

Curing of photoinitiated adhesives

Curing with UV light or visible light in the specific wavelength range. DELOLUX LED curing lamps are especially suitable as

per the chart below. All standard DELOLUX HID lamps are also suitable.

Lamp type	DELOLUX 80, DELOLUX 50 and 502, DELOLUX 20 and 202		
	365	400	460
DELO PHOTOBOND GB310	++	-	-
DELO PHOTOBOND GB368	++	+	-
DELO PHOTOBOND PB437	+	++	-
DELO PHOTOBOND 4494	+	++	-
DELO PHOTOBOND AD491	++	++	-
DELO PHOTOBOND AD494	+	++	-
DELO PHOTOBOND 4442	+	++	-
DELO PHOTOBOND FB4175	+	++	-
DELO PHOTOBOND GE4005	++	++	-
DELO PHOTOBOND SL4165	+	++	-
DELO PHOTOBOND LA4860	-	++	+
DELO PHOTOBOND LA4875	-	++	+

++ especially suitable + suitable - not suitable

Product selection

Application area	Potting / encapsulation Coating	Bonding of UVA- and VIS-permeable materials	Bonding of VIS-permeable materials	Bonding of opaque materials	Bonding, potting, encapsulation, coating with reliable curing in shadowed areas
Products	DELO KATIOBOND, DELO PHOTOBOND	DELO KATIOBOND, DELO PHOTOBOND	Light-activated DELO KATIOBOND, light-curing DELO PHOTOBOND	Light-activated DELO KATIOBOND, light-activated humidity-curing DELO PHOTOBOND LA	DELO DUALBOND
Processing suggestion	Application ↓ Irradiation	Application ↓ Joining ↓ Irradiation	Application ↓ Preactivation ↓ Joining	Application ↓ Preactivation ↓ Joining	Application ↓ Joining ↓ Irradiation and/or heat or air humidity

CONTACT

DELO Industrial Adhesives
Headquarters

► **Germany** · Windach/Munich

- **China** · Shanghai
- **Japan** · Yokohama
- **Malaysia** · Kuala Lumpur
- **Singapore**
- **South Korea** · Seoul
- **Taiwan** · Taipei
- **Thailand** · Bangkok
- **USA** · Sudbury, MA

www.DELO-adhesives.com

Our selection charts/material selection guides are a technical selection aid giving an overview of various product variants. We will be pleased to provide you with sales details, such as available container sizes, stock availability and minimum order quantities, on request. The data and information provided are based on tests performed under laboratory conditions. Reliable information about the behavior of the product under practical conditions and its suitability for a specific purpose cannot be concluded from this. It is the customer's responsibility to test the suitability of a product for the intended purpose by considering all specific requirements and by applying standards the customer deems suitable (e.g. DIN 2304-1). Type, physical and chemical properties of the materials to be processed with the product, as well as all actual influences occurring during transport, storage, processing and use, may cause deviations in the behavior of the product compared to its behavior under laboratory conditions. All data provided are typical average values or uniquely determined parameters measured under laboratory conditions. The data and information provided are therefore no guarantee for specific product properties or the suitability of the product for a specific purpose. Nothing contained herein shall be construed to indicate the non-existence of any relevant patents or to constitute a permission, encouragement or recommendation to practice any development covered by any patents, without permission of the owner of this patent. All products provided by DELO are subject to DELO's General Terms of Business. Verbal ancillary agreements are deemed not to exist.

© DELO – This brochure including any and all parts is protected by copyright. Any use not expressly permitted by the Urheberrechtsgesetz (German Copyright Act) shall require DELO's written consent. This shall apply without limitation to reproductions, duplications, disseminations, adaptations, translations and microfilms as well as to the recording, processing, duplication and/or dissemination by electronic means.

ADHESIVES

DISPENSING

CURING

CONSULTING

DELO

DELO



SELECTION CHART

DELO PHOTOBOND

Acrylates
one-component · UV-curing · UV- and light-curing ·
light-activated humidity curing

