Shin-Etsu

Nissin Chemical Industry Co.,Ltd.

SOLBIN®

Vinyl Chloride-Vinyl Acetate Copolymer Resin

Characteristics of SOLBIN

Copolymer resin with characteristics of vinyl chloride and vinyl acetate

SOLBIN is a modified resin that combines the toughness and chemical resistance of vinyl chloride, strong adhesiveness and plasticity of vinyl acetate, and other polar groups that enhance adhesivity and solubility. Due to its many outstanding characteristics, including its lack of odor or taste and high resistance to water penetration, SOLBIN has been used as a binder for magnetic cards and tapes, as a coating agent for beverage drink cans and moisture-proof cellophanes, and as an essential part of various paints, inks, and adhesives.

Characteristics of SOLBIN

SOLBIN is a copolymer resin prepared from vinyl chloride and vinyl acetate in addition to other elements, and has the following characteristics:

- It dissolves in organic solvents such as ketone and ester.
- It forms an odorless, tasteless, and transparent film.
- It is highly resistant to chemicals such as acids, alkalis, and brine.
- It forms a coating film highly resistant to water.
- Its coating films are fire-retardant and self-extinguishing.
- Its coating films are thermoplastic and heat-sealable.
- It is highly compatible with urethane and melamine resins.
- Products with hydrophilic groups favorably disperse inorganic pigments such as magnetic powder.
- Products with hydroxyl groups react with isocyanate to form cross-links.

SOLBIN PRODUCTS

SOLBIN

PRODUCT TYPES

COATING & PAINT

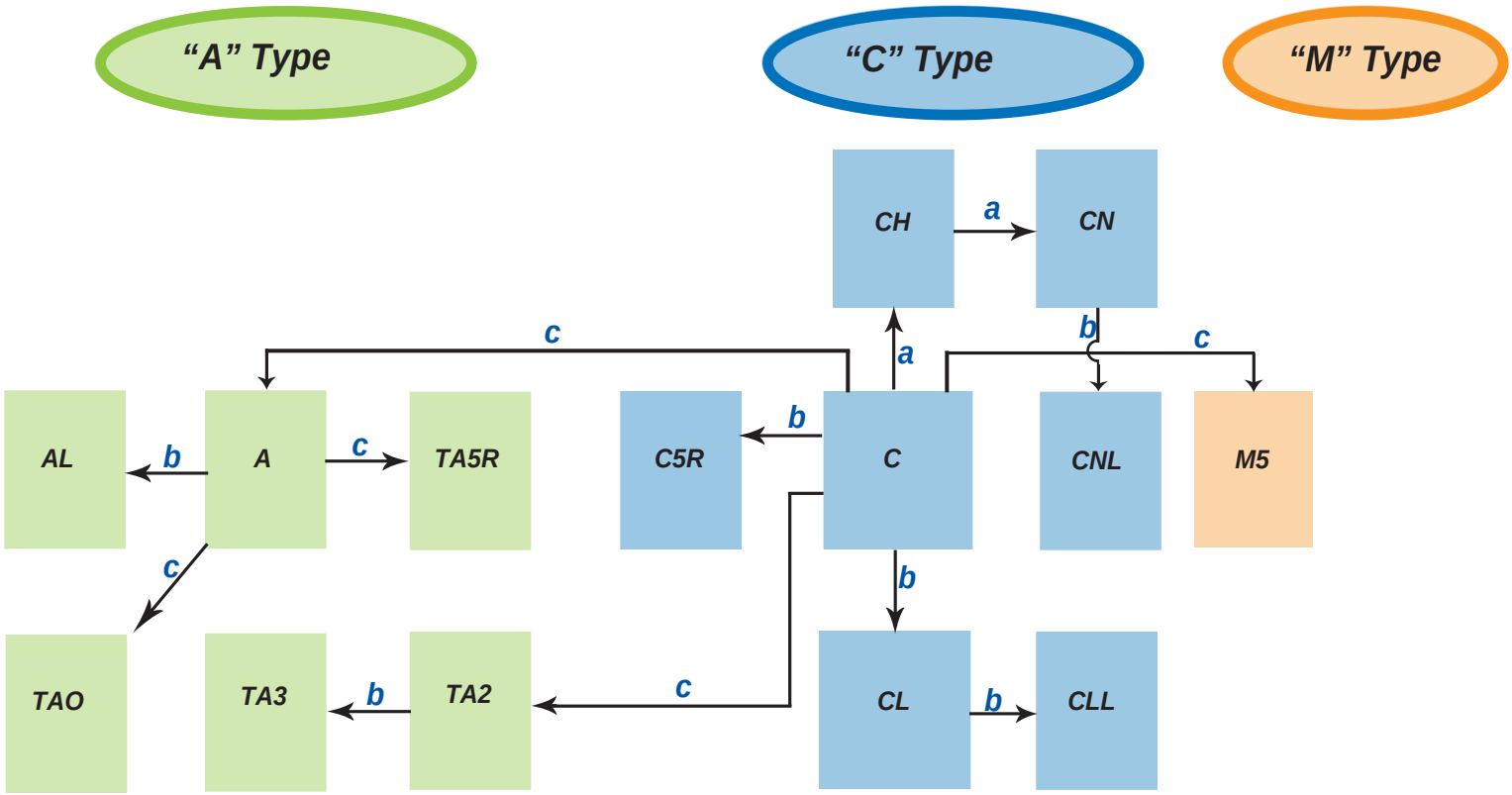
- Inkjet printing paper/film
- Heat transfer paper/film
- Wood coating
- Can Coating
- Marine Paint
- Strippable paint
- Magnetic cards
- Video, audio & data storage tapes

