kuraray

Kuraray Poval™

Kuraray Poval™ & Exceval™

Technical Data Sheet

Characteristics

Polyvinyl alcohol (PVOH) having varying degree of polymerization and hydrolysis.

Recommended Uses

Ranging from emulsion polymerization aid to binder for pigments in paper applications.

Form Supplied

Granules / fine powder with defined grain size.

Specifications

The data are determined by our quality control for each lot prior to release.

Fully saponified grades (DH ≥ 98 mol%)

Grade name		Viscosity[1] [mPa•s]	Degree of hydrolysis [mol%]	Non-volatile [2] content [%]	Ash [3] content [%]	pH
Kuraray Poval™	**2-98**	2.5-3.1	98.0-99.0	97.5 ±2.5	≤0.7	5.0-7.0
	3-98	3.2-3.8	98.0-99.0	97.5 ±2.5	≤0.7	5.0-7.0
	4-98	4.0-5.0	98.0-98.8	97.5 ±2.5	≤0.5	4.5-7.0
	6-98	5.0-7.0	98.0-98.8	97.5 ±2.5	≤0.5	4.5-7.0
	10-98	9.0-11.0	98.0-98.8	97.5 ±2.5	≤0.5	4.5-7.0
	20-98	18.5-21.5	98.0-98.8	97.5 ±2.5	≤0.5	4.5-7.0
	30-98	28.0-32.0	98.0-98.8	97.5 ±2.5	≤0.5	4.5-7.0
	56-98	52.0-60.0	98.0-98.8	97.5 ±2.5	≤0.5	4.5-7.0
	60-98	54.0-66.0	98.0-99.0	97.5 ±2.5	≤0.4	5.0-7.0
	15-99	12.5-17.5	99.0-99.8	97.5 ±2.5	≤0.5	4.5-7.0
	28-99	26.0-30.0	99.0-99.8	97.5 ±2.5	≤0.5	4.5-7.0

1) of a 4 % aqueous solution at 20 °C DIN 53015 / JIS K 6726
2) after 3 hours drying at 105 °C DIN 53189 / JIS K 6726
3) calculated as Na_2O

kuraray

Kuraray Poval™

Kuraray Poval™ & Exceval™

Technical Data Sheet

Partially saponified grades (DH 96 – 86.5 mol%)

Grade name		Viscosity[1] [mPa•s]	Degree of hydrolysis [mol%]	Non-volatile [2] content [%]	Ash [3] content [%]	pH
Kuraray Poval™	**3-88**	3.2-3.6	87.0-89.0	97.5 ±2.5	≤0.4	5.0-7.0
	4-88	3.5-4.5	86.7-88.7	97.5 ±2.5	≤0.5	4.5-7.0
	6-88	5.0-6.0	86.7-88,7	97.5 ±2.5	≤0.5	4.5-7.0
	8-88	7.0-9.0	86.7-88.7	97.5 ±2.5	≤0.5	4.5-7.0
	13-88	11.5-14.5	86.7-88.7	97.5 ±2.5	≤0.5	4.5-7.0
	18-88	16.5-19.5	86.7-88.7	97.5 ±2.5	≤0.5	4.5-7.0
	22-88	20.5-24.5	87.0-89.0	97.5 ±2.5	≤0.4	5.0-7.0
	26-88	24.5-27.5	86.7-88.7	97.5 ±2.5	≤0.5	4.5-7.0
	32-88	30.0-34.0	86.7-88.7	97.5 ±2.5	≤0.5	4.5-7.0
	40-88	38.0-42.0	87.0-89.0	97.5 ±2.5	≤0.4	5.0-7.0
	44-88	40.0-48.0	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
	95-88	80.0-110.0	87.0-89.0	97.5 ±2.5	≤0.4	5.0-7.0
	30-92	28.0-32.0	91.5-93.5	97.5 ±2.5	≤0.5	4.5-7.0
	50-92	47.0-53.0	91.5-93.5	97.5 ±2.5	≤0.5	4.5-7.0
	17-94 NA	14.5-18.5	92.5-94.5	97.5 ±2.5	≤0.4	5.0-7.0
	55-95	50.0-60.0	95.0-96.0	97.5 ±2.5	≤0.4	5.0-7.0
	6-96	5.0-7.0	96.0-97.5	97.5 ±2.5	≤0.5	4.5-7.0

kuraray

Kuraray Poval™

Kuraray Poval™ & Exceval™

Technical Data Sheet

1) of a 4 % aqueous solution at 20 °C DIN 53015 / JIS K 6726
2) after 3 hours drying at 105 °C DIN 53189 / JIS K 6726
3) calculated as Na_2O

Partially saponified grades (DH 86,2 – 70 mol%)

