NTT AT

Optical Adhesives

Adhesives for Optical Waveguides

If you are seeking PLC and fiber array adhesion with high reliability, try these products

Adhesives for Optical Waveguides

In order to achieve high reliability, a product must clear the tests conducted by the users themselves. If you have had even just a bit of dissatisfaction in reliability test results, please put NTT-AT's adhesives to the test.
We will also offer consulting regarding adhesion related issues.

Excellence in Durability

Acrylate-based adhesives which have cleared a large number of reliability tests

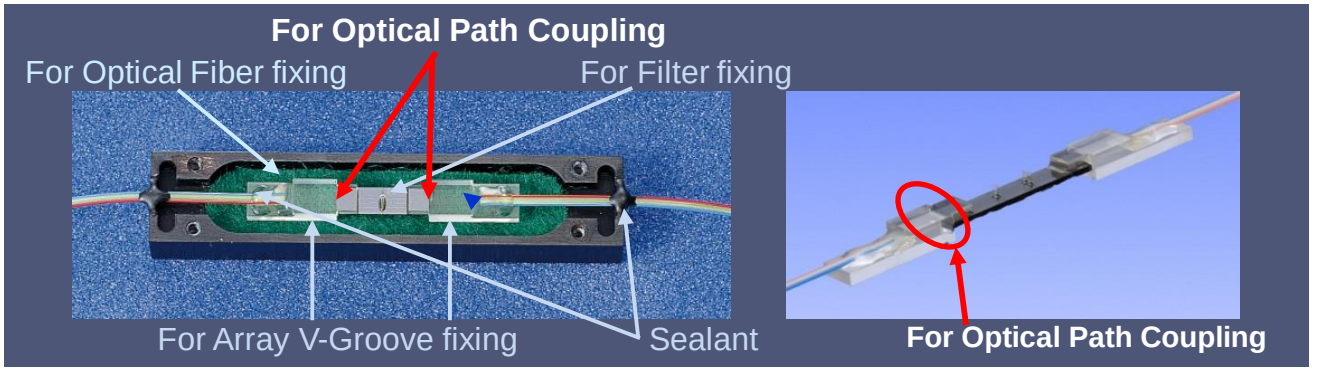
Adjustable Refractive Index

Epoxy adhesives with the same refractive index as quartz to deliver low reflectance

Simple Operability

The UV curing allows for adhesion in a short time frame

Structural Images



Standard Products, Properties

Item	Conditions	Units	Epoxy		Acrylate	
			GA700H	GA700L	AT6001	AT8224
Curing Conditions	UV Intensity	mW/cm^2	30	10	10	10
	Time	Min	10	5	5	5
Viscosity	25° C	mPas	280	250	470	145
Refractive Index (after curing)	589nm	–	1.458	1.456	1.505	1.505
	830nm		1.453	1.450	1.495	1.496
	1300nm		1.448	1.446	1.490	1.491
	1550nm		1.447	1.445	1.489	1.489
Optical Transmittance	850nm	% (1mm)	92	94	93	86
	1300nm		91	94	91	89
	1550nm		88	92	86	82
Glass Transition Temperature (Tg)	$Tan\delta_{max}$	° C	145	46	0	115
Shrinkage	Density change	%	4	4	7	9
Hardness	Shore D	–	80	44	24	38
Thermal Expansion Coefficient(CTE)	25 – 100° C	ppm/° C	81	210	148	123
Elastic Modulus	25° C	Mpa	1300	480	18	67
Shear Bond Strength	Initial period	kgf/cm^2	>247	>154	99	>209
	121° C, 100% after 20H		72	132	91	83
Water Absorption	1mm, after 24H	%	0.5	0.8	3	10
Weight Loss on Heating	100° C, 100H	wt%	0	5	3	3
	150° C, 10H		0	11	3	5

