SANHO CHEMICAL CO., LTD.
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FUJICURE FXR-1030

-A latent type hardener for epoxide resin-

FXR-1030 is a latent type curing agent for epoxide resins, as well as curing accelerator.

It contains in one single molecule the active hydrogen portion and also the functional groups which act as curing catalyst.

FXR-1030 can be easily dispesed in the epoxide resinx, and the mixture shows good storage stavility (＝pot life) at amvient temperature, and it can be cured at relatively low temperature condition (＝by moderate heating).

When added into other latent type curing agent as the dicyandiamide, a small quantity of FXR-1030can remarkably decrease temperature of the curing cycle while maintaining the originals good storage stability.

Variety of reactive as well as non reactive diluent can be used with FXR-1030 in order to decrease the viscosity of the mixture remarkably of the mixture remarkavly without spoiling the original good storage stability.

The cured products by FXR-1030 with epoxide resin is light/ thin in its color, and give superiour mechanical properties, and adhesion so that a wide variety of applications are possivle, such as adhesives, sealings, mouldings, encaprslations, powder coatings and thermosetting type printing inks applications.

1.Typical specifications

Appearance		White powder
Specific gravity		1.09
Size of the particles	μm	Avarage 8
Softening point	℃	140

2. Storage stability and curing characteristics

The pot life, curing exothermic profile, gelation time of epoxide resin mixture of 100g of bisphenol A type liquid epoxide resin with epoxide equivalent 190 as weight, 1g of Aerosoil 300 ([1]) and different weight of FXR-1030 were tested and glass transition temperature of cured one was also tested.

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	EX-1	EX-2	EX-3	EX-4	EX-5
Epoxy resin g	100	100	100	100	100
FXR-1020 g	10	15	20	25	30
Aresoil 300 g	1	1	1	1	1
① Storage stability					
Initial viscosity Pa·s	20.4	24.5	29.0	35.2	43.4
After 30 days at 40℃	1.1	1.1	1.1	1.1	1.1
After 30 days at 60℃	1.6	1.8	2.6	—	—
② Curing exothermic profile					
Reaction start temp. –1, ℃	83	81	83	83	78
Reaction start temp.－2, ℃	100	99	98	98	78
Peak top temperature, ℃	112	110	109	109	109
③Gelation time					
□ At 100℃	5’ 21”	4’ 32”	4’ 09”	3’ 55”	3’ 11”
□ At 120℃	4’ 15”	3’ 10”	2’ 52”	2’ 43”	2’ 27”
□ At 150℃	5’ 37”	2’ 47”	2’ 09”	2’ 09”	1’ 58”
④Transition temperature, ℃	78	106	108	106	104

Remark（[1]）：Colloidal Silica from Aerosil Nippon Co., Ltd.

Remark①：Viscosity change was tested at 25℃ after stored at 40℃ or 60℃ and it was designated as index of initial viscosity.

Remark②：Estimated from DSC curve scanned at 5℃/min.

Remark③：Gelation time of 2g sample was tested on the designated Temperature by Gel-time-tester(by YASUDA Seiki Sesakusho Ltd.).

Remark④：Estimated from DSC curve re-scanned at 5℃/min for the sample which had been scanned at same condition from room temperature to 250℃

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3. Properties of cured epoxide resin

Various performance properties of the cured resin prepared from 100g of Bisphenol A type epoxide resin with epoxide equivalent 190, 1phr（g）of Aerosil 300 and different phr （g）of FXR-1030 were tested.

