TOYOBO

TOYOBO
Ideas & Chemistry

VYLON

All the data showed in this brochure is only for your reference,
not guaranteed values.
Please refer to safety data sheet (SDS) or delivery specification
before using the grades listed.

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"VYLON" incorporates advanced technology to offer greater opportunities in the future.

"VYLON", TOYOBO's copolyester, has been developing new applications as the result of its high performance and unique properties.
"VYLON" will keep on walking toward the future together with advanced technology.

"VYLON" harmonizes with environment.

TOYOBO's highly advanced polymerization technology has made "VYLON" succeed to develop water-based copolyester, "VYLONAL" and hot melt adhesives to eliminate or decrease organic solvents.
And now it is on the way to develop functional biodegradable copolyesters and non-halogen flame-retardant system, which are more friendly to the environment.

CONTENTS

VYLON is high molecular weight copolyester.

Highly advanced polymer designing is possible by combining various raw materials, such as stiff, soft and both stiff and soft properties.

We propose the most suitable resin according to the use, condition and demand characteristics.

VYLON give an excellent adhesion to various substrate materials such as plastics and metals. Also possible to bond dissimilar materials.

Suitable for paint, coating materials and adhesion, and can also apply to the various use.

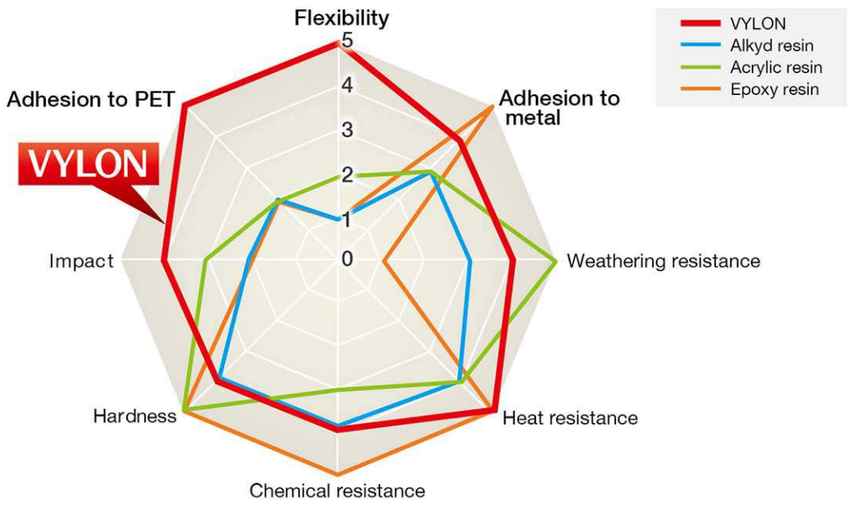
The polymerizing technology of VYLON give an excellent flexibility, bending performance, workability, corrosion resistance, durability, heat-resistance, solvent solubility, pigment dispersibility and flame resistance.

One of the attractive charactaristics of VYLON is to custmerize various well-balanced properties which other resin cannot provide.

VYLON

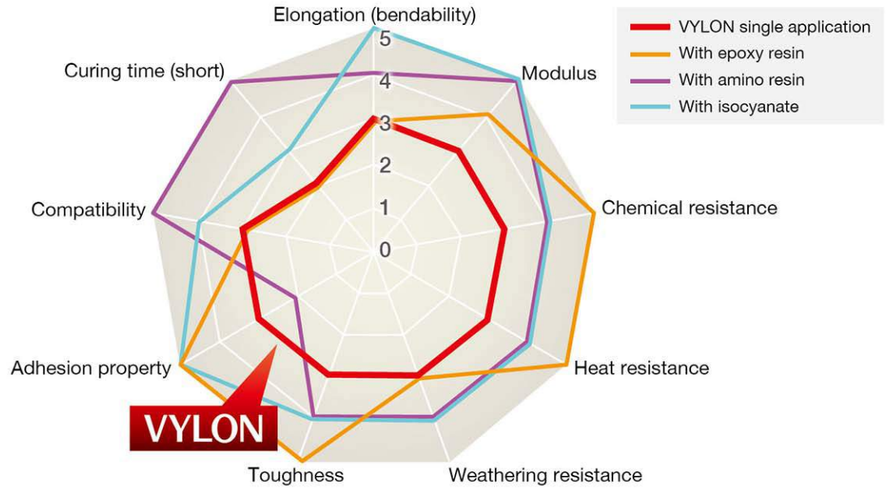
Comparison with other resins

Thanks to its low content of low-molecular weight components, VYLON have an excellent sanitation performance.
Also give well-balanced properties such as hardness, flexibility, bending perfomance, adhesion strength, heat resistance, chemical resistance and the weather resistance, etc.