Adjustable Refractive Index Products, Properties

Item	Conditions	Units	High-Tg Type	Low-Tg Type
Curing Conditions	UV Intensity	mW/cm^2	30	10
	time	min	10	10
Viscosity	25° C	mPas	250 - 2000	200 - 560
Refractive Index	1550nm	–	1.446 - 1.547	1.445 - 1.549
Optical Transmittance	1550nm	%	89 - 90	86 - 90
Tg	$tan\delta_{max}$	° C	140 - 150	40 - 50
shrinkage	Density change	%	3 - 5	4 - 8
Hardness	Shore D	–	75 - 80	23 - 45
CTE	25 – 100° C	ppm/° C	60 - 80	80 - 220

For more information http://www.ntt-at.com/product/adhesive/

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Optical Adhesives

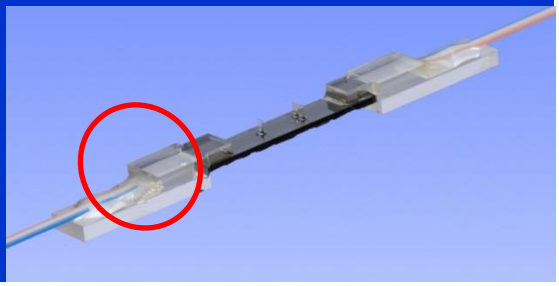
Adhesives for Fiber Array

Introducing the adhesives with high moisture resistance and excellent workability for fiber array assemblies

V-Groove Fixing / Optical Fiber Fixing

Adhesives for Fiber Array

Fiber arrays are used for the input and output of optical waveguide devices. As adhesives used for fixing the V-Grooves, AT3727E and AT3728E have realized price reductions while enhancing moisture resistance than conventional products with over 20 years more experience. As adhesives for Optical Fiber fixing, the AT9575M and AT8105 have gained popularity for their good workability as non-fluid adhesives.



High Moisture Resistance and Excellent Durability

For a Fiber Array, no peeling after 2,000 hours at 85° C, 85 % humidity.
*** Our company test results**

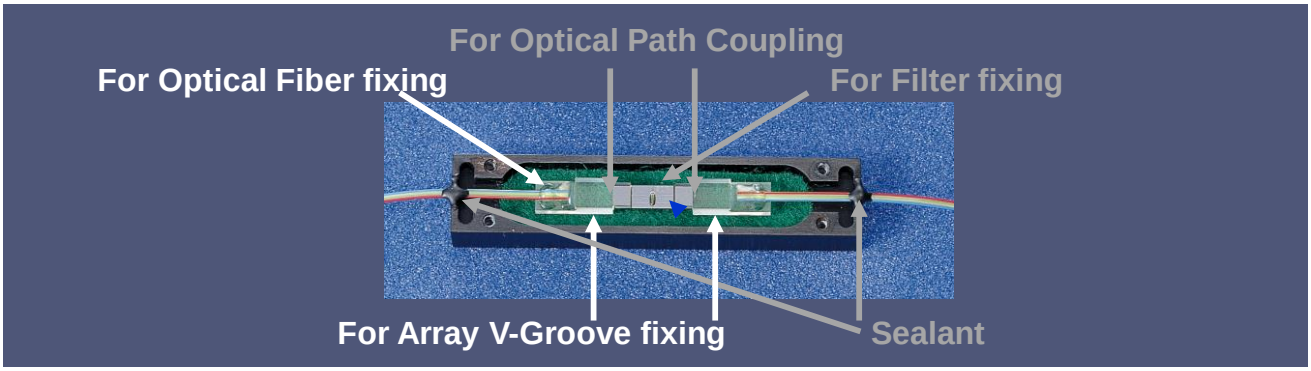
Can Be Polished

The adhesives for V-Groove fixing can be polished after assembly.

Viscosity Appropriate for Usage Location makes it Easy to Use

The adhesives for fixing V-Grooves have a fluidity, while the optical fiber fixing adhesives are a paste suitable for protecting the fiber.