PRINTING INK

- Gravure printing ink
- Screen printing ink
- Inkjet printing ink
- Vinyl wall paper ink
- Pigment preparation

ADHESIVE

- Blister packaging
- Adhesive for aluminum
- Adhesive for metals
- Adhesive for PVC
- Heat seal lacquer
- Primer for metal
- Primer for aluminum



a : HIGHER VISCOSITY b : LOWER VISCOSITY c: FUNCTIONAL MODIFICATION

Characteristics of SOLBIN Product Line

PRODUCT CHARACTERISTICS
COATING AND ADHESIVE APPLICATIONS

Grade	Composition (% by weight)			Degree of polymeri-zation	Average molecular Mn (x10⁴)	Glass transition temperature (˚C)	Viscosity (mPa•s)	K-value	Features	Uses
	VC	VAc	Other							
C	87	13		420	3.1	70	150 (a)	48	Gastight, highly resistant to water and chemicals.	Heat-seal Internal coating of soft drink cans Moisture-proof cellophane coating Rotogravure ink Silk-screen ink Top coating on galvanized color iron plate Adhesive Pigment preparation Inkjet ink Heat transfer paper & film Color master batch
CL	86	14		300	2.5	70	60 (a)	41	Less viscous than “C” grade and highly soluble.	
CLL	84	16		260	1.9	70	35 (a)	39	Less viscous than “CL” grade and highly soluble. High filter permeability	
CH	86	14		650	3.8	73	700 (a)	55	More viscous than “C” grade, highly transparent and resistant to heat and weather	Waterproof agent for tents Strippable paint Rotogravure ink Adhesive
CN	89	11		750	4.2	75	40 (b)	59	Highly viscous and forms a strong coating film	Vinyl leather surface treatment Strippable paint Rotogravure ink Adhesive
CNL	90	10		200	1.2	76	30 (a)	35	Less viscous than “CN” grade and highly soluble.	Rotogravure ink Silk-screen ink Processed pigment Inkjet ink
C5R	79	21		350	2.7	68	60 (a)	47	Highly soluble	Nonwoven fabric binder Adhesive Inkjet ink Inkjet printing paper & film

Notes: The values in the table are typical values.
a: Resin concentration/ 20wt%, solvent: MBK/toluene=1/1
Measured by Type B viscometer (25°C).
b: Resin concentration/ 10wt%, solvent: MBK/toluene=1/1
Measured by Type B viscometer (25°C).