FXR-1030 content phr	10	15	20	25	30
Flexural strength, kgf/mm^2					
Cured at 100℃ × 1h	8.7	10.2	11.1	10.9	10.3
120℃ × 1h	14.2	12.8	12.0	11.7	11.5
150℃ × 1h	13.6	12.5	12.2	12.2	12.8
Flexural modulus, ×10^2 kgf/mm^2					
Cured at 100℃ × 1h	3.3	3.8	3.6	3.5	3.5
120℃ × 1h	3.8	3.4	3.2	3.2	3.3
150℃ × 1h	3.7	3.1	3.0	3.1	3.1
Tensile shear strength, kgf/ mm^2					
Cured at 100℃ × 1h	165	174	174	169	168
120℃ × 1h	185	186	183	175	173
150℃ × 1h	193	215	216	210	207
100℃ × 0.5h	100	137	147	141	139
120℃ × 0.5h	151	181	178	170	163
150℃ × 0.5h	174	200	213	205	200
Boiling water absorption, （[1]）,%					
Cured at 100℃ × 1h	0.5	0.5	0.5	0.5	0.6
120℃ × 1h	0.5	0.4	0.4	0.5	0.5
150℃ × 1h	0.6	0.5	0.5	0.5	0.5
Glass transition Temp.（[2]）℃					
Cured at 100℃ × 1h	68	94	100	104	106
120℃ × 1h	73	104	111	114	115
150℃ × 1h	72	97	102	101	100
Electric properties（[3]）					
Volume resistivity Ω-㎝	8.2×10^{16}	3.5×10^{16}	9.3×10^{16}		
Surface resistivity Ω	4.3×10^{15}	1.7×10^{15}	2.5×10^{15}		
Dielectric constant （1MHZ）	3.6	3.4	3.4		
Dielectic loss tangent （1MHZ）	0.02	0.02	0.02		

Remark（[1]） Tested in boiling water for 1h.

Remark（[2]） Estimated from DSC curve scanned from room temperature to 250℃.

Remark（[3]） Tested sample cured at 120℃ for 1h.

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FUJICURE FXR-1030

4. Curing acceleration effect of FXR-1030 to another curing agents

4-1. Curing acceleration for epoxide resin systems used dicyandiamide (DICY) as curing agent were tested.

	EX-6	EX-7	EX-8	EX-9	EX-10
Epoxy resin（[1]） g	100	100	100	100	100
Dicyandiamide（[2]） g	8	8	8	8	8
FXR-1030 g	—	1	3	5	7
Aerosil 300 g	1	1	1	1	1
Reaction start temp. (-1), ℃	155	120	94	85	82
Reaction start temp. (-2), ℃	181	154	123	113	107
Peak top temp. ℃	189	165	140	130	123
② Glass transition temp. ℃	131	131	128	128	126
③ Gel time, At 100℃	＞60’	＞60’	59’ 03”	19’ 26”	11’ 57”
120℃	＞60’	＞60’	10’ 42”	4’ 24”	3’ 21”
150℃	＞60’	8’ 12”	2’ 18”	1’ 47”	1’ 37”
Storage stability					
Initial viscosity Pa·s	20.5	20.8	22.6	24.4	26.5
Index of original vis.	1.2	1.2	1.2	1.2	1.2
⑤ Adhesive strength kgf/ mm^2					
Cured at 100℃ × 1h	—	—	—	—	72
120℃ × 1h	—	—	66	188	207
150℃ × 1h	—	232	245	240	234
180℃ × 1h	264	259	259	258	256
120℃ × 0.5h	—	—	—	90	117
150℃ × 0.5h	—	122	202	225	224

Remark（[1]） Bisphenol A type liquid epoxide resin with epoxide equivalent 190 as weight.
Remark（[2]） From Nippon Carbide Ind. Co., Ltd.
Remark① Estimated from DSC curve scanned at 5℃/min.
Remark② Estimated from DSC curve rescanned at 5℃/min for the sample which had scanned at same condition from room temperature to 250℃
Remark③ Tested for 2g sample by Gel-TIME-tester(by YASUDA Seiki Seisakusyo Ltd., Japan).
Remark④ Sample stored for 30days at 40℃ was tested at 25℃.
Remark⑤ Tested on specimed prepared with mild mild steel plates.

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FUJICURE FXR-1030

4-2. Curing acceleration for epoxide resin system used acid anhydride HN-5500 (3) as curing agent were tested.