Structural Images



Properties

Item	Conditions	Units	V-Groove Fixing					Base Fixing	
			AT3925M	AT9390	AT9968	AT3727E	AT3728E	AT9575M	AT8105
Viscosity	25° C	mPa·s	200	600	70	400	400	Paste	Paste
Refractive Index (after curing)	589 nm	–	1.519	1.492	1.512	1.574	1.573	-	-
Curing Conditions	UV Intensity	mW/cm^2	100	30	100	10	10	100	10
	time	min	10	10	10	10	10	10	5
Glass Transition Temperature (Tg)	$tan\delta_{max}$	° C	219	131	181	107	55	42	103
Shrinkage	Density change	%	3	4	4	4	3	4	7
Hardness	Shore D	–	88	81	85	83	20(A84)	35	78
Thermal Expansion Coefficient (CTE)	25 – 100° C	ppm/° C	67	90	70	134	178	168	111
Shear Bond Strength	Initial period	kgf/cm^2	＞99	>194	>143	>147	>232	＞221	＞226
	121° C100% after 20H		＞69	>142	>98	>147	>230	>122	＞200
Bending Adhesion Strength	Initial period	kgf/cm^2	-	31	26	34	43	-	-
	121° C100% after 20H		-	9	14	19	25	-	-
Elastic Modulus	25° C	MPa	1340	1340	1250	1230	560	160	1880
Water Absorption	1mm after 24h	%	2	0	1	0	1	1	3
Weight Loss on Heating	100° C100h	wt%	0	0	0	0	3	5	1
	150° C10h		0	0	0	0	3	8	2

※ Please understand that all comments and data recorded herein may be subject to change without prior notification.
※ The values in the table above are not specifications.

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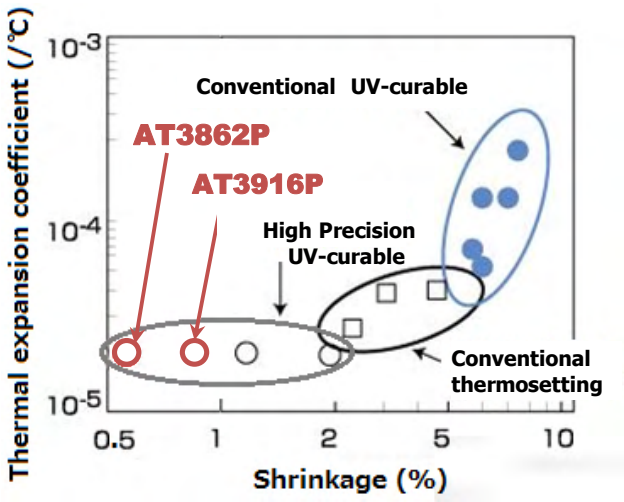
Minimal position changes due to curing time and temperature

High Precision Adhesives

We recommend adhesives which can easy to fix optical components with sub-micron accuracy.

- Shrinkage rate during curing is very low (less than 0.5 %).
- Thermal expansion coefficient is small (less than 20ppm/°C).
- Using UV light curing makes alignment easy.



Excellent Durability

No peeling after 200 cycles in the heat cycle test (simplified test)

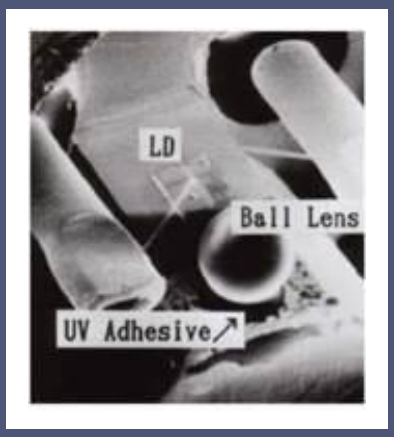
Low shrinkage rate

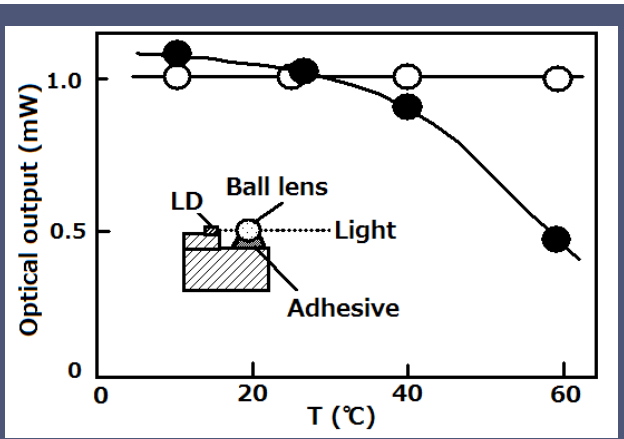
Shrinkage rate during curing is 0.5% (AT3862P)