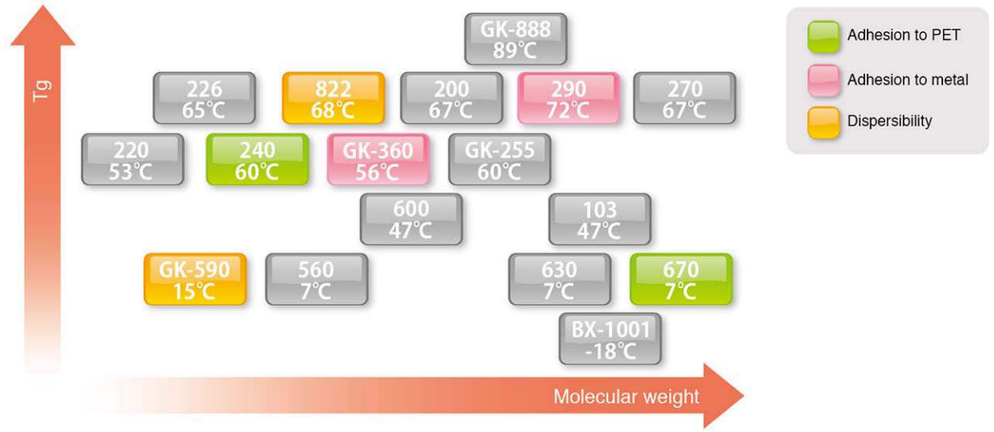
Formulation examples

VYLON can use not only independently but also with general cross linkers (such as amino resin, epoxy resin and isocyanate etc) which is possible to increase their performance.
The level of the function is different depending on the kind, amount, combination and curing (the temperature, catalyst and the thickness).
We suggest most suitable grade to various kinds of customer's requirement.



Product line of VYLON

VYLON (Amorphous copolyester) Grades



VYLON (Amorphous copolyester) Characteristic values

	Grade	Form	Molecular weight (Mn)	Tg (℃)	Hydroxyl group value (KOHmg/g)	Acid value (KOHmg/g)	FDA 175.300	FDA 175.105	Features
High Tg	**200**	Pellet/Flake	17,000	67	6	<2	✓	✓	Adhesion property, general purpose grade
	220	Flake	3,000	53	50	<2	✓	✓	Low molecular weight, resin modification
	226	Pellet	8,000	65	20	<2	✓	✓	High Tg, branched type
	240	Flake	15,000	60	9	<2			Good adhesion to PET
	270	Pellet	23,000	67	5	<2	✓	✓	High molecular weight, toughness
	280	Pellet	18,000	68	6	<2		✓	Pigment dispersibility, hydrophilic nature
	290	Pellet	22,000	72	5	<2			Adhesion to metal, corrosion resistance
	822	Flake	15,000	68	3	5	✓	✓	High Tg, can coating
	GK-250	Flake	10,000	60	11	<2	✓	✓	Weather resistance, solvent solubility
	GK-255	Flake	10,000	60	7	7	✓	✓	Solvent solubility, acid add type
	GK-360	Flake	16,000	56	7	5	✓	✓	Weather resistance, adhesion to PET
	GK-880	Pellet	18,000	84	5	<4	✓	✓	High Tg
	GK-888	Flake	15,000	89	11	<3	✓	✓	High Tg, can coating
Medium Tg	**103**	Pellet	23,000	47	5	<2	✓	✓	High molecular weight, toughness
	600	Pellet/Flake	16,000	47	7	<2	✓	✓	General purpose grade, adhesion property
	GK-780	Sheet	11,000	36	11	3			Metal adhesion, corrosion resistance
Low Tg	**560**	Sheet	19,000	7	8	<2	✓	✓	Branched type
	630	Sheet	23,000	7	5	<2	✓	✓	Flexibility, solution stability
	670	Sheet	30,000	7	<2	2	✓	✓	High molecular weight, Adhesion to metal, PET
	673	Sheet	30,000	13	<2	2	✓	✓	Adhesion to PET and metal
	GK-150	Sheet	13,000	20	7	5		✓	Branched type coil coat
	GK-390	Sheet	13,500	6	7	5		✓	Coil coat
	GK-590	Sheet	7,000	15	17	<2			Adhesion to metal, corrosion resistance
	GK-680	Sheet	6,000	10	21	<2	✓	✓	Sovent Solubility, can overcoat
	BX-1001	Sheet	28,000	-18	8	<2			Low Tg, vibration damping property

