



IGE

Glass Technologies, Inc.

NEW

From IGE...

EVA Materials



Lammy Can



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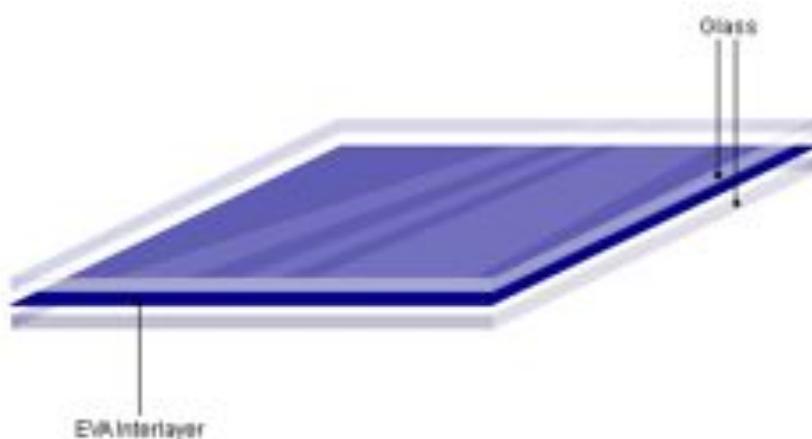
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Introduction to EVA

EVA Film is a revolutionary new type of interlayer for glass and plastic sheet lamination and encapsulation without autoclaving.



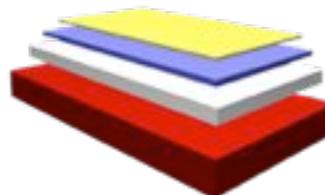
- EVA stands for ethylene vinyl acetate.
- It is a thermoplastic copolymer resin.
- EVA resin, together with a number of ingredients, is heated, mixed thoroughly, and then extruded through a flat die of a specially designed plastic extruding machine.
- EVA film is then formed. This film is wound in roll for storage and packing.
- This extraordinary adhesive film is non-sticky and inert to water moisture.
- Handling and glass assembly can be done at room temperature. No air conditioner or de-humidifier is required.

Classifications of EVA

EVA Film is classified in several categories: Thickness, Colors & Transparencies, and Applications

Available in 3 Thicknesses:

- 0.25mm
- 0.38mm
- 0.76mm



Available in 30 Colors and Transparencies:

- From standard clear to super clear
- From light white to deep white
- From transparent red to transparent black
- From translucent orange to translucent blue
- From opaque yellow to opaque purple



Available For Versatile Applications

- Furnishing, decoration and architectural for both general purpose and outdoor purpose
- Encapsulation for special types of glass such as PDLC smart, intelligent and privacy glass
- Encapsulation for photovoltaic solar panel

Versatile Design

Almost Unlimited Designs Of EVA Laminated Glass Are Made With Vast Choices Of Proper Glass, Film, Foil And Interlayer

Colors

EVA is available in many different colors, clear, translucent and opaque. EVA laminated glass is colored by EVA films instead of using expensive coloring or rare color tinted glass. From ultra high transparency to ordinary clear, from milky white to sandblast white, from transparent red to transparent sapphire blue, from translucent orange to translucent green and from opaque yellow to opaque black.



Design Interlayer

EVA also allows you to use interlayers, such as a design or wallpaper between EVA layers. The EVA layers encase the design or wallpaper in the glass to make artistic shower doors, display, office partitions... the options for creativity are endless.



Excellent Compatibility

EVA Laminated glazings could be composed of many different types of monolithic glass. They could be annealed, toughened, heat-strengthened, spandrel, wired, patterned, tinted and coated glass, etc. Besides glass, EVA is also compatible with different kinds of sheets such as polycarbonate.

Smart or Privacy Glass

Switchable PDLC films are always encapsulated and laminated inside EVA laminated glass. When electric current is applied on the PDLC film, it goes transparent. When it turns off, it goes opaque while still allowing light to pass through. PDLC glass is also popular for image projection.

Overall

All of these possibilities combined together result in numerous designs for EVA laminated glass. These unlimited combinations allow designers' endless imagination.

Applications for EVA

General Application

The Basic Configuration Of EVA Laminated Glass Is To Sandwich Different Colors Of EVA Film In Between Two Pieces Of Glass

There are various color choices, from standard clear to super clear, from light white to sandblast white, from transparent red to transparent black, from translucent orange to translucent blue and from opaque yellow to opaque purple, etc.

Decorative & Furnishing Applications

EVA Is The Most Cost Effective & Lowest Operating Cost Plastic Film For Glass Lamination & Encapsulation For Furnishing, Decorative & Architectural Purposes

Interlayer designs with images and graphics could be sandwiched in between two pieces of glass encapsulated by two pieces of EVA film. The interlayer design could be any image, any graphic, and/or any color. They could be silk, fabric, paper, fiberglass, non-woven fabric, and metal mesh, etc. This allows almost infinite imaginative designs by proper combinations with different types of glass, different colors and transparency of EVA films.