Grade name		Viscosity[1] [mPa•s]	Degree of hydrolysis [mol%]	Non-volatile [2] content [%]	Ash [3] content [%]	pH
Kuraray Poval™	**L-508W**	6.0-7.0	71.5-73.5	97.5 ±2.5	≤0.5	5.0-7.0
	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
	40-80 E	37.0-45.0	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
	3-83	2.5-3.5	80.4-84.7	97.5 ±2.5	≤0.5	4.5-7.0
	3-85	3.4-4.0	84.2-86.2	97.5 ±2.5	≤0.5	4.5-7.0
	4-85	3.8-4.2	84.2-86.2	97.5 ±2.5	≤0.5	4.5-7.0

1) of a 4 % aqueous solution at 20 °C DIN 53015 / JIS K 6726
2) after 3 hours drying at 105 °C DIN 53189 / JIS K 6726
3) calculated as Na_2O

kuraray

Kuraray Poval™

Kuraray Poval™ & Exceval™

Technical Data Sheet

Defoamed grades

Grade name		Viscosity[1] [mPa•s]	Degree of hydrolysis [mol%]	Non-volatile [2] content [%]	Ash [3] content [%]	pH
Kuraray Poval™	**22-88 SB**	20.5-24.5	87.0-89.0	97.5 ±2.5	≤0.4	5.0-7.0
	17-94	14.5-18.5	92.5-94.5	97.5 ±2.5	≤0.4	5.0-7.0
	28-98 DB	25.0-31.0	98.0-99.0	97.5 ±2.5	≤0.4	5.0-7.0

1) of a 4 % aqueous solution at 20 °C DIN 53015 / JIS K 6726
2) after 3 hours drying at 105 °C DIN 53189 / JIS K 6726
3) calculated as Na_2O

Fine powder grades

Grade name		Viscosity[1] [mPa•s]	Degree of hydrolysis [mol%]	Non-volatile [2] content [%]	Ash [3] content [%]	pH
Kuraray Poval™	**3-85 S4**	3.4-4.0	84.2-86.2	97.5 ±2.5	≤0.5	4.5-7.0
	4-88 S2	3.5-4.5	86.7-88.7	97.5 ±2.5	≤0.5	4.5-7.0
	6-88 S2	5.0-6.0	86.7-88.7	97.5 ±2.5	≤0.5	4.5-7.0
	8-88 S2	7.0-9.0	86.7-88.7	97.5 ±2.5	≤0.5	4.5-7.0
	18-88 S2	16.5-19.5	86.7-88.7	97.5 ±2.5	≤0.5	4.5-7.0
	22-88 S2	20.5-24.5	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	≤0.5	5.0-7.0
	56-98 S2	52.0-60.0	98.0-98.8	97.5 ±2.5	≤0.5	4.5-7.0
	28-99 S2	26.0-30.0	99.0-99.8	97.5 ±2.5	≤0.5	4.5-7.0

kuraray

Kuraray Poval™

Kuraray Poval™ & Exceval™

Technical Data Sheet

1) of a 4 % aqueous solution at 20 °C DIN 53015 / JIS K 6726
2) after 3 hours drying at 105 °C DIN 53189 / JIS K 6726
3) calculated as Na_2O

Low ash grades

Grade name		Viscosity[1] [mPa•s]	Degree of hydrolysis [mol%]	Non-volatile [2] content [%]	Ash [3] content [%]	pH
Kuraray Poval™	**5-74 LLA**	4.6-5.4	72.5-74.5	97.5 ±2.5	≤0.1	5.0-7.0
	4-88 LA	3.5-4.5	86.7-88.7	97.5 ±2.5	≤0.09	4.5-7.0
	8-88 LA	7.0-9.0	86.7-88.7	97.5 ±2.5	≤0.09	4.5-7.0
	18-88 LA	16.5-19.5	86.7-88.7	97.5 ±2.5	≤0.09	4.5-7.0
	4-98 LA	4.0-5.0	98.0-98.8	97.5 ±2.5	≤0.09	4.5-7.0
	20-98 LA	18.5-21.5	98.0-98.8	97.5 ±2.5	≤0.09	4.5-7.0
	56-98 LA	52.0-60.0	98.0-98.8	97.5 ±2.5	≤0.09	4.5-7.0
	28-99 LA	26.0-30.0	99.0-99.8	97.5 ±2.5	≤0.09	4.5-7.0

1) of a 4 % aqueous solution at 20 °C DIN 53015 / JIS K 6726
2) after 3 hours drying at 105 °C DIN 53189 / JIS K 6726
3) calculated as Na_2O

Specialty grades (PVOH with carboxylic acid function)