Thermal expansion coefficient is small

CTE is less than 20ppm/°C

Configuration Image





Temperature Properties of LD Module

Properties

Item	Conditions	Units	AT3862P	AT3916P
Viscosity	25° C	mPa·s	500,000	20,000
Curing Conditions	UV Intensity	mW/cm^2	100	100
	Time	min	2	5
Glass transition temperature (Tg)	$tan\delta_{max}$	° C	195	233
Rate of curing shrinkage	(Density change)	%	0.5	0.9
Hardness	Shore D	–	94	91
Thermal Expansion Coefficient (CTE)	25-100° C	ppm/° C	20	18
Elastic Modulus	25° C	MPa	3000	4600
Water Absorption	Thichness: 1mm, after 24H	%	0.3	0.2
Weight Loss on Heating	5wt%	° C	422	372

Durability Test Results

Item	Conditions	Units	AT3862P	AT3916P
Shear Bond Strength	Initial period	kgf/cm^2	>210	>220
	121° C, 100% after 10H		>114	>128
	260° C for 5min Process		262	194
	Heat Cycle, -40 - 85° C, 200cycles		98	237
	Appearance after Heat Cycle	–	No peeling	No peeling

*These products are transported at normal temperature. However, please store in a frozen state.

For more information http://www.ntt-at.com/product/adhesive/

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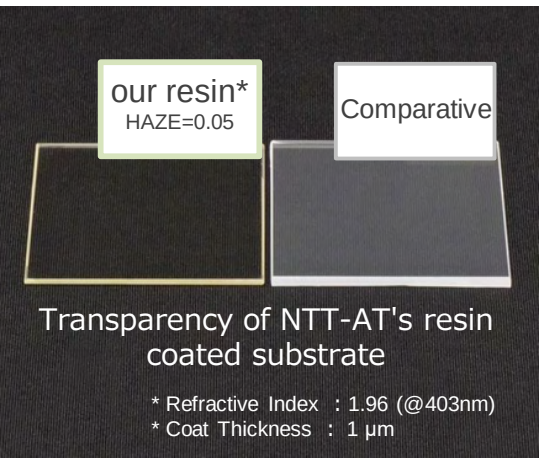
For those seeking resins with a refractive index of 1.6 or greater

High Refractive Index

At NTT-AT, using its refractive index control technology and optical loss reduction technology that are the basis for adhesives of optical communication, has developed for sale resins with a high refractive index of 1.6.
For the high refractive index resins, by adding high refractive index fillers as in the photo on the right, we are able to manufacture resins with a refractive index of 1.9.
These resins are aimed at usage in the fields of optical recording, display technology, optical energy uses, etc.



Transparency of NTT-AT's resin coated substrate

* Refractive Index : 1.96 (@403nm)
* Coat Thickness : 1 μm

High Transparency

Possible to fabricate high refractive index resin coat with good transparency which haze value is 1 or less.