		EX-11	EX-12	EX-13	EX-14	EX-15
Epoxy resin (1) g		100	100	100	100	100
HN-5500 g		85	85	85	85	85
FXR-1030 g		—	1	3	5	7
Aerosil 300 g		1	1	1	1	1
①Reaction start temp. (-1), ℃		—	89	85	83	83
Reaction start temp. (-2), ℃		—	141	130	125	121
Peak top temp.-1 ℃		—	106	104	106	105
Peak top temp.-2 ℃		—	172	159	151	146
② Glass transition temp. ℃		—	90	127	134	133
③ Gel time, At 100℃		—	＞60’	49’	31’	23’
120℃		—	49’	18”	41”	32”
150℃		—	05”	15’	10’	7’ 45”
			10’	42”	14”	2’ 47”
			51”	4’ 17”	3’ 02”	
④ Storage stability						
Initial viscosity Pa·s		0.72	0.73	0.75	0.77	0.82
40℃	7 days	1.27	1.32	1.50	1.69	1.92
	14 days	1.54	1.63	1.82	2.04	2.36
	21 days	1.70	1.79	2.02	2.27	2.81
	30 days	1.75	1.86	2.22	2.76	3.78
23℃	30 days	1.37	1.41	1.53	1.64	1.78

Remark (1) Methyl hexahydro phthalic anhydride from Hitachi Chemical Ind. Ltd.

Remark① Estimated from DSC curve scanned at 5℃/min.

Remark② Estimated from DSC curve rescanned at 5℃/min for the sample which had scanned at same condition from room temperature to 250℃

Remark③ Tested for 2g sample by Gel-TIME-tester(by YASUDA Seiki Seisakusyo Ltd., Japan).

Remark④ Samples stored at 45℃ or 23℃ were tested at 25℃ and it was shown as index of initial viscosity.

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FUJICURE FXR-1030

5. The effect of epoxide-containing reactive diluents on stability.

The stability was measured by the change of viscosity when the composition was stored at 40℃ and 23℃

The viscosity was measured at 25℃

The composition.

Bisphenol-A type liquid epoxide resin (epoxide equivalent weight 190)	80g
Epoxide-containing reactive diluents	20g
Fujicure FXR-1030	20g
Aerosil 300	1g

Multiple to initial viscosity

Epoxide-containing Reactive diluent	Initilal Viscosity mPa·s	Storage Days				
		40℃				23℃
		7 days	14 days	21 days	30 days	30 days
EPOLIGHT M-1230	1,410	1.03	1.06	1.09	1.10	1.05
EPOLIGHT 1600	2,500	10.0	gel			1.50
EPOLIGHT 40E	2,610	gel				4.49
EPOLIGHT 70P	2,860	1.30	1.54	2.13	3.11	1.13
EPOLIGHT 1500NP	3,010	1.09	1.16	1.22	1.28	1.06
EPOLIGHT 400E	4,020	1.01	1.06	1.10	1.13	1.04
EPOLIGHT 400P	4,490	1.07	1.11	1.13	1.16	1.07
EPOLIGHT 100MF	6,750	1.04	1.10	1.14	1.20	1.04
DENACOL EX-121	770	1.09	1.16	1.22	1.30	1.05
DENACOL EX-810	2,120	1.19	1.28	1.36	1.45	1.15
DENACOL EX-850	2,060	1.22	1.33	1.46	1.65	1.16
DENACOL EX-212	2,370	1.09	1.17	1.26	1.35	1.04
DENACOL EX-821	3,100	1.04	1.07	1.12	1.13	1.02
DENACOL EX-830	3,720	1.09	1.13	1.14	1.16	1.10
DENACOL EX-931	6,400	1.01	1.02	1.02	1.03	1.01
DENACOL EX-321	7,000	1.03	1.07	1.11	1.17	1.03
DENACOL EX-313	6,420	gel				2.50
DENACOL EX-2000	9,620	1.02	1.03	1.08	1.09	1.03
EPIOL B	400	gel				26.10
EPIOL P	1,610	1.36	1.32	6.81	17.3	1.12
m'p-CGE	1,950	1.18	1.34	1.75	3.10	1.08
Cardura E	2,260	1.14	1.20	1.28	1.36	1.13
GOT	6,040	1.03	1.07	1.12	1.18	1.07
GAN	13,250	1.06	1.09	1.10	1.12	1.05

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FUJICURE FXR-1030

6. The effect of organic solvents on stability.

The stability was measured by the change in viscosity when the composition was stored at 40℃ and 23℃.