Grade name		Viscosity[1] [mPa•s]	Degree of hydrolysis [mol%]	Non-volatile [2] content [%]	Ash [3] content [%]	pH
Kuraray Poval™	**3-86 SD**	2.4-3.4	83.0-88.0	97.5 ±2.5	≤1.8	5.0-7.0
	25-88 KL	20.0-30.0	85.0-90.0	97.5 ±2.5	≤1.5	5.0-7.0

1) of a 4 % aqueous solution at 20 °C DIN 53015 / JIS K 6726
2) after 3 hours drying at 105 °C DIN 53189 / JIS K 6726
3) calculated as Na_2O

kuraray

Kuraray Poval™

Kuraray Poval™ & Exceval™

Technical Data Sheet

Specialty grades (PVOH with silanol function)

Grade name		Viscosity[1] [mPa•s]	Degree of hydrolysis [mol%]	Non-volatile [2] content [%]	Ash [3] content [%]	pH
Kuraray Poval™	**25-98 R**	20.0-30.0	98.0-99.0	97.5 ±2.5	≤0.6	No Spec

1) of a 4 % aqueous solution at 20 °C DIN 53015 / JIS K 6726
2) after 3 hours drying at 105 °C DIN 53189 / JIS K 6726
3) calculated as Na_2O

Specialty grades (PVOH for suspension polymerization)

Grade name		Viscosity[1] [mPa•s]	Degree of hydrolysis [mol%]	Non-volatile [2] content [%]	Ash [3] content [%]	pH
Kuraray Poval™	**L-8**	5.0-5.8	69.5-72.5	98.5 ±1.5	≤1.1	5.0-7.0
	L-9	5.5-6.1	69.5-72.5	98.5 ±1.5	≤1.1	5.0-7.0
	L-9P	6.2-7.2	71.5-73.5	98.5 ±1.5	≤0.5	5.0-7.0
	L-10	5.0-7.0	71.5-73.5	97.5 ±2.5	≤1.1	5.0-7.0
	L-11	5.5–7.5	71.5–73.5	98.5 ±1.5	≤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

1) of a 4 % aqueous solution at 20 °C DIN 53015 / JIS K 6726
2) after 3 hours drying at 105 °C DIN 53189 / JIS K 6726
3) calculated as Na_2O

kuraray

Kuraray Poval™

Kuraray Poval™ & Exceval™

Technical Data Sheet

Exceval™

Grade name		Viscosity[1)] [mPa•s]	Degree of hydrolysis [mol%]	Non-volatile [2)] content [%]	Ash [3)] content [%]	pH
Exceval™	RS-1717	23.0-30.0	92.0-94.0	98.5 ±1.5	≤0.4	5.0-7.0
	RS-2817 SB	23.0-30.0	95.5-97.5	98.5 ±1.5	≤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
	AQ-4104	3.6-4.4	98.0-99.0	98.5 ±1.5	≤0.1	4.0-7.0
	HR-3010	12.0-16.0	99.0-99.4	97.5 ±2.5	≤0.6	5.0-7.0

1) of a 4 % aqueous solution at 20 °C DIN 53015 / JIS K 6726
2) after 3 hours drying at 105 °C DIN 53189 / JIS K 6726
3) calculated as Na_2O

Kuraray Poval™ & Exceval™

Technical Data Sheet

Additional data, valid for all Kuraray Poval™ grades

Methanol content: less than 3 %, can be less than 1 % upon request.
Bulk density (DIN 53466): approx. 0.4-0.6 gcm^{-3}, depending on grade.
Nomenclature: 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 the Kuraray Poval™. The second number denotes the degree of hydrolysis of the polyvinyl acetate from which the Kuraray Poval™ grade is derived. This nomenclature doesn't apply to Kuraray Poval™ L- and Exceval™.

Properties and uses

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 acetyl groups.

Partially saponified grades

Kuraray Poval™ as adhesive promoter

Kuraray Poval™ as an adhesive raw material is used in a similar manner as natural products such as casein as well as 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™ 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 of envelopes and Jiffy®-type bags. Partially saponified Kuraray Poval™ grades with low to medium viscosity, e.g. Kuraray Poval™ 4-88 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™ 4-88 solid per m^2 allows the production of coatings with very good remoistening properties and the following advantages:

Kuraray Poval™ & Exceval™

Technical Data Sheet

- 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™ can be added to polymer emulsions already stabilized with polyvinyl alcohol. This benefits include the:

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

The open time is very important in such operations like the manual or machine 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™ 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 roller on applicator machines the addition of Kuraray Poval™ solutions has the advantage of largely preventing skin formation during processing.