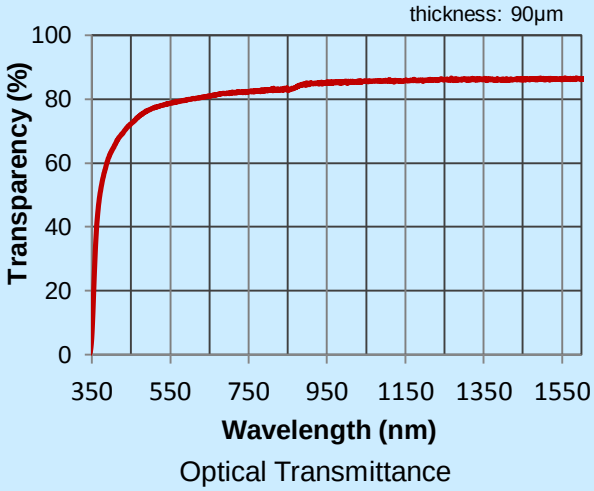
Refractive Index Adjustable

Refractive Index adjustable to 1.6 or more

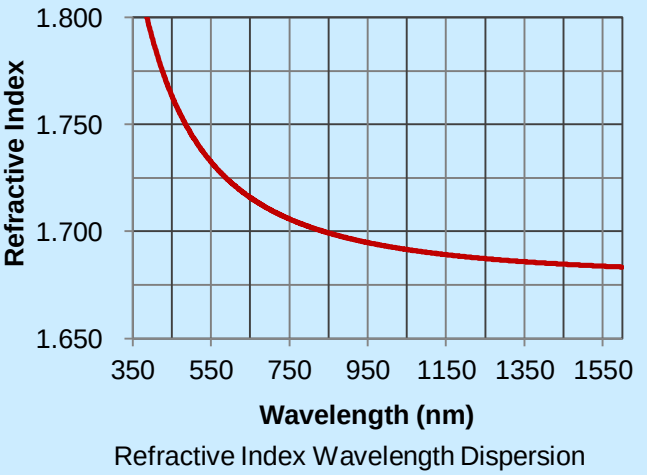
Customize

Possible to respond several kind of requests such as with/without solvent or adjusting the viscosity.

Optical Features



Optical Transmittance



Refractive Index Wavelength Dispersion

Properties

	Item	Test method: Condition	Units	Acrylate		Epoxy	
				#18165	#6205	E3754	#7200
Before curing	Viscosity	25° C	mPa・s	9	20*1	1200	7000
Curing Conditions		UV Intensity	mW/cm^2	10	100	100	100
		Time	min	5	5	5	10
After curing	Refractive Index	589nm	-	1.675	1.720	1.603	1.627
	Glass Transition Temperature (Tg)	$\tan\delta_{max}$	° C	113	68	73	63
	Thermal Expansion Coefficient (CTE)	TMA : α1	ppm/°C	144	93	107	60
		TMA : α2		182	191	212	178
	Hardness	Shore D	-	D67	D70	D76	D83
	Elastic Modulus	25° C	MPa	1000	300	2000	1000
	Optical Transmittance	450nm	% (Thickness 50μm)	94	72*2	92	78
		540nm		96	78*2	96	88
		630nm		96	81*2	96	92
	Shear Bond Strength	glass/glass	kgf/cm^2	＞48	35	>280	55

*1 : Tends to crystallize at low temperatures.
*2 : Thickness 90 μm

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For those seeking resins with a refractive index of 1.4 or less

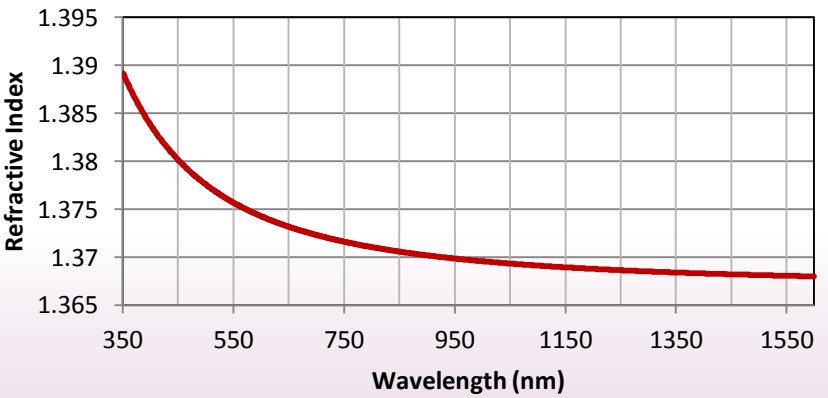
Low Refractive Index Resins

At NTT-AT, using its refractive index control technology and optical loss reduction technology that are the basis for adhesives of optical communication, has developed for sale resins with a low refractive index of 1.4.