The viscosity was measured at 23℃

The composition

Bisphenol-A type liquid epoxide resin (epoxu equivalent weight 190)	100g
Fujicure FXR-1030	20g
Aerosil 300	1g
Organic solvents	10g

Multiple to initial viscosity

Solvent	Initial Viscosity mPa·s	Storage Days				
		40℃				23℃
		7 days	14 days	21 days	30 days	30 days
Toluene	1,770	1.28	1.35	1.42	1.56	1.26
Xylene	1,910	1.31	1.32	1.40	1.49	1.22
Pegsol R-100（＊）	2,610	1.16	1.20	1.26	1.32	—
1’4 dioxane	3,270	1.12	1.15	1.19	1.23	—
MEK	970	1.55	2.19	3.38	8.66	1.35
MIBK	1,590	1.32	1.39	1.53	1.69	1.22
Cyclohexane	3,900	1.09	1.15	1.18	1.28	—
Ethyel acetate	1,250	1.39	1.56	1.78	2.15	1.30
n-propyl acetate	1,610	1.36	1.56	1.83	2.32	1.29
n-butyl acetate	1,780	1.24	1.33	1.49	1.63	1.23
Isoamyl acetate	2,260	1.24	1.30	1.41	1.55	1.16
Butyl cellosolve	2,660	Gel				Gel
Cellosolve acetate	2,380	1.10	1.20	1.28	1.38	—
Carbitol acetate	3,440	1.27	1.43	1.60	1.76	1.13

（＊）Pegasol R-100：Mobil Oil Product.

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FUJICURE FXR-1030

7. Curing characteristics and storage stability;
Epoxy resin：Bisphenol-F type resin (epoxy equivalent weight＝about 175).

		EX-16	EX-17	EX-18	EX-19	EX-20
Epoxy resin, (1)	g	100	100	100	100	100
FXR-1030,	g	10	15	20	25	30
Aerosil 300,	g	1	1	1	1	1
①Reaction start temp. (-1),	℃	82.0	80.0	75.0	75.0	71.0
⑪ Reaction start temp. (-2),	℃	99.0	96.0	96.0	95.0	94.0
⑫ Peak temperature,	℃	114.0	111.0	109.0	107.0	107.0
② Tg.,	℃	44.5	84.0	87.5	92.0	86.5
③ Gel time	80℃	＞60’	41’ 45”	17’ 32”	12’ 27”	10’ 17”
	100℃	6’ 03”	4’ 09”	4’ 07”	3’ 40”	3’ 31”
	120℃	5’ 29”	3’ 21”	2’ 56”	2’ 39”	2’ 21”
④ Storage stability						
⑬ Initial viscosity	mPa·s	5750	6800	8200	9700	12150
⑭ 40℃ after 30days, Multiple		1.1	1.1	1.1	1.1	1.1
⑤ Adhesive strength, kgf/cm^2						
100℃, 1h cure		—	139	146	146	144
120℃, 1h cure		87	201	193	182	176
100℃, 0.5h cure		—	80	112	120	124
120℃, 0.5h cure		—	160	187	168	167

①：Estimated from DSC curve at 5℃/min.

②：Estimated from DSC curve at 5℃/min.for the sample heated at 5℃/min. to 250℃.
(by Yasuda Seiki Seisakusho Ltd., Japan)

③：Gel time of 2g sample. Measured at the designated temerature by Gel-Time-Tester

④：Viscosity change at 25℃ when stored at 40℃.

⑤：Tensile shear strength of the cured product film on the mild steel plate.

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FUJICURE FXR-1030

8. Curing acceleration effect of Fujicure FXR-1030 to Dicyandiamide (DICY).
Epoxy resin：Bisphenol-F type resin (epoxy equivalent weight＝weight＝about 175).

