Kuraray Poval™ for Textile Sizing

kuraray

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The textile manufacture of spun yarn, which has grown based upon cotton, has a long history, and starch was used as a warp size from its beginning. As the use of polyester and polyester cotton yarn has increased, so have the demands on textile size. The need for productivity and quality has justified the higher cost of PVOH compared to starch. As weavers get used to the advantages of PVOH, it has become common to use PVOH on cotton yarns, with or without starch in the size. Kuraray Poval™ is manufactured with careful control of degree of polymerization and degree of hydrolysis. Kuraray Poval™ solution forms a film very easily. Films of PVOH are superior to other resins in tensile strength, tear strength and abrasion resistance. Kuraray Poval™ absorbs moisture less than other water-soluble resins, such as acrylic resin, starch, etc.

Kuraray Poval™ requires less humidity in the weave room. Besides, Kuraray Poval™ has excellent adhesion, especially to synthetic fibre. Overall, Kuraray Poval™ is consistently in high quality giving excellent efficiency in weaving over wide range of fabrics and looms.

Advantages of Kuraray Poval™

- Good Adhesion; excellent strength and abrasive resistance of the formed coating ⇢ Excellent protective action to the yarns, and minimium warp breakage during weaving ⇢ Higher weaving efficiency and better quality of the fabrics. Decreasing rate of warp breakage is 20% ~ 50%.
- Effective in sizing performance with low size add-on.
- No size drop during sizing or weaving ⇢ Better working environments and less cleaning work.
- Weaving under relatively low humidity ⇢ Better working environments and greater work efficiency.
- The best humidity in weaving room is 70 ~ 75% R.H.
- Uniform properties and effectiveness of a size ⇢ Stable weaving efficiency.

Grades for Textile

PVOH Production Process

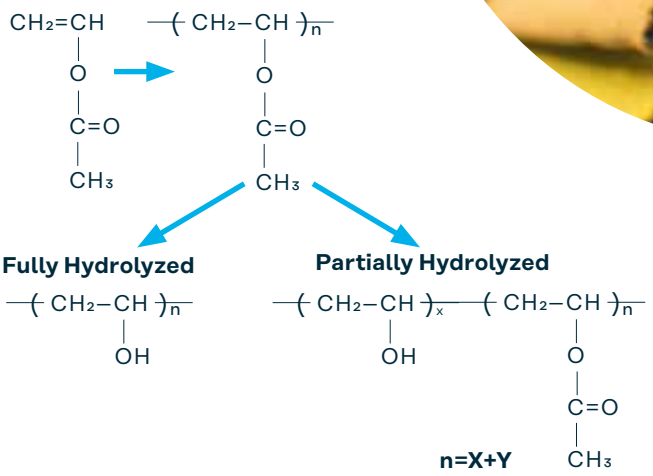
Vinyl acetate monomer

↓ **Polymerization**

Polyvinyl acetate

↓ **Hydrolysis**

Polyvinyl alcohol (PVOH)



Factors Dominating PVOH Properties

1) Degree of Polymerization

Typical degrees of polymerization (n)

500~600 ..... Low Viscosity

1700~2400 ..... High Viscosity

2) Degree of Hydrolysis

Showed by mol%:x100

Typical degrees of hydrolysis

980~99 mole % ..... Fully Hydrolyzed

87~89 mole % ..... Partially Hydrolyzed

Grades of Kuraray Poval™

	Grade Kuraray Poval™		Specifications				
	Standard Type	Anti-foaming/ Defoaming type	Viscosity [mPa•s]	Hydrolysis [mol%]	Volatile Max [%]	Ash Max [%]	pH
Partially Hydrolyzed	5-88	5-88 MB	4.6 - 5.4	86.5 - 90.0	5.0	0.4	5.0 - 7.0
	22-88	22-88 SB 22-88 PK	20.5 - 24.5	87.0 - 89.0	5.0	0.4	5.0 - 7.0
	30-88	30-88 SB 30-88 DB	27.0 - 33.0	87.0 - 89.0	5.0	0.4	5.0 - 7.0
	44-88	44-88 SB	40.0 - 48.0	87.0 - 89.0	5.0	0.4	5.0 - 7.0
Medium Hydrolyzed	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
Fully Hydrolyzed	5-98		5.2 - 6.0	98.0 - 99.0	5.0	0.6	5.0 - 7.0
	28-98		25.0 - 31.0	98.0 - 99.0	5.0	0.4	5.0 - 7.0