✓ = All monomers are listed

VYLON (Amorphous copolyester) Applications

Applications		High Tg										Medium Tg		Low Tg				
		200	**220**	**226**	**240**	**270**	**280**	**290**	**GK-250**	**GK-360**	**GK-880**	**103**	**600**	**560**	**630**	**670**	**GK-590**	**BX-1001**
Coatings	**Interior can coating**	✓							✓	✓✓	✓✓		✓		✓			
	Exterior can coating	✓✓						✓✓	✓	✓✓	✓		✓✓		✓✓			
	Coil coating	✓						✓✓	✓	✓✓	✓		✓	✓	✓✓	✓✓		
	Architecture		✓						✓									
	Plastics			✓✓											✓		✓✓	
Printing inks	**Screen ink**	✓		✓	✓✓	✓			✓✓	✓		✓			✓	✓		
	Gravure ink	✓			✓				✓									
	TTR	✓			✓						✓✓		✓✓					
Adhesives	**PET**	✓✓			✓✓			✓				✓	✓	✓✓	✓	✓✓		✓
	PVC	✓			✓							✓	✓	✓✓	✓	✓		
	Other plastics	✓						✓				✓	✓	✓	✓	✓		✓
	Metal				✓			✓						✓	✓	✓✓	✓✓	
	Glass							✓	✓					✓				
	Heat seal	✓				✓					✓			✓	✓	✓		
	FPC													✓				
	FFC	✓✓	✓					✓								✓✓		✓

✓ = Useable application ✓✓ = Recommended application

VYLON (Amorphous copolyester) Solubility data

	Grade	Ethyl acetate		MEK		Cyclohexanone		Dibasic acid ester		ECA	
		30 (%)	10 (%)	30 (%)	10 (%)	30 (%)	10 (%)	30 (%)	10 (%)	30 (%)	10 (%)
High Tg	200	○	△	○	△	○	○	○	○	○	○
	220	○	○	○	○	○	○	○	○	○	○
	226	○	○	○	○	○	○	○	○	○	○
	240	○	△	○	○	○	○	○	○	○	○
	270	△	×	△	△	○	○	○	○	○	○
	280	△	×	○	×	○	○	○	○	○	○
	290	×	×	×	×	○	○	○	○	○	○
	GK-250	○	○	○	○	○	○	○	○	○	○
	GK-360	×	×	○	×	○	○	○	○	△	×
	GK-880	○	○	○	○	○	○	○	○	○	○
Medium Tg	103	○	○	○	○	○	○	○	○	○	○
	600	○	○	○	○	○	○	○	○	○	○
Low Tg	560	○	○	○	○	○	○	○	○	○	○
	630	○	○	○	○	○	○	○	○	○	○
	670	△	○	△	○	○	○	○	○	○	○
	GK-590	△	○	○	○	○	○	○	○	○	○
	BX-1001	○	○	○	○	○	○	○	○	○	○

○ : Clear
△ : Haze, insoluble partially
× : Separate

ECA Ethyl Carbitol Acetate

VYLON (Amorphous copolyester) Compatibility with other VYLON grade ①

Solvent Ethyl acetate
Solid contents 30%
○ : Clear
△ : Haze, insoluble partially
× : Separate