		EX-21	EX-22	EX-23	EX-24	EX-25
Epoxy resin, (1)	g	100	100	100	100	100
DICY	g	8	8	8	8	8
FXR-1030,	g	—	1	3	5	7
Aerosil 300,	g	1	1	1	1	1
①Reaction start temp. (-1), ℃		136.0	124.0	77.0	73.0	71.0
⑮ Reaction start temp. (-2), ℃		176.0	163.0	143.0	122.0	109.0
⑯ Peak temperature, ℃		186.0	173.0	157.0	142.0	133.0
② Tg., ℃		110.0	110.0	106.5	104.5	103.5
③ Gel time	80℃	＞60’	＞60’	＞60’	50’ 55”	15’ 31”
	100℃	＞60’	＞60’	31’ 20”	9’ 18”	4’ 00”
	120℃	＞60’	7’ 58”	2’ 56”	2’ 11”	1’ 31”
④ Storage stability						
⑰ Initial viscosity mPa·s		5190	5250	5650	6020	6500
⑱ 40℃ after 30days, Multiple		1.2	1.2	1.2	1.2	1.2
⑤ Adhesive strength, kgf/cm^2						
120℃, 1h cure		—	—	—	41	131
150℃, 1h cure		—	209	228	233	229
120℃, 0.5h cure		—	—	—	—	63
150℃, 0.5h cure		—	62	155	187	209

① : Estimated from DSC curve at 5℃/min.
② : Estimated from DSC curve at 5℃/min. for the sample heated at 5℃/min. to 250℃.
③ : Gel time of 2g sample. Measured at the designated temperature by Gel-Time-Tester. (by Yasuda Seiki Seisakusho Ltd., Japan)
④ : Viscosity change at 25℃ when stored at 40℃.
⑤ : Tensil shear strength of the cured product film on the mild steel plates.

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FUJICURE FXR-1030

9. Curing effect of accelerating agents to Fujciure FXR-1030.
Epoxy resin：Bisphenol-A type resin (Epoxy equivalent weight＝about 190).
Accelerating agent：EPIOL-B (NOF Corporation, Butylglycidylether) or Nonylphenol.

		EX-26	EX-27	EX-28	EX-29	EX-30	EX-31
Epoxy resin,	g	100	100	100	100	100	100
FXR-1030,	g	15	15	15	20	20	20
Aerosil 300,	g	1	1	1	1	1	1
Epiol-B	g	—	2	—	—	1	—
Nonyl phenol,	g	—	—	3	—	—	3
①Reaction start temperature：-1, ℃		81.0	73.0	66.0	83.0	75.0	64.0
⑲ Reaction start temperature：-2, ℃		99.0	91.0	93.0	98.0	92.0	92.0
⑳ Peak temperature, ℃		110.0	106.0	107.0	109.0	106.0	103.0
② Tg., ℃		106.0	106.0	106.0	108.5	107.0	103.0
③ Gel time	80℃	＞60’	17’ 39”	12’ 15”	＞60’	11’ 54”	10’ 18”
	90℃	7’ 24”	5’ 30”	6’ 05”	6’ 20”	5’ 09”	5’ 21”
	100℃	4’ 32”	3’ 57”	3’ 59”	4’ 09”	3’ 44”	3’ 48”
	120℃	3’ 10”	2’ 58”	2’ 58”	2’ 52”	2’ 34”	2’ 31”
④ Storage stability							
Initial visocosity, mPa·s		24500	13300	19900	29000	21800	23050
40℃, after 30days, Multiple		1.1	1.6	2.0	1.1	1.3	2.3

①：Estiated from DSC curve at 5℃/min.

②：Estimated from DSC curve at 5℃/min for the sample heated at 5℃/min. to 250℃.

③：Gel time of 2g sample. Measured at the designated temperature. By” Gel-time-tester”(by Yasuda Seiki Seisakusho., Ltd. Japan)

④：Viscosity change at 25℃ when stored at 40℃.

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FUJICURE FXR-1030

11.Hygroscopic characteristics and Gel time of Fujciure FXR-1030

Epoxy resin：100g, Bisphenol-A type (epoxy equvalent weight＝about 190)

Aerosil 300：1g, Fujicure FXR-1030, whose hygroscopic quantity differ each other; 20g

Total mass of the component ：2g.