Figure 1: Dissolving Rate of Kuraray Poval™ in Water

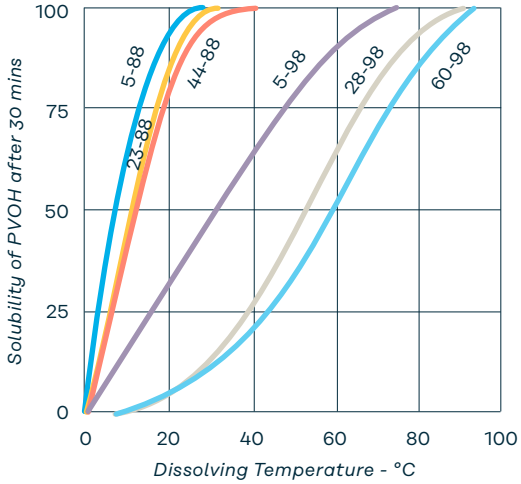
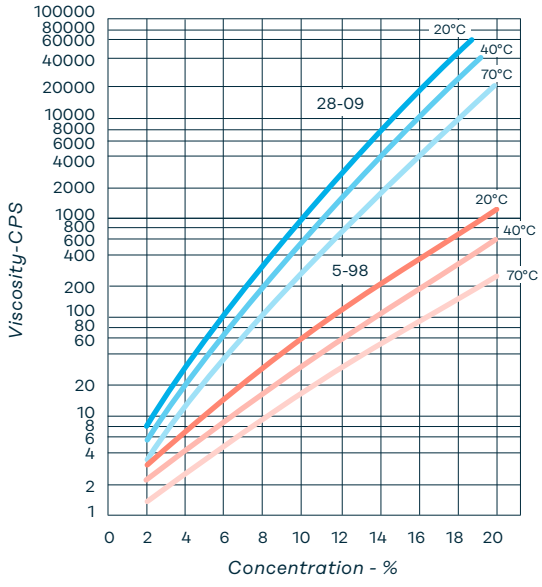


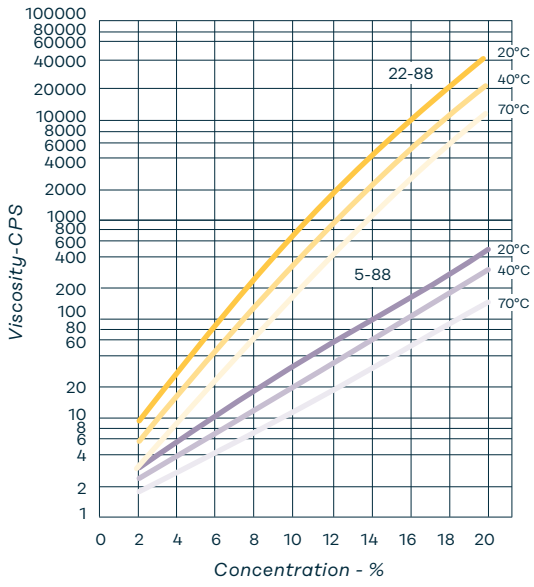
Table 1: Percentage of Affinity of Kraray Poval™ with Various Kinds of Fibers

Grade of PVOH Fibers	28-98	22-88	5-98	5-88
Cotton*	100	92	95	115
Viscose rayon	100	95	95	93
Bamberg	100	120	97	110
Acetate	100	300	120	250
Vinylon	100	105	100	115
Nylon	100	210	90	190
Polyester	100	195	110	250

Note: *1) The affinity of other grades of Kuraray Poval™ compared with that of 28-98(=100)*
*2) * Bleached cotton is used.*

Figure 2: Viscosity Concentration Relationship for Aqueous Solutions of Kuraray Poval™ at Various Temperatures





Guidelines to use Kuraray Poval™

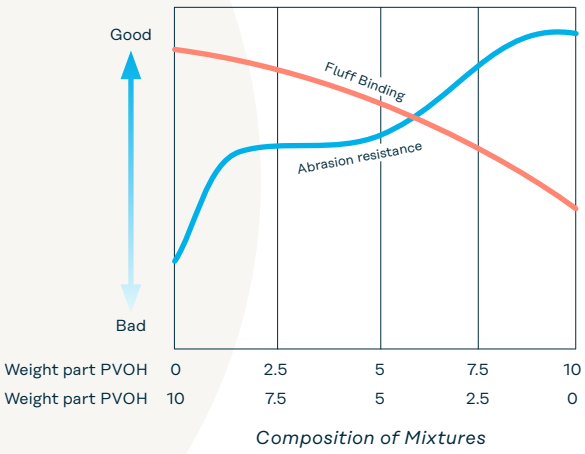
PVOH is commonly used for warp sizing in combination with starch. Through a lot of experiences in the field, it has been proved that the following two basic methods, which draw best performance of PVOH and starch are the nost suitable for warp sizing.