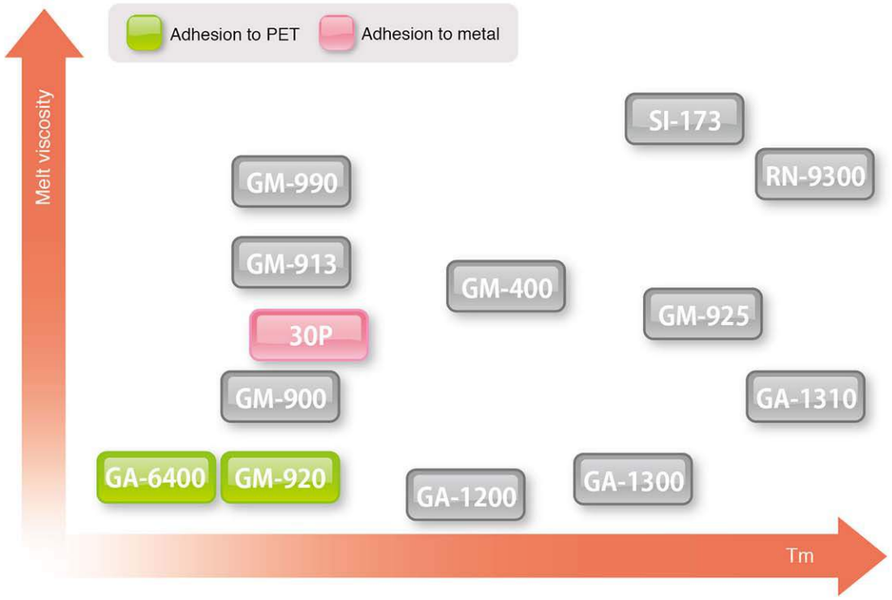
		200	220	226	240	270	280	290	GK-250	GK-360	GK-880	103	600	560	630	670	GK-590	BX-1001
High Tg	200	200																
	220	○	220															
	226	○	○	226														
	240	○	○	○	240													
	270	○	○	○	○	270												
	280	×	×	×	×	×	280											
	290	×	×	×	×	×	×	290										
	GK-250	○	○	○	○	○	×	×	GK-250									
	GK-360	×	×	×	×	×	×	×	×	GK-360								
	GK-880	○	○	○	○	○	×	×	○	×	GK-880							
Medium Tg	103	○	○	○	○	○	×	×	○	×	○	103						
	600	○	○	○	○	○	×	×	○	×	○	○	600					
Low Tg	560	△	○	○	○	×	×	×	○	×	○	○	○	560				
	630	○	○	○	○	△	×	×	×	×	○	○	○	○	630			
	670	×	×	×	×	×	×	×	○	×	×	×	×	×	×	670		
	GK-590	○	○	○	○	○	×	×	×	○	○	○	○	○	×	○	GK-590	
	BX-1001	△	○	○	×	×	×	×	×	○	○	○	○	○	×	○	○	BX-1001

VYLON (Amorphous copolyester) Compatibility with other VYLON grade ②

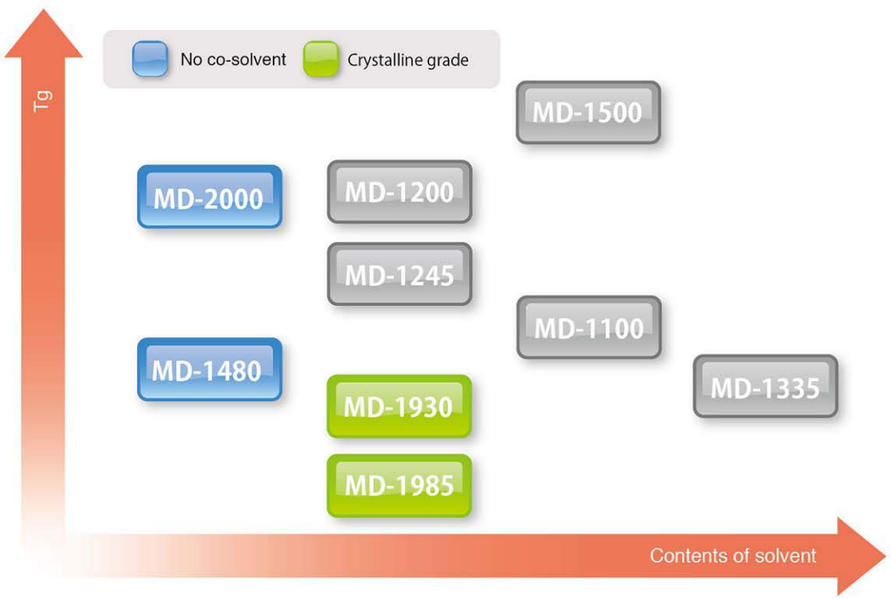
Solvent Cyclohexanone
Solid contents 30%
○ : Clear
△ : Haze, insoluble partially
× : Separate