VC -Vinyl Chloride VAc - Vinyl Acetate

Characteristics of SOLBIN Product Line

PRODUCT CHARACTERISTICS
PAINTING AND PRINTING INK APPLICATIONS
ADHESIVE APPLICATIONS

Grade	Composition (% by weight)			Degree of polymeri-zation	Average molecular Mn (x10⁴)	Glass transition temperature (˚C)	Viscosity (mPa•s)	K-value	Features	Uses
	VC	VAc	Other							
A	92	3	5 (f)	420	3.0	76	220 (a)	48	Compatible with urethane, alkyd, acryl, melamine, and urea resins.	Rotogravure ink Heat-seal Magnetic tape, magnetic card binder Internal coating soft drink cans Galvanized color iron Ship bottom paint Pigment preparation Cap outer surface coat Color master batch
AL	93	2	5 (f)	300	2.2	76	70 (a)	41	Less viscous than grade“A”	
TA5R	88	1	11 (f)	300	2.8	78	130 (a)	41	Favorably disperses pigments and magnetic powder and is highly soluble in ethyl acetate.	Floppy disk binder Environmentally friendly Rotogravure ink
TA2	83	4	13 (g)	500	3.3	70	300 (b)	51	Favorably disperses pigments and magnetic powder and is more thermostable than “A” grade	Magnetic tape magnetic card binder
TA3	83	4	13 (g)	350	2.4	65	80 (a)	45	Less viscous than “TA2” grade	Wood paint, Rotogravure ink Magnetic tape, magnetic card binder
TAO	91	2	7 (f)	360	1.5	77	230 (a)	45	Favorably disperses pigments and magnetic powder	Magnetic tapes, magnetic card binder Rotogravure ink
M5	85	14	1 (d)	430	3.2	70	130 (a)	48	Strongly adheres to metal aluminum and cellophane	Blister Packaging Adhesive for aluminum Adhesive for metals Adhesive for PVC Heat-seal lacquer Primer for metals Primer for aluminum

Notes: The values in the table are typical values.

a: Resin concentration/ 20wt%, solvent: MBK/toluene=1/1
Measured by Type B viscometer (25°C).
b: Resin concentration/ 10wt%, solvent: MBK/toluene=1/1
Measured by Type B viscometer (25°C).
c: Number average molecular weight
d: Dicaboxylic acid
e: Acrylic acid
f: Vinyl alcohol
g: Hydroxylalkyl acrylate

Properties of SOLBIN

Powder properties of representative SOLBIN

Item	SOLBIN C	SOLBIN A	SOLBIN M5	Test Method
Particle size Sieve test 100 mesh pass 200 mesh pass	100~120 μ 90% 10%	100~120 μ 60% 5%	100~120 μ 60% 10%	Optical transmission particle-size distribution meter JIS standard sieve 100 mesh pass 149μ 200 mesh pass 74μ
Specific gravity	1.4	1.4	1.4	
Bulk specific gravity	0.8	0.7	0.7	JIS K-6720-2:1999
Repose angle	23~25°	25~28°	40~50°	
Electrification	Max + 1500V After 10 seconds + 400V After 1 minute 0	Minimum - 1500V After 30 seconds - 1100V After 1 minute - 250V		STATIRON M static electricity meter

Film properties of representative SOLBIN

Physical Properties

Item	SOLBIN C	SOLBIN A	SOLBIN M5	Test Method
Moisture permeability of film	about 170	about 130	about 180	JIS Z-0208 40± 0.1°C 90 ± 2% RH 0.02-0.03mm thickness
Physical properties Elongation Tensile strength Young's modulus	 1~2 4~6 2~3X10^{10}	 1~2 4~6 2~3X10^{10}	 2~3 4~5 2~3X10^{10}	 23±1°C 80±2%RH

Chemical Resistance

Test Item	Chemical	Immersion time	SOLBIN C	SOLBIN A	SOLBIN M5
Acid resistance	10% HNO_3	144 hours	Excellent	Excellent	Excellent
Alkali resistance	10% NaOH	144 hours	Excellent	Excellent	Excellent
Water resistance	Pure water	144 hours	Excellent	Excellent	Excellent
Brine resistance	5% brine	144 hours	Excellent	Excellent	Excellent
Alcohol resistance	60% ethyl alcohol	18 hours	Excellent	Excellent	Excellent
Hot water resistance	Pure water 77°C	45 minutes	Excellent	Slightly whitened	Slightly whitened