DELO PHOTOBOND photoinitiated-curing acrylates

		UV-curing	UV- and light-curing									light-activated humidity curing	
Product code		GB310	GB368	PB437	4494	AD491	AD494	4442	FB4175	GE4005	SL4165	LA4860	LA4875
Application area	B = bonding, S = sealing	B	B	B	B	B	B	B/S	B	B/S	B/S	B/S	B/S
Color ^{cured product}	in 0.1 mm layer thickness	colorless clear	colorless clear	colorless clear	colorless	colorless translucent	colorless clear	colorless clear	yellowish	blue fluorescent	colorless fluorescent	colorless fluorescent	colorless
	in 1.0 mm layer thickness	colorless clear	colorless clear	colorless clear	colorless	colorless translucent	yellowish clear	colorless clear	yellowish	blue fluorescent	yellowish fluorescent	yellowish fluorescent	yellowish
Viscosity [mPa·s] at +23 °C, rheometer	DIN EN 12092	65 ¹⁾	5,000 ¹⁾	6,000 ¹⁾	20,000 ¹⁾	48,000 ¹⁾	26,000 ¹⁾	740 ¹⁾	150,000 ¹⁾	1,700 ²⁾	124,000 ¹⁾	70,000 ¹⁾	70,000 ¹⁾
Wavelength range for curing [nm]		320 – 400	← 320 – 420 →				← 320 – 450 →				← 360 – 460 →		
Recommended preactivation time [s] Layer thickness 0.5 mm LED 400 nm, LED intensity 200 mW/cm ²		–	–	–	–	–	–	–	–	–	–	4	4
Open time after preactivation [s]	DELO Standard 19	–	–	–	–	–	–	–	–	–	–	~ 23	~ 10
Recommended irradiation time [s] DELOLUX 80/400, intensity 200 mW/cm ²		20	15	4	3	3	6	10	6	13	6	–	–
Compression shear strength [MPa] DELO Standard 5 Irradiation and curing conditions: DELOLUX 20, layer thickness 0.1 mm; LED intensity 200 mW/cm ²	glass/glass	25	25	25	28	26	10	4	27	5	2	2	6
	glass/Al	20	21	24	25	29	11	4	20	5	2	2	5
	glass/PC	4	11	10	17	25	7	5	10	4	2	3	–
	glass/PMMA	5	15	10	4	14	9	4	13	4	1	1	5
	PC/PC	–	–	27	18	25	20	5	16	6	5	1	7
	PMMA/PMMA	3	13	15	10	14	9	3	14	5	3	–	–
Tensile strength [MPa]	by the criteria of DIN EN ISO 527	33	20	21	20	20	13	3	22	11	2	1	6
Elongation at tear [%]	by the criteria of DIN EN ISO 527	4	17	110	160	150	310	300	220	460	170	350	270
Young's modulus [MPa]	DMTA	1,600	1,100	870	400	820	200	6	584	64	8	0.5	4
Shore hardness	by the criteria of DIN EN ISO 868	D 77	D 67	D 65	D 62	D 63	D 25	A 30	D 51	A 53	A 41	A 10	A 50
Glass transition temperature T _g [°C]	DMTA	+140	+90	+90	+100	+100	+48	+19	+68	+39	–37	–64	–75
Average coefficient of linear expansion [ppm/K]	TMA, in temperature range: +25 °C to +155 °C	168	236	184	211	180	200	254	185	340	210	400	195
Shrinkage [vol. %]	DELO Standard 13	10	7	9	9	7.5	7	6	6.7	6.8	4.5	3	2.5
Water absorption [weight %]	by the criteria of DIN EN ISO 62 24 h at +23 °C	0.4	0.5	1	1.3	1	3	0.6	1.1	0.7	0.2	0.7	1.5
Special features of product		glass adhesive capillary high-strength	glass adhesive also for glass-to-plastic connections dry surface	very fast curing tough-hard	fast curing tough-hard	excellent humidity resistance	multi-purpose adhesive run-resistant gap-filling	flexible sealing USP XXIII Class VI approval	for the bonding of fastening elements (ONSERT)	pin sealing	highly flexible sealant good recovery capacity	peel-resistant flexible for bonding and sealing opaque components	peel-resistant flexible for bonding opaque components

Values according to other measuring methods can be found in the Technical Data Sheet of the respective product.

¹⁾ shear rate 2 1/s

²⁾ shear rate 10 1/s

AD = ADhesive FB = Fastener Bonding GB = Glass Bonding GE = General Encapsulant LA = Light-Activated PB = PHOTOBOND SL = SealLing

Product description

DELO PHOTOBOND are one-component, solvent-free adhesives based on acrylates.

The use of DELO PHOTOBOND adhesives in the field of glass construction, including façade engineering or overhead applications, requires special building approvals which must be obtained by the users themselves.

Standard temperature range

DELO PHOTOBOND acrylates are normally used in a temperature range of –40 °C to +120 °C.

Many product properties depend on the temperature and can change permanently, in particular at high temperatures. Therefore, it has to be checked before each use whether a certain adhesive is suitable for the temperatures in the required area of application. Please see the Technical Data Sheet for more information on how our products react to temperatures.

Processing

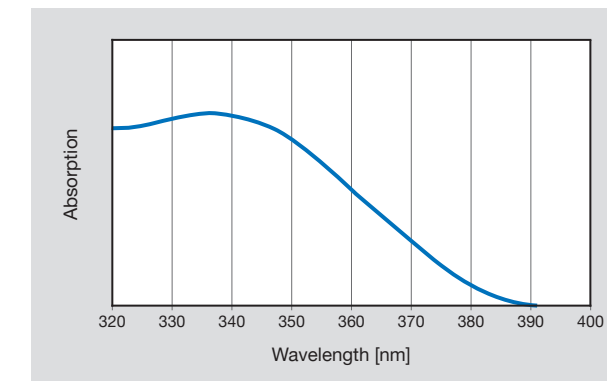
The products are normally delivered ready for use. They are applied directly from the container or using dispensing units.