Hygroscopic q'ty		0.74	0.91	1.13	1.14	1.70	2.23	2.62	3.18	3.70	(wt%)
Gel time,	80℃	＞60'	＞60'	＞60'	＞60'	45' 41"	19' 22"	12' 09"	9' 15"	8' 38"	
	100℃	4' 09"	4' 02"	3' 57"	3' 59"	3' 50"	3' 48"	3' 37"	3' 34"	3' 40"	
	120℃	2' 52"	2' 47"	2' 48"	2' 49"	2' 45"	2' 37"	2' 35"	2' 31"	2' 22"	
	150℃	2' 09"	2' 08"	2' 07"	2' 16"	1' 55"	1' 46"	1' 52"	1' 46"	1' 49"	

FUJICURE FXR-1030

Latent epoxide curing agent.

Specifications

(2nd revised)

Appearance.	Slightly yellowish white powder in fine particle form.
Average Particle size.	4.0 ~ 7.0μm. in 50% cumulative volume. Measured by Laser Diffraction method.
Viscosity.	V ~ Z, as 50% solution in isopropanol. Measured by JIS K7233：1988, 4. 3. (Bubble viscometer method： Equivalent to ASTM D1545-98)
Amine value.	140 ~ 160. Measured by the own method of the manufacturer.
Softening point.	135 ~ 145℃. Measured by JIS K7234：1986, 4. 1. (Ring & Ball method. Equivalent to ISO 4625;1980)

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THE LATENT CURING AGENT：
(FUJICURE FXR-1020 & FUJICURE FXR-1030)

PROPER SELECTION of THE REACTIVE DILUENT and ORGANIC SOLVENT.

REACTIVE DILUENT	**For FXR-1020**	**For FXR-1030**
＝Bigger molecular weight (REACTIVE DILUENT.) (Epolite 400E, 400P)	○	○
＝Smaller molecular weight (REACTIVE DILUENT). (Epolite 1600, 150NP)	×	○
BGE	×	×

Solvent.	**FXR-1020**	**FXR-1030**
＝Alcohol	×	×
＝Methyl Ethyl Ketone (＝MEK)	×	×
＝Butyl Cellosolve	×	×

Solvent		**FXR-1020**	**FXR-1030**
＝Aromatic hydrocarbon based solvent.	Even aromatic hydrocarbon based-solvent increase the initial viscosity of the one packed resin mixture upto more than double within 7 days if you store them at 40℃.	×	○
	Organic solvent is not proper to employ in the formulation when you store the one packed resin mixture at 40℃ for 30days.	×	○
＝Storage temperature at lower than 23℃	If store the one packed resin mixture at lower than 23℃. SOME SOLVENT may not increase the initial viscosity so badly. (Increase upto 1.3 ~ 1.5 times on the initial viscosity)	△	○
＝MEK	MEK-forumulated one packed resin mixture increase the initial viscosity critically (Do not formulate)even at storing temperature of the one packed resin mixture than 23℃)	×	40℃ for 30 days × 23℃ for 30 days ○
＝Butyl Cellosolve		×	× even at 23℃ for 30 days.

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STORAGE STABILITY OF ORGANIC SOLVENT FORMULATED FXR-1020 & FXR-1030

Organic Solvent	Latent Hardener	Initial Viscosity	Viscosity Increase	
			at 40℃, 30 days	at 23℃, 30 days
Toluene	FXR-1020	1,680 mPa·s	Hard Gel	1.4 times
	FXR-1030	1,770	1.6	1.3
Xylene	FXR-1020	2,100	Hard Gel	1.3
	FXR-1030	1,910	1.5	1.2
Pegasol R-100（＊）	FXR-1020	2,340	Hard Gel	1.1
	FXR-1030	2,610	1.3	
MEK	FXR-1020	980	Hard Gel	Hard Gel
	FXR-1030	970	8.6	1.3
MIBK	FXR-1020	1,450	Hard Gel	1.4
	FXR-1030	1,590	1.7	1.2
Cycol -hexanone	FXR-1030	3,900	0. 2	
Ethyl- Acetate	FXR-1020	1,150	Hard Gel	1.9
	FXR-1030	1,250	2.1	1.3
n-propyl acetate	FXR-1030	1,610	1.3	1.3
n-propyl acetate	FXR-1030	1,780	1.6	1.2