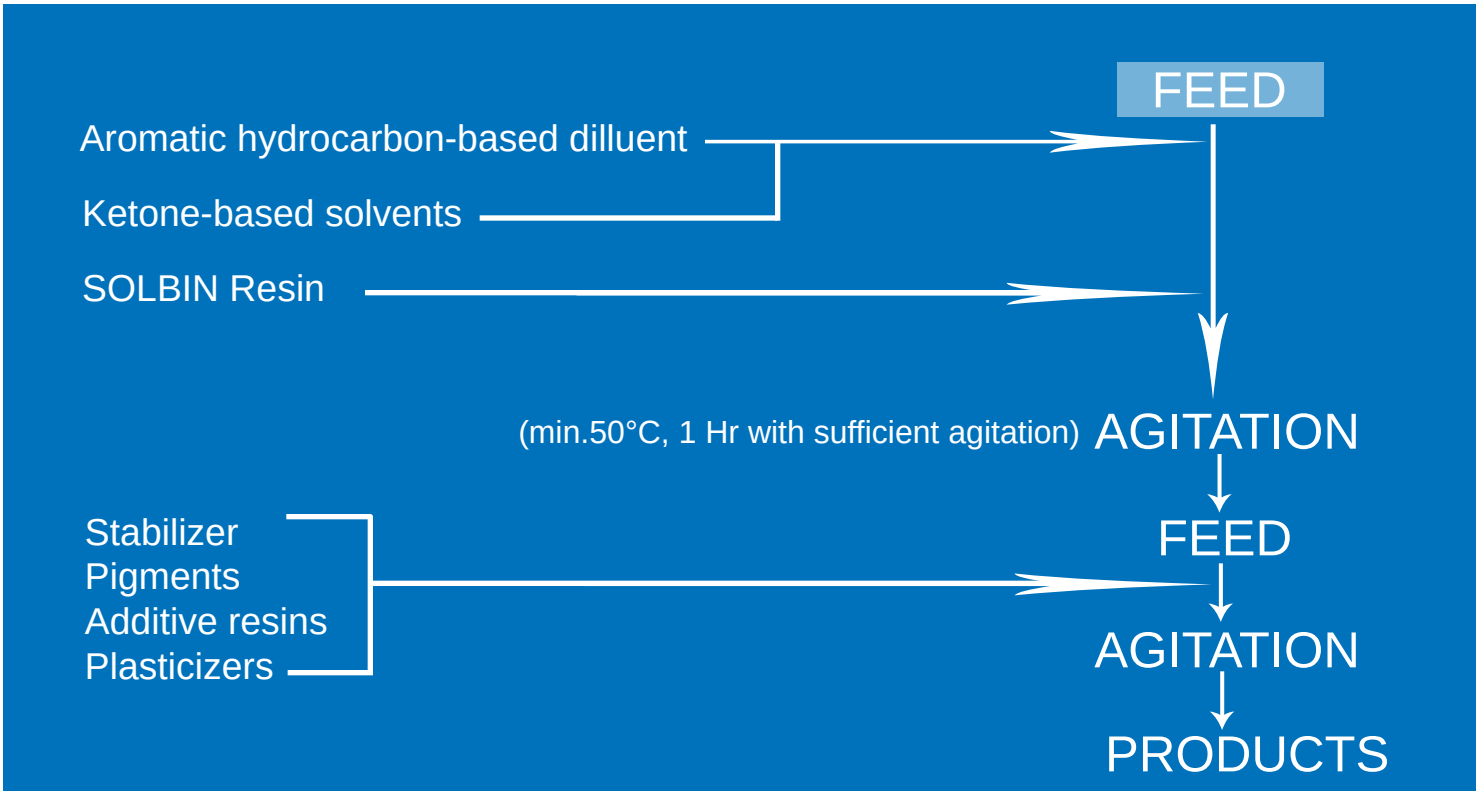
Properties of SOLBIN

Organic solvents used in SOLBIN

Solvent \ Temperature	25°C	50°C	Solvent \ Temperature	25°C	50°C
Cellosolve	△	△	Methanol	×	×
Acetone	○	○	IPA	×	×
M E K	○	○	n-Butanol	×	×
M I B K	○	○	Methyl acetate	×	○
Isophorone	○	○	Ethyl acetate	△	○
Cyclohexanone	○	○	Butyl acetate	△	○
Ethylene chloride	○	○	D I D P	△	△
Toluene	×	×	D I N P	△	△
Aromatic hydrocarbon	×	△	Tetrahydrofuran	○	○
Aliphatic carbide	×	×	Dioxane	○	○