These resins are aimed at usage in the fields of optical recording, display technology, optical energy uses, etc.

High Transparency	Refractive Index Adjustable	High accuracy Refractive Index Control
90 % or more transparency at 1mm thickness	**Refractive Index adjustable to 1.4 or less**	**The accuracy of adjusting refractive index is ±0.005**

Optical Features



Refractive Index Wavelength Dispersion of #18204

Properties

	Item	Test method: Condition	Units	Acrylate		Epoxy
				#18204	#18114	E3810
Before curing	Viscosity	E-type viscometer : 25° C	mPa・s	7	25	130
After curing	Curing Conditions	UV Intensity	mW/cm^2	10	10	10
		Time	min	1	5	10
	Refractive Index	589nm	-	1.375	1.400	1.438
	Glass Transmission Temperature (Tg)	$tan\delta_{max}$	° C	18	94	103
	Thermal Expansion Coefficient (CTE)	TMA : α1	ppm/°C	-	140	110
		TMA : α2		180	180	240
	Hardness	Shore D	-	D20 A85	D72	D78
	Elastic Modulus	Dynamic viscoelasticity : 25° C	Mpa	13	800	1000
	Optical Transmittance	450nm	% (Thickness 1mm)	89	92	76
		540nm		91	94	86
		630nm		91	94	89
	Shear Bond Strength	glass/glass : 25° C	kgf/cm^2	27	26	>61

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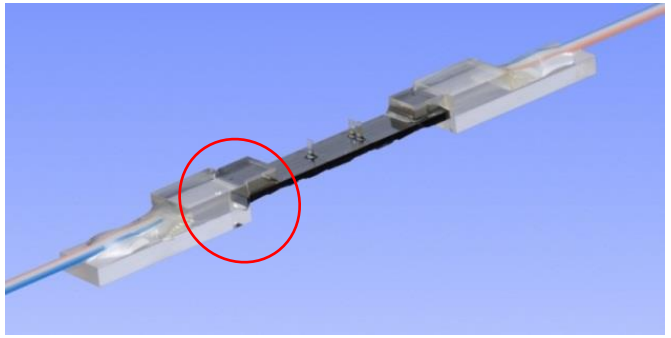
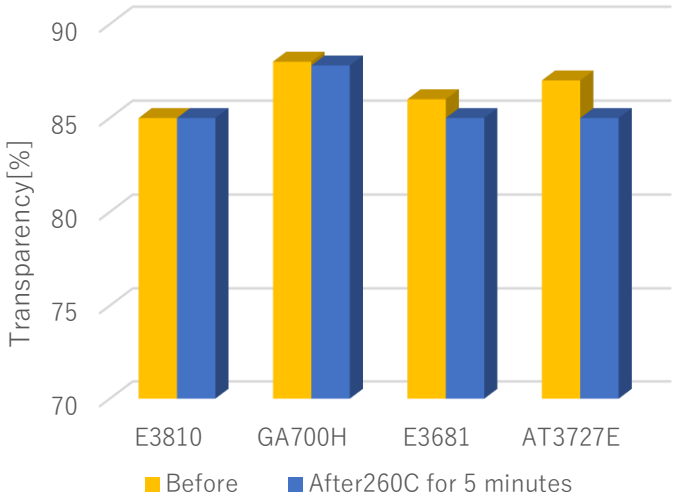
Optical Adhesives that withstand a high temperature process for Silicon Photonics