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STORAGE STABILITY OF ORGANIC SOLVENT FORMULATED FXR-1020 & FXR-1030

Organic Solvent	Latent Hardener	Initial Viscosity	Viscosity Increase	
			at 40℃, 30 days	at 23℃, 30 days
iso-amyl acetate	FXR-1030	2,260	1.5 times	1.2 times
Butyl Cellosolve	FXR-1030	2,660	Hard Gel	Hard Gel
Cellosolve Acetate	FXR-1020 FXR-1030	2,500 2,380	Hard Gel 1.4	1.3
Butyl-Carbitol-Acetate	FXR-1020 FXR-1030	3,700 3,440	Hard Gel 1.7	1.3 1.1
Diethylene-Glycol-Dimethylether	FXR-1020	1,950	Hard Gel	1.3

Butyl cellosolve＝ethylene glycol monobutyl ether.
Cellosolve acetate＝Ethylene glycol monomethyl ether acetate.
Butyl carbitol acetate＝Diethylene glycol monobutyl ether acetate.

(1) The formulation for this evaluation.
① Epoxy resin ：100phr (Liquid epoxy resin of Bisphenol-A, EEW＝190)
② Organic solvent ：10phr
① FXR-1020 or FXR-1030 ：20phr
① Aerosil-300：1phr

(2) Evaluated an increase of the initial viscosity of the formulated resin mixture of (1) above for 30 days at 40℃ and 23℃.

(3) Formulation procedure to make one packed resin mixture.
①：Mix and blend well of Epoxy resin, FXR-1020 (or FXR-1030) an Aerosil-300.
②：Solvent
After the procedure of ①, move to ② (①→②)

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APPLICATION FIELDS.

Latent curing agent：Fujicure FXR-1020 & FXR-1030

(1) Electricity and Electronics related fields.

- ＝ Sealing and encapsulation of “relay switch”
- ＝ Adhesive of LSI.
- ＝ Electro conductive adhesives.
- ＝ Encapsulation of LED.
- ＝ Encapsulation of semi conductor.
- ＝ Adhesives of printed circuit boad with PET film or aluminium sheet
- ＝ Sealing of liquid crystal panel.
- ＝ Adhesive of a small opening space in a circuit board.
- ＝ Temporary bonding of material.

(2) Mobil Industry field.

- ＝ Hem flange bonding.
- ＝ Co-bonding use with a spot welding.

(3) Others.

- ＝ Adhesives for a medical equipment parts.
- ＝ Bonding of a grindstone with metals.
- ＝ Pre-preg use for a glass cloth for sports airticles. (ex：snow board)

LATENT TYPE CURING AGENT
FUJICURE FXR-1020 & FUJICURE FXR-1030

	PATENT			CAS No	TSCA Inventory List.
	USA	JAPAN	EUROPE		
FUJICURE FXR-1020	◎	◎	△	—	Confidetially Listed
FUJICURE FXR-1030	◎	◎	△	—	Confidetially Listed

Curing ℃ for a reliable performance.		Solvent
FXR-1020	80~100℃	╳
FXR-1030	100~120℃	○

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COMPARISON DATA

	Fujicure FXR-1020	Other supplyer P	Other supplyer M	Fujicure FXR-1030
Storage stability of a mixtured resin （＊）	○	○	◎	◎
Lower temperature cure of a mixtured resin （＊）	◎	○	×	×
Heat exothermic temperature in a curing process of a mixtured resin （＊）	○	×	◎	◎
Glass transition （TG）of a cured product.a	○	◎	△	○
Bending strength of a cured product.	◎	△	○	○
Adhesive strength of a cured product.	◎	△	◎	◎
Boiled water absorption rate of a cured product.	○	◎	△	△
Transparency of the cured product.	◎	×	○	◎
As a curing accelerator to Acid anhydride.	○	×	◎	○
As a curing accelerator to D. I. C. Y.	○	◎	△	○

（＊）Mixtured resin ：a mixture of FXR-1020 or FXR-1030 with an epoxy resin (Liquid, Bisphenol-A, EEW＝about 190)