○: Soluble △: Swells or partially insoluble ×: Insoluble

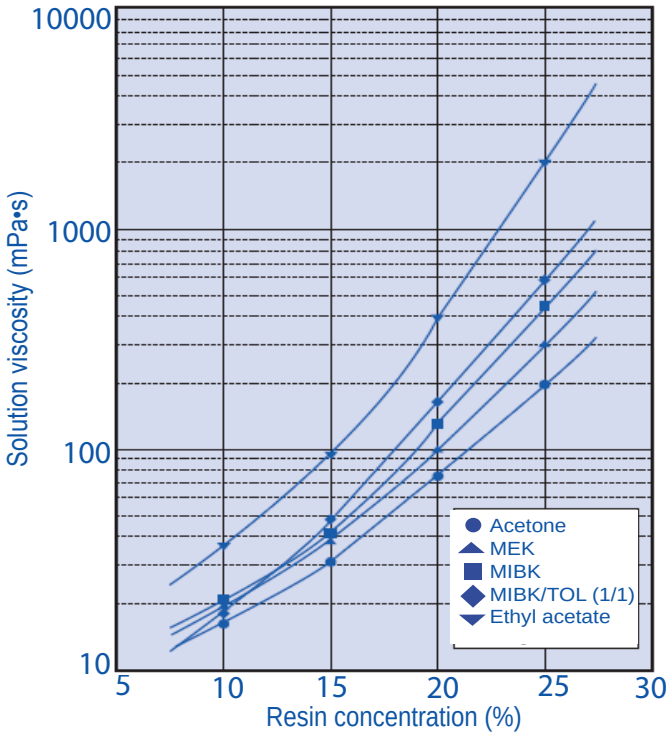
How to Use SOLBIN



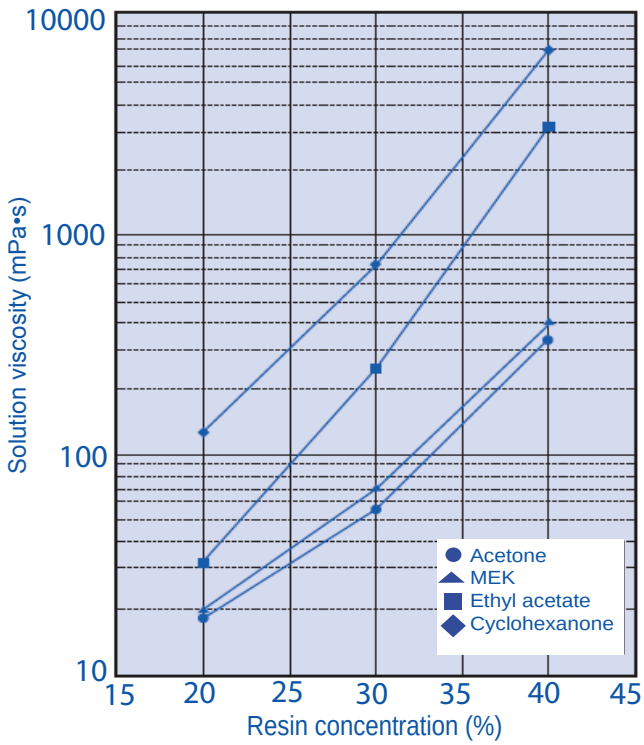
Properties of SOLBIN

Solution viscosity of SOLBIN

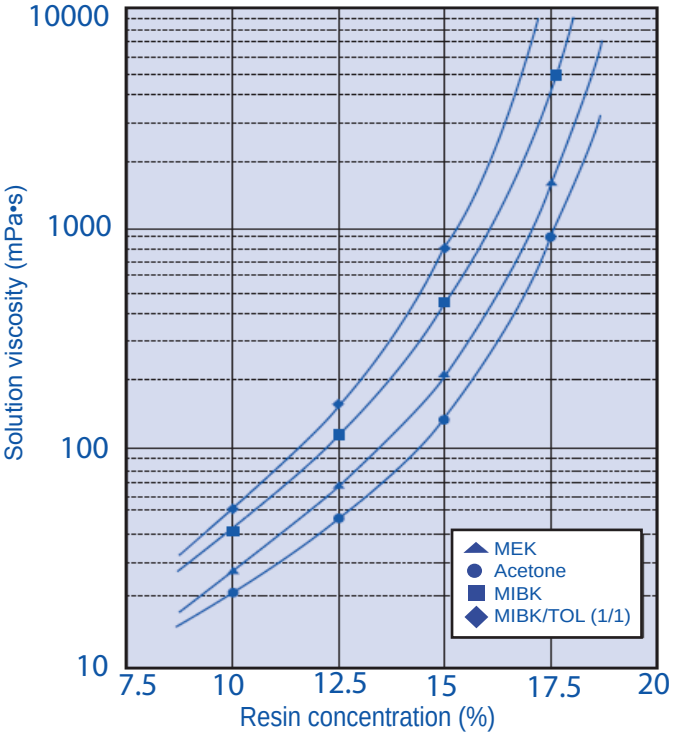
Viscosity of SOLBIN C solutions in various solvents (25°C)