"PVOH rich method" and "Starch rich method"

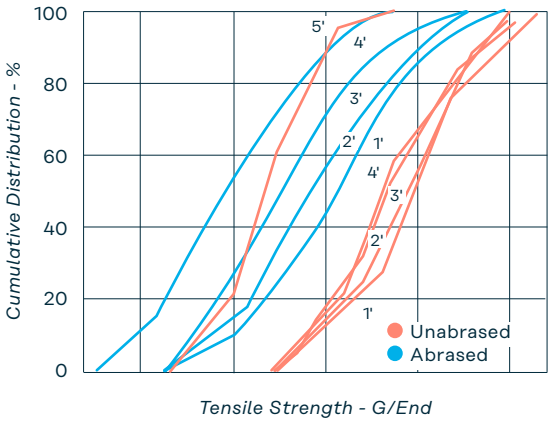
PVOH:Starch ····· PVOH method
7:3

Starch:PVOH ····· Starch rich method
7~8:3~2

Abrasion Resistance



Residual Strength of Sized Yarn after Abrasions by Stationary Weaving



Size Composition:

1 1' 28-98 only
Size take up 5.4%

2 2' 28-98:
Corn Starch=7:3.
Size take up 8.1%

3 3' 28-98:
Corn Starch=1:5
Size take up 11%

4 4' Corn Starch only.
Size take up 15%

1'2'3' : Abrasion of 10,000 cycles on loom
4' : Abrasion of 3,000 cycles on loom
5' : Un-sized yarn

Guides with fabric formulation with Kraray Poval™

Fiber: 100% Cotton
Yarn: 35/1 to 50/1
Weave: Medium to Tight

Size Formula	Shuttle	Rapier	Projectile	Air Jet
% PVOH	80	80-100	80-100	65-100
% Starch	20	20-0	20-0	35-0
% CMC				
% Wax	7-10	7-10	7-10	7-10
% Urea	0-6	6-0	6-0	6-0
% Acrylic		0-6	0-6	0-6
% Polyester				
% Other				
% Add-On	11-12	14-11	14-11	13-10

Note: %Wax and additives based on total of PVOH, Stach and CMC.

Fiber: 100% Cotton
Yarn: 10/1 to 20/1
Weave: Denim

Size Formula	Shuttle	Rapier	Projectile	Air Jet
% PVOH		0-15	80-100	
% Starch		100-85	20-0	
% CMC				
% Wax		7	7	
% Urea				
% Acrylic		15-0	15-0	
% Polyester				
% Other				
% Add-On		13-11	13-11	

Note: %Wax and additives based on total of PVOH, Stach and CMC.

Key points of sized yarn and size for air jet loom

Sized yarn			Sizing material
Spurn yarn	▪ Good shedding	▪ Good fluff binding ▪ Smoothness	▪ Proper size take-up (15% more than conventional looms) ▪ Proper viscosity of size solution ▪ Smoothness of size film
	▪ High abrasion resistance	▪ High abrasion resistance to stand up to high speed motion (reed, heald, dropper etc.)	▪ Film properties of size (strength, elongation, pliability, moisture absorbency, smoothness)
Filament	▪ Good shedding	▪ Cohesive performance of fibers ▪ Good elongation, pliability, smoothness to stand up to high speed	▪ Adhesiveness ▪ Permiability ▪ Smoothness ▪ Pliability ▪ Anti-static property ▪ Non-stickiness
	▪ High abrasion resistance	▪ High abrasion resistance to stand up to high speed motion (reed, heald, dropper etc.)	▪ Adhesiveness ▪ Pliability ▪ Smoothness ▪ Film strength & elongation
Common with spun & fil.	▪ Uniform quality	▪ The quality of raw yarn ▪ Uniform size-take-up	▪ The stability of size solution viscosity ▪ Good compatability of sizing materials
	▪ Good desizability		▪ Solubility of size