Kuraray Poval™ as protective colloid

Kuraray Poval™ grades, preferably of the partially hydrolysed range, are used as protective colloids in the poly-merization 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 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.

kuraray

Kuraray Poval™

Kuraray Poval™ & Exceval™

Technical Data Sheet

Fully saponified grades

Kuraray Poval™ 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™ like high cohesion and toughness, low electrostatic charging and re-dissolving capacity of the dried film in water complete the characterisation of this polymer as suitable agent for this purpose.

Kuraray Poval™ as a versatile auxiliary aid in paper applications

Due to its broad property profile Kuraray Poval™ is frequently used as a co-binder in paper coatings. The particular suitability of Kuraray Poval™ 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 fibre and to the pigment particles, respectively.

Kuraray Poval™ possesses remarkable barrier properties. Due to its insolubility in most organic solvents, surfaces treated with Kuraray Poval™ repel hydrophobic products such as oil, grease and fat. Furthermore Kuraray Poval™ 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™, for example:

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

Kuraray Poval™ & Exceval™

Technical Data Sheet

Specialty grades

Properties and uses

At the same degree of hydrolysis, the carboxylate polymer, K-grades, have stronger hydrophilic property than conventional PVOH. Due to its advantageous hygroscopic property, films produced from K-grades are soft and flexible. K-grades can react with aluminium sulphate $Al_2(SO_4)_3$ to form a gel, enabling K-grades to work effectively in the field of paper sizing. Furthermore, K-grade is less sensitive to salting-out effects, judged with comparable conventional PVOH.

R-grades are water-soluble polymer, which molecular structure contain peculiar functional groups, i.e., silanol groups. The silanol groups are reactive with inorganic substances such as silica or alumina. R-grades can beapplied with inorganic substances to form water resistant films. R-grades are 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.
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 low level of L-grades. Also a 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.

Processing

Preparation of Kuraray Poval™ solutions, general procedure

Kuraray Poval™ is usually processed as an aqueous solution. The solution should be prepared in corrosion resistant vessels. As a first step Kuraray Poval™ is sprinkled into cold water during stirring and heated to 90 - 95 °C in a water bath or by the use of live steam. The solution should be stirred during cooling in order to prevent skin formation. The speed of dissolution increases with increasing temperature. The speed of dissolution decreases with increased molecular weight (increased viscosity of the aqueous solution). The dissolving process is also made more difficult when there is a transition to higher concentrations. As a result even a more highly concentrated Kuraray Poval™ solution, e.g. a 30 % solution of Kuraray Poval™ 4-88, should be produced at temperatures of 90 -95 °C.

Aqueous solution of Kuraray Poval™ L- have cloud point because of lower degree of hydrolysis and different procedure is necessary to prepare solutions. Please refer separate technical information of Kuraray Poval™ L-.

Polyvinyl alcohol solutions may produce foam when stirred or during transport 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.

Kuraray Poval™ & Exceval™

Technical Data Sheet

Suitable defoamers are n-octanol, tributyl phosphate, Foamaster® 223 and the Agitan® grades 301, 305 and 731, which are used in quantities of up to approx. 0.001 - 0.010 % relative to the solution. Polyvinyl alcohol solutions which have been stored for lengthy periods may increase in viscosity. This is especially true of fully saponified grades in high concentrations and at low temperatures. The original viscosity can be restored by heating and stirring.

Preservation

Like any other polyvinyl alcohol, Kuraray Poval™ in the form of an aqueous solution can be attacked by microorganisms under certain conditions. In the acidic pH range the main organisms reproduced are the fission fungi, whilst bacteria grow most readily in a neutral to weakly alkaline medium. The solution can be preserved from any microorganism attack by adding a preservative. Products which have proved especially suitable for the purpose are for example the Mergal® grades K9N and K14. 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 Kuraray Poval™ solution, are generally sufficient. Compatibility and efficiency must be tested. Information on the quantity to be used is available from the suppliers.

It is advisable for the Kuraray Poval™ solution to be prepared and stored in clean containers. Considering the resistance that may be shown by some microorganisms 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 for Kuraray Poval™ in solution (cosmetic preparations, finger paints etc.) require the preservatives employed to be of approved types and physiologically inert. In such instances it is essential for the relevant legal regulations regarding physiological effects to be taken into account.

Storage

Kuraray Poval™ resin can be stored for an unlimited period of time under appropriate conditions that is in its original packs in closed, dry rooms, at room temperature. Kuraray would recommend that our product is used within 12 months from the shipment date as given on the certificate of analysis.

General

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.

kuraray

Kuraray Poval™

Kuraray Poval™ & Exceval™

Technical Data Sheet

Special remarks

Status as governed by foodstuffs legislation

Refer to the Kuraray Poval™ webpage for regulatory information

Kuraray Europe GmbH
Philipp-Reis-Str. 4
65795 Hattersheim am Main
Germany
Phone: +49 69 305 85351

pva@kuraray.com

Version: 30.04.2024