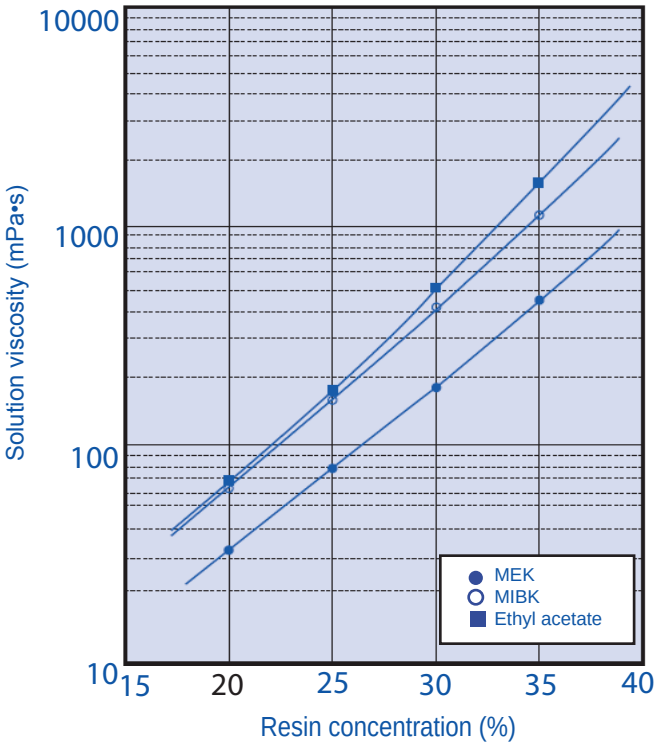
Viscosity of SOLBIN CLL solutions in various solvents (25°C)



Viscosity of SOLBIN CN solutions in various solvents (25°C)



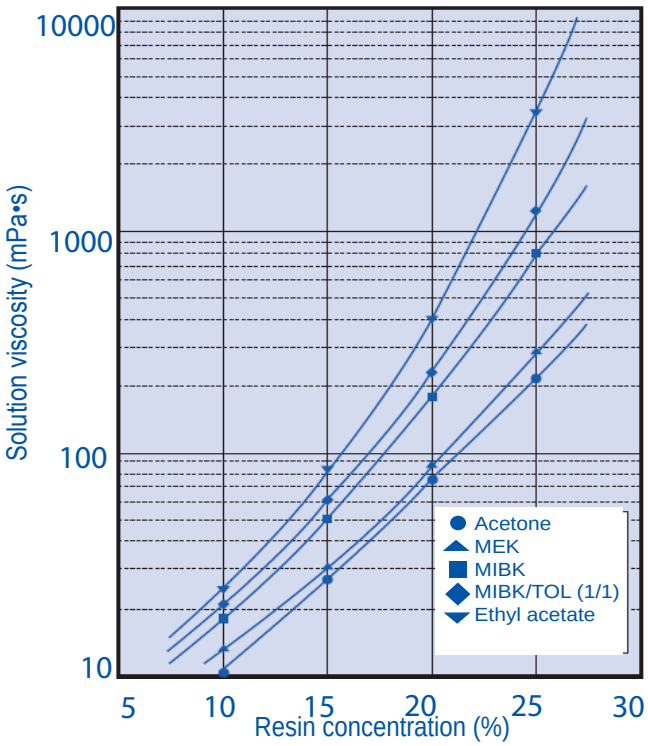
Viscosity of SOLBIN C5R solutions in various solvents (25°C)