Curing

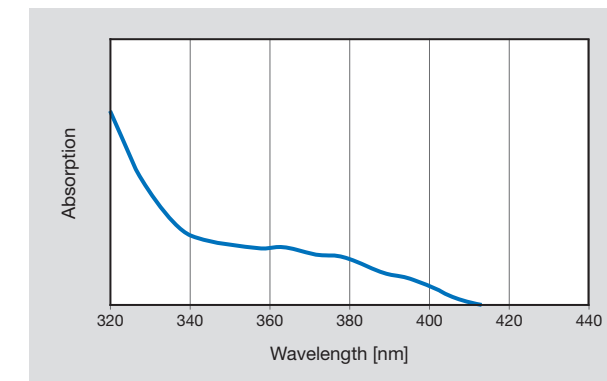
All DELO PHOTOBOND acrylates immediately achieve complete curing by irradiation with light of the suitable wavelength. Therefore, to bond two components, one has to be permeable to light of the wavelength used for curing.

DELO PHOTOBOND products are also used for casting and coating applications. After curing, the adhesive surface can remain slightly sticky. DELO PHOTOBOND GB368 has a dry surface after curing with proper irradiation parameters.

Curing of DELO PHOTOBOND LA products is initiated by exposure to light in the suitable wavelength range with the suitable intensity for the required irradiation time. Humidity access is required during curing. Without preactivation by light of the suitable wavelength, the adhesive does not cure within several days, even if humidity is available.



Absorption spectrum of the photoinitiator (wavelength range from 320 to 400 nm) of the UV-curing DELO PHOTOBOND products in an acrylate matrix.



Absorption spectrum of the photoinitiator (wavelength range from 320 to 420 nm) of the UV- and light-curing DELO PHOTOBOND products in an acrylate matrix.

Surface pretreatment

To achieve optimum bond strength, the surfaces must be free from dust, oil, grease, separating agents and other contaminations.

After cleaning, the adhesion of the adhesive can be further enhanced by sand blasting, flaming and plasma or corona treatment.

Storage life

After delivery, most DELO PHOTOBOND products are durable for 6 months if stored in the unopened original container at room temperature.

You can find detailed information in the Technical Data Sheet of the product.

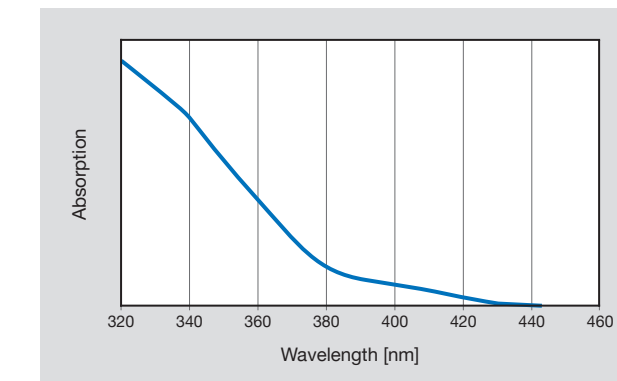
Further information

More type-specific properties are included in the Technical Data Sheets, Material Safety Data Sheets and Instructions for Use.

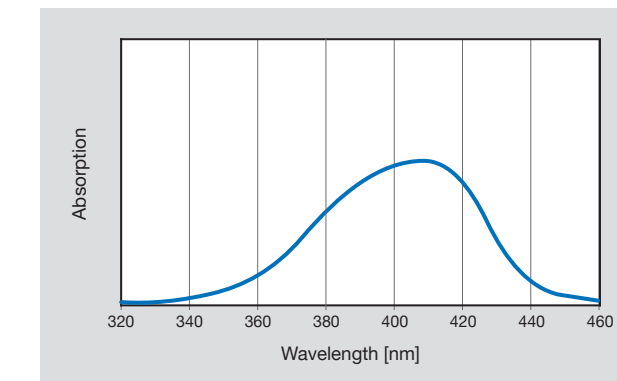
For application tests and any question you might have regarding the use of DELO products, please do not hesitate to contact our Engineering Department.

Please also refer to the DELO KATIOBOND Selection Chart.

DELO KATIOBOND are also photoinitiated, one-component and solvent-free adhesives. Contrary to the radical-curing DELO PHOTOBOND acrylates, DELO KATIOBOND are based on cationic-polymerizing epoxy resins curing completely after a minimum irradiation time even after irradiation is stopped. As a result, the light-activated types offer the possibility of preactivation. With this procedure two opaque components can be bonded. UV-curing DELO KATIOBOND can be used as Dam&Fill products for chip encapsulation. All DELO KATIOBOND products have a completely dry surface after curing.



Absorption spectrum of the photoinitiator (wavelength range from 320 to 450 nm) of the UV- and light-curing DELO PHOTOBOND products in an acrylate matrix.



Absorption spectrum of the photoinitiator (wavelength range from 360 to 460 nm) of the light-activated humidity-curing DELO PHOTOBOND LA products in an acrylate matrix.