilic property than conventional PVOH even at a lower degree of hydrolysis. Therefore, K Grades such as e.g. KURARAY POVAL™ 25-88KL has a good affinity to hydrophobic substances such as polyester, polystyrene, etc. as well as good water solubility. Due to its advantageous hygroscopic property, films produced from K Grades are soft and flexible at standard condition (20°C, 65% RH) or under higher humidity. K Grades can react with aluminum sulfate $Al_2(SO_4)^3$ to form a gel, enabling K Grades to work effectively in the field of paper sizing. Furthermore, K Grades are less sensitive to salting-out effects, judged with comparable conventional PVOH.

L Grades are polyvinyl alcohol grades that have been developed to be used as primary suspending agents for vinyl suspension polymerization. The desired grain size can be obtained at the low level of L Grades. Also, precise control of the particle size distribution is achieved and PVC grains tend to be more spherical using L Grades. PVC grains of good porosity are produced while maintaining a satisfactory bulk density. The plasticizer speed, the “fish eyes” count and the residual vinyl chloride monomer level are drastically improved using L Grades.

R Grade is a water-soluble polymer, which molecular structure contains peculiar functional groups, i.e., silanol groups. The silanol groups are reactive with inorganic substances such as silica or alumina. R Grade can be applied with inorganic substances to form water-resistant films. R Grade is mainly used as a binder for inorganic substances and as a surface coating agent for organic materials which contain inorganic substances such as e.g. paper.

PROCESSING

Preparation of PVOH solutions:

In the adhesives sector, PVOH is processed as an aqueous solution as it is in most other fields of application. The solutions should be prepared in corrosion-resistant vessels. In the case of Fully and Medium hydrolyzed PVOH, the PVOH is sprinkled into cold water during stirring and heated to 90-95°C in a water bath or by the use of live steam. In the case of Partially hydrolyzed PVOH, the PVOH is sprinkled into cold water during stirring and heated to 70-95°C in a water bath or by the use of live steam. The solution should be stirred during cooling to prevent skin formation.

The speed of dissolution increases with increasing temperature. For both partially and fully hydrolyzed PVOH grades the speed of dissolution decreases with increasing molecule size (i.e., increasing viscosity of the 4 % aqueous solution). The dissolving process is also made more difficult when there is a transition to higher concentrations. As a result, even more highly concentrated PVOH solution, (e.g. 30 % solution of KURARAY POVAL™ 5-88), should be produced at temperatures of 90-95°C. Polyvinyl alcohol solutions may produce foam during stirring or transporting in pipelines, but this can be largely prevented by using a suitable stirrer design such as a low-speed anchor stirrer or by avoiding steep downward gradients in the pipelines.

Suitable defoamers are offered by numerous suppliers such as Dow Corning, Air Products and Chemicals, Inc., Emerald Performance Materials, Munzing Chemie Gmbh, etc. Please check regulatory compliance if the application requires such status.

Polyvinyl alcohol solutions which have been stored for lengthy periods may show increases in viscosity. This is especially true of fully hydrolyzed grades in high concentrations and at low temperature. The original viscosity can be restored by heating and stirring.

Preservation

Under certain conditions, aqueous solution PVOH can be attacked by micro-organisms. The main organisms that can reproduce in the acidic pH range are the fission fungi, whilst bacteria grow most readily in a neutral to weakly alkaline medium. The PVOH solutions can be preserved from any micro organism attack by the addition of preservatives. Suitable preservatives are offered by numerous suppliers such as Dow Chemical, Bayer Chemicals, Troy Corporation, Thor Specialties, Inc. etc. The dosage depends on the concentration of the solution, the storage temperature and the nature and intensity of the infection. Quantities of about 0.01-0.2% by weight preservative, relative to the PVOH solution, are generally sufficient. Compatibility and efficiency must be tested. Information on the quantity to be used is available directly from the suppliers.

It is advisable for the PVOH solution to be prepared and stored in clean containers. Considering the resistance that is shown by some micro-organisms to the preservatives employed, the dissolving vessel in particular, together with the filling equipment (pipes, valves, tubing, etc.), needs to be kept clean. Any skins or incrustations should be removed. In the event of complications, the possibility of changing to a different preservative must be considered.

Certain applications of PVOH solutions (cosmetic, finger paints, etc.) require that the preservatives employed are physiologically inert and are approved for the application in question. In such instances, it is essential to refer to the relevant regulations.

Storage

In its original packaging, KURARAY POVAL™ resin can be stored under dry and cool conditions for at least 12 months.

Industrial Safety and Environmental Protection

Not classified as a dangerous substance or preparation according to the current criteria of chemical legislation or of the EU Directives 67/548/EC. A safety data sheet is available on request.

Special remarks

Status as governed by foodstuffs legislation

Refer to the KURARAY POVAL™ resin webpage for regulatory information.

KURARAY POVAL™ and ELVANOL™ are registered trademarks of Kuraray and affiliates (collectively “Kuraray”) for its brand of polyvinyl alcohols.

DISCLAIMER - The information provided herein corresponds to Kuraray’s knowledge on the subject at the date of its publication. This information may be subject to revision as new knowledge and experience becomes available. The information provided fall within the normal range of product properties and relate only to the specific material designated; these data may not be valid for such material used in combination with any other materials or additives or in any process, unless expressly indicated otherwise. The data provided should not be used to establish specification limits or used alone as the basis of design; they are not intended to substitute for any testing you may need to conduct to determine for yourself the suitability of a specific material for your particular purposes. Since Kuraray cannot anticipate all variations in actual end-use conditions, Kuraray makes no warranties and assumes no liability in connection with any use of this information.