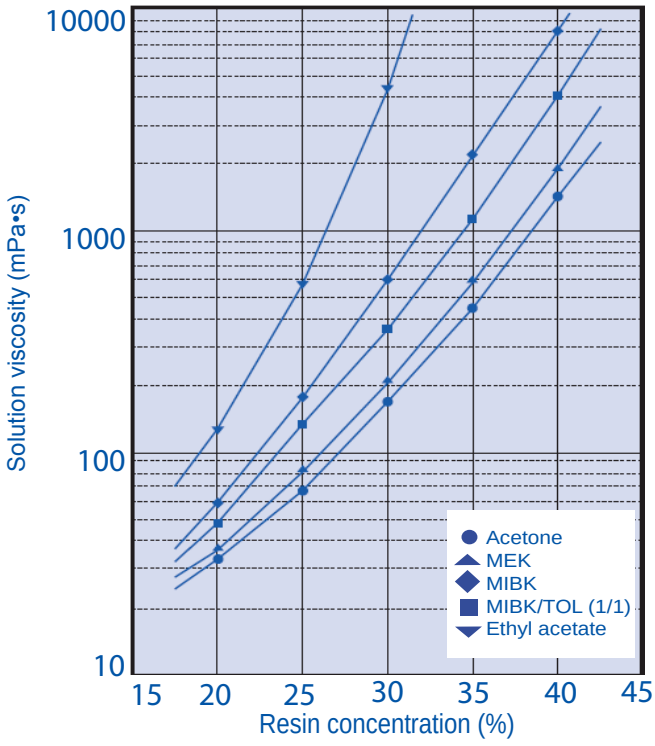
Properties of SOLBIN

Solution viscosity of SOLBIN

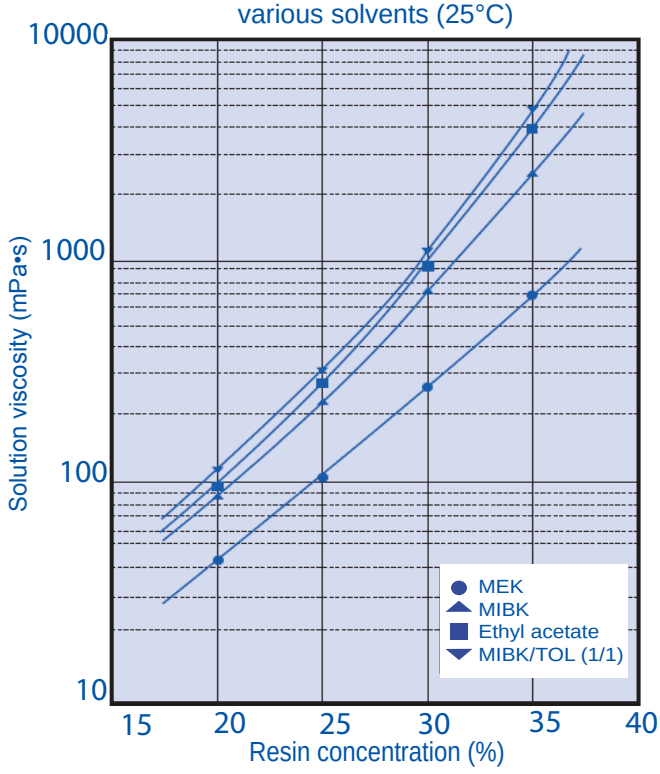
Viscosity of SOLBIN A solutions in various solvents (25°C)



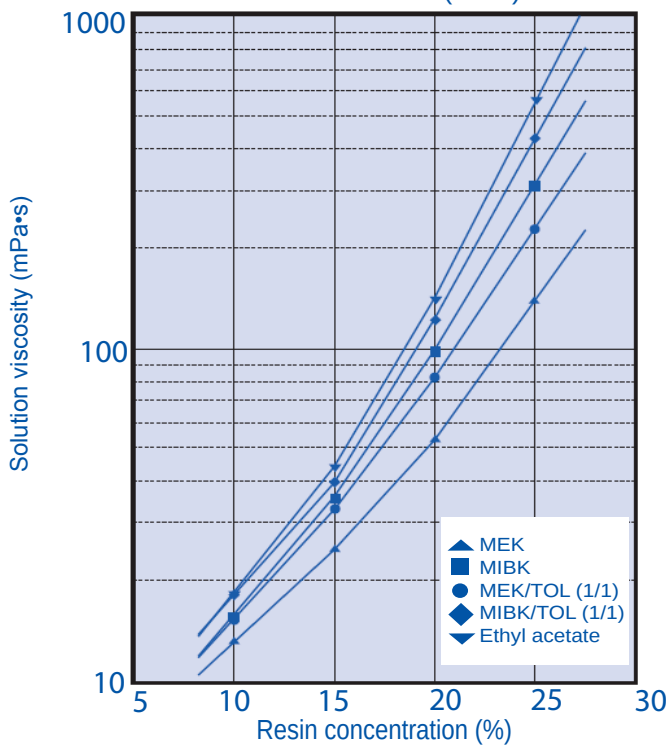
Viscosity of SOLBIN AL solutions in various solvents (25°C)