		200	220	226	240	270	280	290	GK-250	GK-360	GK-880	103	600	560	630	670	GK-590	BX-1001
High Tg	200	200																
	220	○	220															
	226	○	○	226														
	240	○	○	○	240													
	270	○	○	○	○	270												
	280	○	○	○	○	○	280											
	290	○	○	○	○	○	×	290										
	GK-250	○	○	○	○	○	○	○	GK-250									
	GK-360	○	○	○	○	○	○	○	○	GK-360								
	GK-880	○	○	○	○	○	○	○	○	○	GK-880							
Medium Tg	103	○	○	○	○	○	○	○	○	○	○	103						
	600	○	○	○	○	○	×	○	○	○	○	○	600					
Low Tg	560	○	○	○	○	○	△	○	○	○	○	○	○	560				
	630	○	○	○	○	○	△	○	○	○	○	○	○	○	630			
	670	○	○	○	○	○	×	○	○	○	○	○	○	○	○	670		
	GK-590	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	GK-590	
	BX-1001	○	○	○	○	○	×	○	○	○	○	○	○	○	○	○	○	BX-1001

VYLON (Crystalline copolyester) Grades



VYLONAL (Water-based copolyester) Grades



VYLON (Crystalline copolyester) Characteristic values

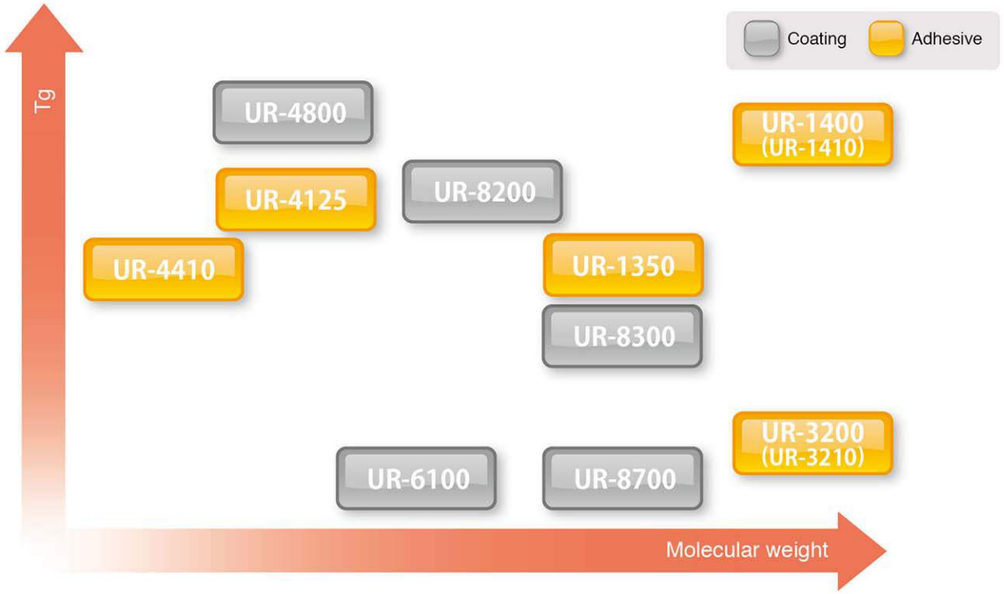
	Grade	Form	Molecular weight (Mn)	Melting point (°C)	Tg (°C)	Melt viscosity (dPa・s/200°C)	Features
High Tm	**GM-925**	Pellet	25,000	166	15	4000	Transparency, fabric application
	GA-1300	Pellet	20,000	167	-6	510	Solvent resistance, fuel filter
	GA-1310	Pellet	20,000	179	27	1500	Solvent resistance, fuel filter
	SI-173	Pellet	25,000	185※	78	7000※※	High melt viscosity, toughness, extrusion performance
	RN-9300	Pellet	25,000	198	73	3800※※	High melt viscosity, extrusion performance
Medium Tm	**GM-400**	Pellet	25,000	143	19	4600	Dry cleaning resistance, fabric application
	GA-1200	Pellet	10,000	141	0	130	Low viscosity, air filter
Low Tm	**GM-900**	Pellet	25,000	112	-15	1500	Texture, fabric application
	GM-913	Pellet	35,000	126	-70	6500	Adhesion property, moisture resistance
	GM-920	Pellet	30,000	107	-60	1000	Adhesion to PET, moisture resistance
	GM-990	Pellet	30,000	111	4	8000	High melt viscosity, Hydrolysis resistance
	GA-6400	Pellet	30,000	96	-20	500	Low Tm, low temperature adhesion property
	30P	Pellet	25,000	125	-28	2000	Adhesion to metal
Flame retardance grade	**GH-230**	Pellet	8,000	—	72	—	Flame retardance