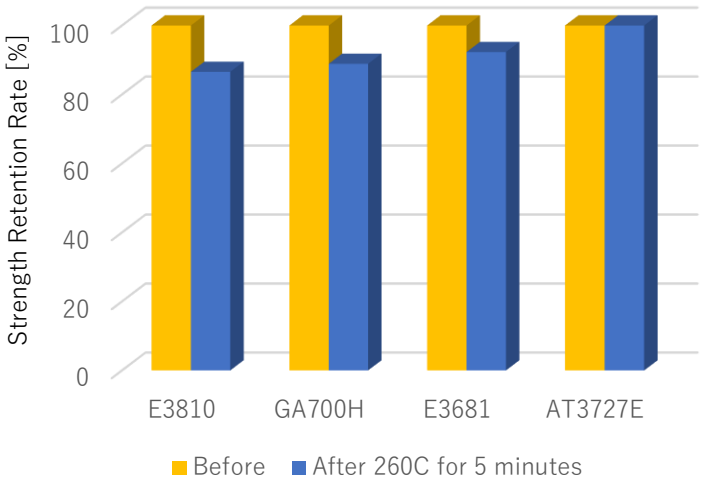
◆ Testing Method



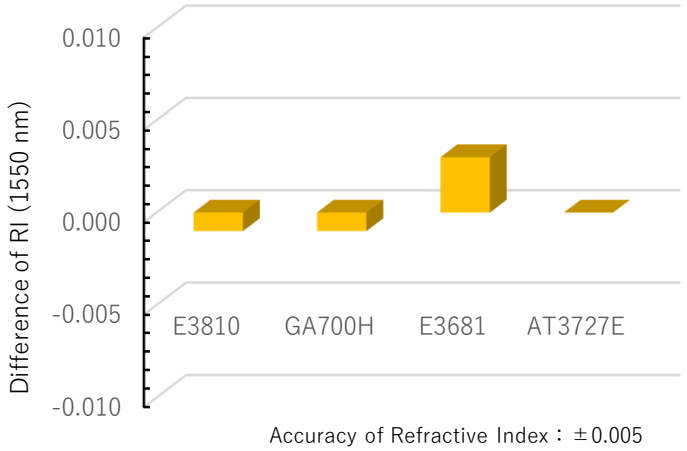
◆Test Results



Change in Transparency



Change in Bending strength
(before the process: 100%)



Change in Refractive Index

Properties

			In optical path						Fiber fixation	
Product Number			**E3810**		**GA700H**		**E3681**		**AT3727E**	
Substance Type			epoxy		epoxy		epoxy		epoxy	
Viscosity	25℃	mPa・s	100		280		400		400	
Curing Conditions	Intensity	mW/cm2	10		30		10		10	
	Time	min	10		10		10		10	
	Post bake	–	80℃/1h		80℃/1h		100℃/1h		80℃/1h	
260℃ for 5 minutes Process			Before	After	Before	After	Before	After	Before	After
Transparency(1550nm)	Thickness 1mm	%	85	85	88	88	86	85	87	85
Bending Bond Strength(3 points)		kgf/cm^2	18	15	36	32	26	24	34	34
Refractive Index, after curing	1550nm	–	1.427	1.426	1.447	1.446	1.545	1.548	1.552	1.552
Tg	$\tan\delta_{max}$	℃	103	103	145	147	143	147	107	112
Hardness	25℃	Shore D	78	65	80	82	85	86	83	83
Thermal expansion Coefficient	25–100℃	ppm/℃	110	102	81	68	60	54	134	115
Weight loss at 260℃ before re-flow	TG curve by TG-DTA	%	2.9	–	1.8	–	1.2	–	0.2	–
5% weight loss before re-flow	TG curve by TG-DTA	℃	292	–	302	–	366	–	313	–
Curing shrinkage		%	5	–	4	–	4	–	4	–

Not guaranteed values.

NTT Advanced Technology Corporation

For the Openings and Junctions, etc. of Protective Casing for Parts.

Not containing phthalate ester which has been listed in the RoHS Directive（EU)2015/863

Sealants for Optical Parts

In order to increase the long term reliability of mechanical protection, moisture prevention, etc., optical parts are housed in a protective case made by metal or plastic. Through the special features of these sealants used for the openings and junctions of protective cases , the reliability, especially moisture prevention reliability is greatly expanded.
We introduce here sealants that were developed for the purpose of preventing moisture in optical parts. If you have been unsatisfied with conventional products , please test out these materials.