Viscosity of SOLBIN TA5R solutions in various solvents (25°C)



Viscosity of SOLBIN M5 solutions in various solvents (25°C)



Properties of SOLBIN

Compatibility of representative SOLBIN with other resins

Resin	Trade name		SOLBIN A SOLBIN A / other resin				SOLBIN C, M5 SOLBIN C or M5/ other resin			
			9/1	4/1	1/1	1/4	9/1	4/1	1/1	1/4
Alkyd	Beckosol※1	1307-60-EL	○	○	○	○	○	○	○	×
	Beckosol※1	1334-EL	○	○	○	○	○	○	×	×
	Beckosol※1	1323-60-EL	○	○	○	○	○	○	×	×
Styrenated alkyd	Styrenesol※1	4250	△	△	×	×	△	△	×	×
	Styrenesol※1	4000	○	○	×	×	△	×	×	×
Melamine	Beckamine※1	J-138	○	○	○	○	△	×	×	×
	Super Beckamine※1	TD-126	○	○	○	×	○	○	△	×
	Super Beckamine※1	J-820	○	○	○	○	△	△	×	×
	Super Beckamine※1	G-821	○	○	○	○	○	○	△	×
Epoxy	Epicoat※2	828	○	○	○	○	○	○	○	○
	Epicoat※2	1001	○	○	△	×	○	○	×	×
Urethane	Nipporane※3	2300	○	○	○	○	○	○	○	○
	Nipporane※3	3000	○	○	○	○	○	○	○	○
	Coronate L※3		○	○	○	—	○	○	○	—

○:Transparent coating △:Slightly clouded coating film ×:Whitish or knurled coating film

※1: DIC Corp ※2 : Japan Epoxy Resins Co.,Ltd . ※3 : Nippon Polyurethane Industry Co., Ltd.

Representative stabilizers used in SOLBIN

Base	Trade name
Tin	TVS 8831※1, TVS 8813※1, TVS 8102※1, TVS Tin. Lau※1, TVS 86-SP※1, Adekastab 1292※2, Adekastab 465E※2, Adekastab 466※2, TS 300※3, KS 6C6※4 ,KS 2000A※2 ,KS-1260※4
Epoxy	Epolite 100MF※5, Epicoat #828※6, Epicoat #834※6, Adekasizer O-130P※2

※1: Nitto Kasei Co.,Ltd. ※2: ADEKA CORPORATION ※3: Akishima Chemical Co., Ltd.

※4: Kyodo Chemical Co., Ltd. ※5: Kyoeisha Chemical Co., Ltd. ※6: Japan Epoxy Resins Co., Ltd.

Applicable laws and regulations

SOLBIN
C,CL,CLL,CH,CN,CNL,C5R,M5,A,AL,TA5R

U.S. Food and Drug Administration (FDA)
21 CFR Food and Drug

SOLBIN Products: C,CL,CLL,CH,CN,CNL,C5R,M5,A,AL, and TA5R conform to the FDA regulations in Parts 175-177. However, the final article/product that is produced using these SOLBIN products must meet the following requirement.

Note: Part 174.5. General provisions applicable ti Indirect Food Additives.

According to the FDA, the following Federal Register rule applies to the use of these SOLBIN products for Indirect Food Additives articles/products identified in 21 CFR Parts 175-177.

Federal Register, Vol 51, No.22, February 3, 1986 (Proposed Rules). Pages 4185-418. This rule limits Vinyl Chloride residual in the final Indirect Food Additive article/product.

Part	Applications
175	INDIRECT FOOD ADDITIVES: ADHESIVES AND COMPONENTS OF COATINGS
§ 175.105	Adhesives
§ 175.300	Resinous and polymeric coatings
§ 175.320	Resinous and polymeric coatings for polyolefin films
176	INDIRECT FOOD ADDITIVES : PAPER AND PAPERBOARD COMPONENTS
§ 176.170	Components of paper and paperboard in contact with aqueous and fatty foods
§ 176.180	Components of paper and paperboard in contact with dry food
177	INDIRECT FOOD ADDITIVES : POLYMERS
§ 177.1210	Closures with sealing gaskets for food containers

Since government regulations are subject to revision, it is the user's responsibility to refer to the Code of Federal Regulations or the Federal Register to determine current regulatory status.

Please contact

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