

# KURARAY POVAL Standard Grades

## Technical data sheet

### Characteristics

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

### Recommended Uses

Ranging from the production of paper adhesives as well as production of sizes and textile finishes. Also for binder in the surface finishing of paper, regulation of processing characteristics for all coating types, modification of emulsion adhesives and remoistenable adhesives, protective colloid for emulsion polymerization, binder and raw material for PVOH films.

### 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 Hydrolyzed Grades

Grade [ KURARAY POVAL ]			SPECIFICATIONS				
Standard Type	Anti-foaming/ Defoaming Type	Fine Powder Type	Viscosity <sup>1)</sup> [mPa•s]	Hydrolysis [mol.-%]	Volatile Max [%]	Ash Max <sup>2)</sup> [%]	pH
3-98			3.2 - 3.8	98.0 - 99.0	5.0	0.7	5.0 - 7.0
5-98			5.2 - 6.0	98.0 - 99.0	5.0	0.6	5.0 - 7.0
11-98			10.2 - 11.8	98.0 - 99.0	5.0	0.6	5.0 - 7.0
28-98	28-98 DB	28-98 S2	25.0 - 31.0	98.0 - 99.0	5.0	0.4	5.0 - 7.0
60-98			54.0 - 66.0	98.0 - 99.0	5.0	0.4	5.0 - 7.0

#### Partially Hydrolyzed Grades

Grade [ KURARAY POVAL ]			SPECIFICATIONS				
Standard Type	Anti-foaming/ Defoaming Type	Fine Powder Type	Viscosity <sup>1)</sup> [mPa•s]	Hydrolysis [mol.-%]	Volatile Max [%]	Ash Max <sup>2)</sup> [%]	pH
3-88			3.2 - 3.6	87.0 - 89.0	5.0	0.4	5.0 - 7.0
5-88	5-88 MB	5-88 S2	4.6 - 5.4	86.5 - 89.0	5.0	0.4	5.0 - 7.0
22-88	22-88 SB 22-88 PK	22-88 S2	20.5 - 24.5	87.0 - 89.0	5.0	0.4	5.0 - 7.0

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30-88	30-88 SB 30-88 DB	30-88 S2	27.0 - 33.0	87.0 - 89.0 86.5 - 89.0	5.0	0.4	5.0 - 7.0
44-88	44-88 SB	44-88 S2	40.0 - 48.0	87.0 - 89.0	5.0	0.4	5.0 - 7.0
49-88			45.0 - 52.0	86.5 - 89.0	5.0	0.4	5.0 - 7.0
95-88			80.0 - 110.0	87.0 - 89.0	5.0	0.4	5.0 - 7.0
3-80			2.8 - 3.3	78.5 - 81.5	5.0	0.4	5.0 - 7.0
5-82			4.5 - 5.2	80.0 - 83.0	5.0	0.4	5.0 - 7.0
40-80 E			37.0 - 45.0	79.0 - 81.0	5.0	0.4	5.0 - 7.0
27-96			24.0 - 30.0	95.5 - 96.5	5.0	0.4	5.0 - 7.0
17-94			14.5 - 18.5	92.5 - 94.5	5.0	0.4	5.0 - 7.0
55-95			50.0 - 60.0	95.0 - 96.0	5.0	0.4	5.0 - 7.0

Note: 1) Viscosity is measured at 4% aqueous solution at 20°C determined by Brookfield synchronized-motor rotary type.  
2) Ash content is measured at dry basis as Na<sub>2</sub>O.

## Additional data, valid for all KURARAY POVAL grades

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.

## 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.

As PVOHs have such good cohesion and good adhesion to fibres, fillers and pigments, all KURARAY POVAL grades are notable for their good bonding strength and pigment binding capacity. The latter intensifies with increasing molecular weight; in the case of KURARAY POVAL expressed by the viscosity of aqueous 4 % solution stated in the first number of the grade designation. This, in addition to the adhesive/ cohesive strength and with a number of other specific properties, allows the manufacture of unfilled to highly filled systems for a variety of uses.

For KURARAY POVAL defoamed grades, REACH conform defoamers is added to reduce foaming during dissolution using direct steam and during processing.

## KURARAY POVAL as 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

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electrostatic charging and redissolving 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**

Low molecular weight KURARAY POVAL grades such as KURARAY POVAL 5-98 are the preferred polyvinyl alcohols to be used in paper coatings. 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, such as

- **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 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 dextrans) as raw material for the production of aqueous adhesive solutions. Compared to dextrans 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 flaps of envelopes and Jiffy®-type bags. Partially hydrolyzed 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

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accompanied by decreasing open time. An applied quantity of some 10 g KURARAY POVAL 5-88 solid per m<sup>2</sup> 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 can be added to polymer emulsions already stabilized with polyvinyl alcohol. This affects 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 proven 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 hydrolyzed 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 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 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.

## Processing

### Preparation of KURARAY POVAL solutions

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 increasing molecule size. 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 5-88, should be produced at temperatures of 90 -95 °C.

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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.

### 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. Quantities of about 0.01 - 0.20 % 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 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.

## Industrial Safety and Environmental Protection

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

## Special remarks

### Status as governed by foodstuffs legislation

Refer to the KURARAY POVAL webpage for regulatory information.

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