※Softening point ※※dPa・s/250℃

VYLONAL (Water-based copolyester) Characteristic values

	Grade	Solid content (wt%)	Viscosity (dPa・s/25°C)	Molecular weight (Mn)	Tg (°C)	Hydroxyl group value (KOHmg/g)	Acid value (KOHmg/g)	Flash point (°C)	pH	Organic co-solvent (wt%)	Features
High Tg	**MD-1200**	34	20～80	15,000	67	6	<3	—	4～7	n-BuCel (11)	Weather Resistance Heat Resistance
	MD-1245	30	0.5～3	20,000	61	5	<3	—	5～7	t-BuCel (10)	Adhesion to PET, Solvent resistance
	MD-1500	30	0.1～1	8,000	77	14	<3	—	5～7	n-BuCel (15)	High Tg
	MD-2000	40	9	18,000	67	6	<2	—	4～7	None	No co-solvent
Medium Tg	**MD-1100**	30	2～7	20,000	40	5	<3	—	4～6	n-BuCel (15)	Flexibility
	MD-1480	25	<1.0	15,000	20	6	3	—	4～7	None	No co-solvent
Low Tg	**MD-1335**	30	0.1～1.1	8,000	4	13	3	23	4～6	i-PrOH (30)	Low Tg
	MD-1930	31	<1.0	20,000	-10	5	<3	—	4～7	t-BuCel (11)	Crystallinity, Adhesion to PET
	MD-1985	27	0.1～1.3	25,000	-20	4	<3	—	4～7	n-BuCel (9)	Crystallinity, Adhesion to PET

VYLON UR series (Polyester urethane) Grades



VYLON UR series (Polyester urethane) Characteristic values

	Grade	Solid content (wt%)	Solution Viscosity (dPa·s/25°C)	Molecular weight (Mn)	Tg (°C)	Hydroxyl group value (KOHmg/g)	Acid value (KOHmg/g)	Features	Solvent composition (Weight ratio)
High Tg	**UR-1400**	30	40	40,000	83	2～3	<1	Hardness	MEK/TOL =50/50
	UR-1410	30	210	40,000	83	2～3	<1	Different solvent formulation of UR-1400	TOL/CHX/ARM =20/50/30
	UR-4125	23	16	20,000	68	6～8	<1	Pigment dispersability	MEK/TOL =50/50
	UR-4410	40	0.6	10,000	56	11	<2	Heat Resistance, toluen-free	MEK=100
	UR-4800	32	40	25,000	106	4～6	<1	High Tg, pigment dispersability	MEK/TOL =50/50
	UR-8200	30	20	25,000	73	4～6	<1	Pigment dispersability	MEK/TOL =50/50
Medium Tg	**UR-1350**	33	7	30,000	46	3～4	<1	Adhesion to PET, no yellowing grade	MEK/TOL =65/35
	UR-8300	30	15	30,000	23	3～4	<1	Pigment dispersability	MEK/TOL =50/50
Low Tg	**UR-3200**	30	50	40,000	-3	2～3	<1	Adhesion property, toughness	MEK/TOL =50/50
	UR-3210	30	35	40,000	-3	2～3	<1	Toluen-free type of UR-3200	MEK=100
	UR-6100	45	100	25,000	-30	4～6	<1	Low Tg, no yellowing grade	CHX/ARM/IPH =40/40/20
	UR-8700	30	30	32,000	-22	2～4	<1	Pigment dispersability	MEK/TOL/CHX =33/33/34