Slashing

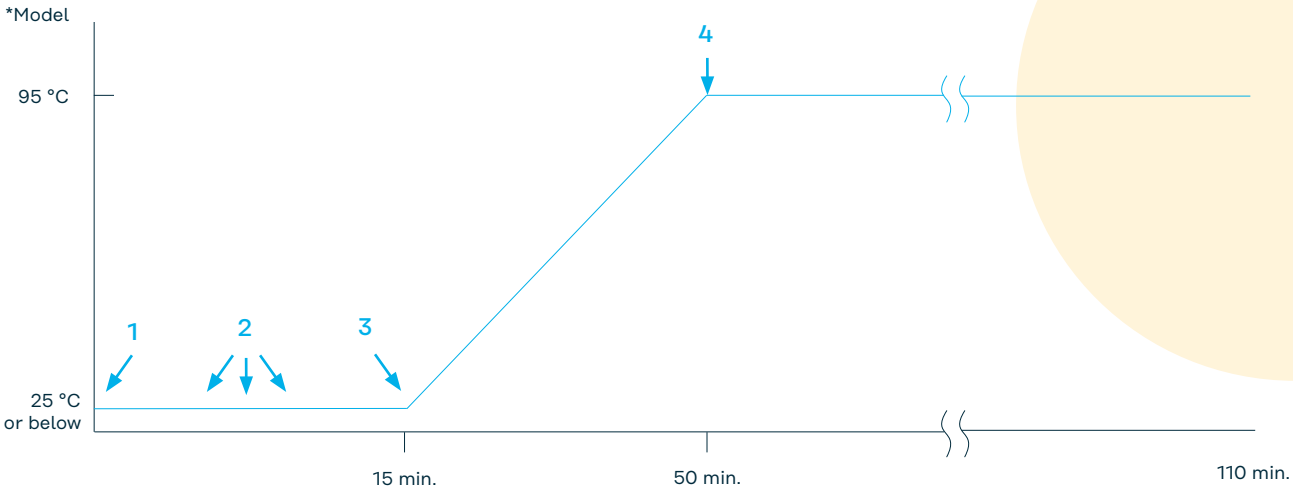
The primary purpose of sizing is to increasing weaving efficiency via reducing warp stops by the application of a protective coating on the warp yarn. On the other hand, the primary function of sizes is to improve abrasion resistance to warp yarns. The effectiveness of sizes varies with mass of add-ons and types of materials such as PVOH, starch, etc. Abrasion testing of sized yarns provides a means of comparing the effectiveness of sizes and thus their relative costs, for example, X pounds of Size A = Y pounds of Size B. Of course, abrasion resistance is not the only determinant of weaving efficiency.

Besides the size formulation, consistency and quality of the loom beams make a big difference in the weave room. Some items to check for include:

1. Consistency of size add-on from side to side and loom beam to beam.
2. Yarn sticking to the dryer(s)
3. Yarns out of lease
4. Size distribution – size mainly on the outside of the yarns to improve abrasion resistance and penetration of size into the yarns to help strengthening them.
5. Too much size (shedding, difficult tight weaves)
6. Too little size (abrasion breaks, weak yarn)

The list could be much longer, but the operation of the slasher should be controlled as any modern industrial process.

Preperation of Kuraray Poval™



1. Start stirring. Stirring must be kept for all the dissolving process.
2. Charge Kuraray Poval™ gradually.
3. Start heating up. Raise the temperature 2˚C per minute as standard.
4. After getting 95˚C, continue stirring for 60 minutes, as standard, to get complete solution.

Note: Partially hydrolyzed grades of PVOH tend to form lumps at the time of charging into water. In order to avoid this phenomenon and to achieve rapid and easy cooking, take care of the water temperature at charging time, the charging rate of PVOH and the stirring speed.

Adding value to your products – worldwide

KURARAY POVAL™, EXCEVAL™, ELVANOL™, and MOWIFLEX™ are the trademarks for polyvinyl alcohols (PVOH) made by Kuraray. Their key characteristics — outstanding film-forming properties and high binding strength — add real value to your products. Our polymers are water-soluble, highly reactive, crosslinkable and foamable. They have high pigment binding capacity, protective colloid characteristics and thickening effects. The physical and chemical properties of KURARAY POVAL™ make it ideal for a wide variety of applications, ranging from adhesives through paper and ceramics to packaging films. Many of our polymers are food contact-approved and thus suitable for food applications.

Kuraray produces its wide range of KURARAY POVAL™ grades in Japan, Singapore, Germany and the USA. Kuraray's global production and service network make us your partner of choice for innovative high-quality PVOH resins.

Kuraray Poval™

PLEASE CONTACT US

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