Possible Usage Examples

- Moisture prevention sealant
  for protective casing for optical parts
  for electronic component parts and general electric parts, etc.
- Moisture resistant adhesives
  for assembly of all types of devices

Low Moisture Permeability

The low moisture permeability type sealant has a low moisture permeability coefficient and shuts out moisture (humidity).

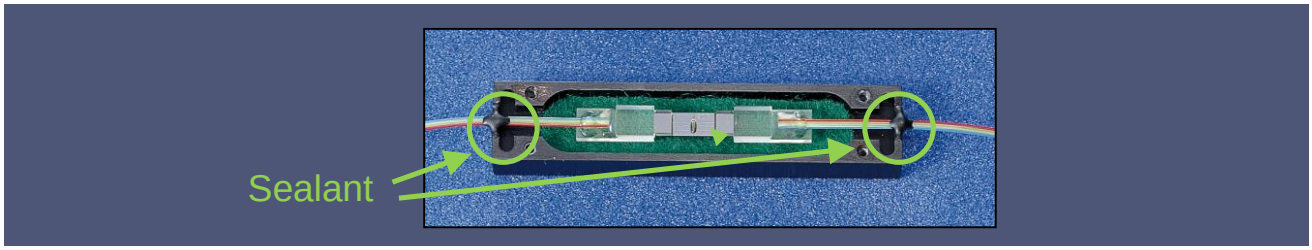
Flexibility

The high flexibility type sealant gives very little internal stress which causes transmission loss in optical fiber.

Long Pot Life

The improvement in workability in our lineup delivers a long pot life.

Structural Images



Low Moisture Permeability Type, Properties

Item	Conditions		Units	OS5958	OS5962
Curing Conditions	-		-	Room temperature, 24H or 80° C, 1H	
Pot Life	r.t.		min	120	120
Moisture Permeability	85° C, 85%		cc•cm/cm²•sec•cmHg	1.6×10^{-8}	0.7×10^{-8}
Hardness	25° C		Shore D	47	66
Glass Transition Temperature (Tg)	$\tan\delta_{max}$		° C	45	49
CTE	25 – 100° C		ppm/° C	190	100
Weight loss	100° C, 100H		wt%	0.7	-
Shear Bond Strength to SUS	Initial period		kgf/cm²	131	146
	After 121° C, 100%	10H		142	204
		20H		68	207
Pre-curing State	Solution A		-	White paste	
	Solution B			Transparent fluid (light yellow)	
Primary Ingredient	Solution A		-	Epoxy	Epoxy
	Solution B			Amine	Amine
Mixing Ratio	Weight A : B		-	10 : 3	21 : 3
Special Features				Low Viscosity	High Moisture Resistance

High Flexibility Type, Properties

Item	Conditions		Units	OS5980	OS-48
Curing Conditions	-		-	80° C, 1H	r.t., 24 H or 100° C, 1H
Pot Life	r.t.		min	120	180
Moisture Permeability	85° C, 85%		cc•cm/cm²•sec•cmHg	30×10^{-8}	1×10^{-8} (75° C, 90%)
Hardness	25° C		Shore D	20	66 (Shore A)
Glass Transition Temperature (Tg)	$\tan\delta_{max}$		° C	-55	-46
CTE	25 – 100° C		ppm/° C	145	200
Weight loss	100° C, 100H		wt%	2.0	0.4
Shear Bond Strength to SUS	Initial period		kgf/cm²	24	11
	After 121° C, 100%	10H		44	-
		20H		50	-
Pre-curing State	Solution A		-	Transparent	White
	Solution B			Black	Black
Primary Ingredient	Solution A		-	Amine	Butylene
	Solution B			Modified Epoxy	Butylene
Mixing Ratio	Weight A : B		-	1 : 2	1 : 1
Special Features				S3903-5 RoHS confirming product	Long Pot Life Low Hardness

For more information http://www.ntt-at.com/product/adhesive/

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