TOL：Toluene　CHX：Cyclohexanone　ARM：Aromatic solvent　IPH：Isophorone

VYLOMAX (Polyamideimide) Grades

VYLOMAX (Polyamideimide) Characteristic values

	Grade	Solid content (wt%)	Solution Viscosity (dPa·s/25°C)	Molecular weight (Mn)	Tg (°C)	Modulus (GPa)	Coefficient of thermal expansion (×10⁻⁵°C)	Features	Solvent composition (Weight ratio)
High Tg	**HR-11NN**	15	20	15,000	300	2.8	4.2	General purpose grade, toughness	NMP=100
	HR-41DD	30	15	12,000	300	2.8	4.2	NMP free of HR-11NN	DMAc=100
	HR-16NN	14	500	30,000	320	6.0	2.3	High mechanical property, Low thermal expansion	NMP=100
	HR-66NN	13	500	19,000	340	7.5	2.1	High heat resistance, Low moisture absorption	NMP=100
Medium Tg	**HR-15ET**	25	4	6,000	260	2.7	5.7	Colorless, transparency, Soluble in low	EtOH/TOL =50/50
Low Tg	**HR-17NN**	35	180	14,000	130	1.9	ND	Alkaline resistance	NMP=100
	HA-107	—	—	13,000	190	2.0	6	Solid	—

GBL：γ-Butyrolactone, EtBz：Ethyl benzene, XYL：xylene

How to dissolve VYLON

Laboratory scale

Preparation

In case of dissolving sheet formed VYLON,
it is preferable to cut in small size (ex.3cm×3cm) .

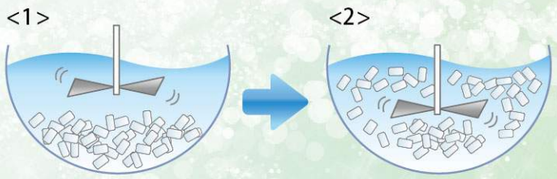
Charging and dissolving

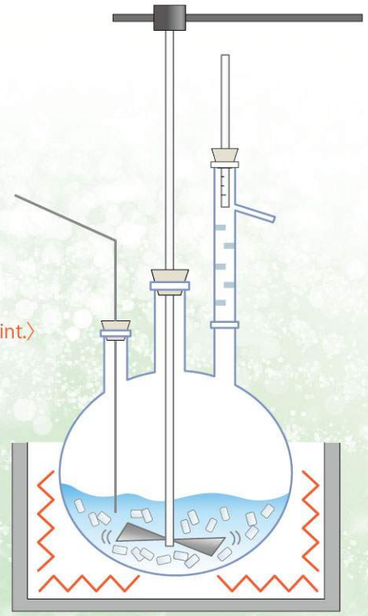
- Charge VYLON and organic solvent into separable flask.
- Raise temperature up to 60-70℃ and stir 1-2 hours.

<1> Only stirring solvent area (without tougching resin) is recommended to make the resins well swelled.

<2> Keep stirring for 2 - 3 hours to dissolve resin completely.

〈※Be careful not to raise the temperature higher than the boiling point.〉





Cooling down and filtering

Cool down to less than 40℃ before filtering the solution.

Precautions when dissolving

Static electricity may be generated while handling.
Since there is a possibility of breaking fire with static electricity when handling flammable organic solvents, static electricity should be removed by neutralization apparatus or grounding, etc and set up a good ventilation and exhaust system in the work area.

Global Network

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