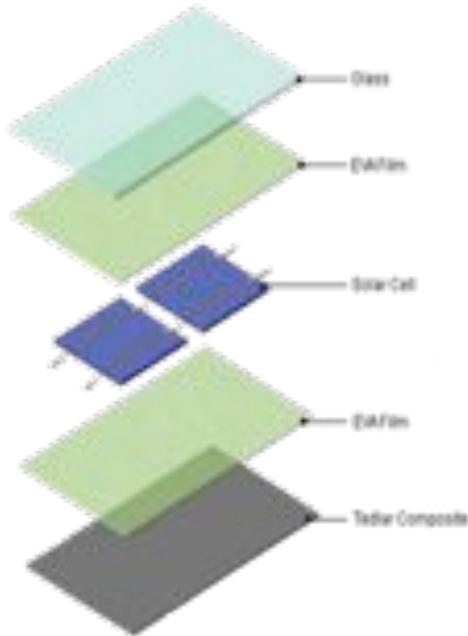
Functional Application

PDLC Smart & Intelligent Glass Is One of The Most Popular Types of Functional Laminated Glass With PDLC Film Encapsulated By Two Pieces of EVA Interlayer In A Perfect Protection Way

It is a laminated glass sandwiched with a piece of PDLC film encapsulated by two pieces of EVA film. PDLC stands for polymer disperse liquid crystal. This electro-chromic PDLC film is connected to electricity power. When voltage is applied, it becomes transparent. When voltage is turned off, it becomes opaque. This intelligent glass, also known as privacy, major or switchable glass, is extensively employed in those areas where sometimes privacy and sometimes open are major concern, for example, banks, conference rooms, function rooms, offices, patio doors, schools, hospitals, vehicles, restaurants, hotels, etc.

Solar Application

EVA Interlayer Is The Standard Encapsulation Material For Photovoltaic Solar Panel



Due to the increasingly enormous demand of green energy in recent years, solar energy becomes one of the most important alternatives to fossil fuel energy. Solar energy is generally transformed into electric power by photovoltaic solar panels. The most popular photovoltaic technology is to sandwich a silicon wafer in between two pieces of ultra clear rolls and glass encapsulated by plastic interlayer film. After years of trail and practice, EVA is proven to be the most cost effective and reliable film with the best performance.

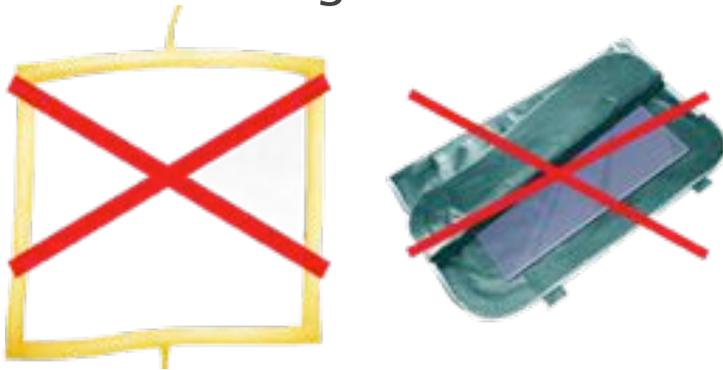
As solar energy plays an important part in green energy, it becomes extensively used where alternatives to fossil fuel are a major concern. Therefore, there is significant demand of EVA encapsulation film in the solar industry.

Advantages of EVA Production

Less Capital Investment

Only one single machine is required to produce EVA laminated glass: an oven. There is no investment required in an autoclave or a large pre-laminating line.

No Rubber Rings or Vacuum Bags



High temperature resistant silicon vacuum pads are incorporated with the EVA laminating ovens. Glass is put inside the silicon pad which is sealed tight to prevent air from leaking during the vacuum process. No extra vacuum bags or rubber rings are required.

No Autoclave or Rollers Presses



Thanks to many years of research, development and proven experience, EVA laminated glass can be obtained without using autoclaves or roller presses. The EVA laminating production is done by a vacuum and heating oven in a one step process. Pre-laminating and final bonding are done within the same oven.

Durable & Flexible Silicon Blankets



This strong silicon pad meets the most severe industrial tests. It is made of special high temperature resistant silicon. The material will not become brittle after numerous heating and cooling cycles. It is resistant to high pressure forces when wrapping around glass during vacuum.

Patented Silicon Blankets Edge Seal



Top and bottom pad edges are specially designed, providing an airtight interlocking system. The higher the vacuum in between the top and bottom pads, the firmer the edges are sealed.

Fast & Easy Glass Loading & Unloading

Thanks to silicon pad edge and sealing design, the pads seal tightly when the system is in use and are easily taken apart when the system is not in use. This allows fast glass loading and unloading, resulting in high production efficiency.

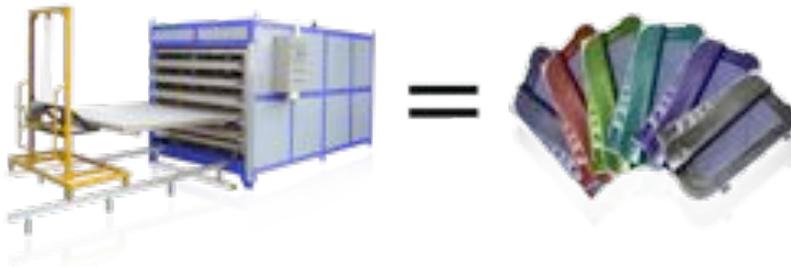
Non-Restricted Glass Sizes & Shapes

Extraordinary high tensile strength and elongation of silicon pads allow different sizes of laminated glass to be loaded in the same silicon pads and within one batch.

High Vacuum

When the top silicon pad wraps around the laminated glass, there is no room for any air to be trapped between the top and bottom silicon pads. This is due to a powerful vacuum pump, highly flexible silicon pads and patented silicon pad edges.

High Production Capacity



An EVA glass laminating oven comes with a multi-story rack with several sets of silicon pads. If the glass is small enough, each silicon pad could hold a few pieces of glass at one time, resulting in higher production.

Fast Production Cycle

Due to a powerful hot air fan, blower, and forced convection heating, a highly efficient heating profile is created in a short production cycle.

Safe Equipment

Unlike an autoclave, EVA laminating ovens are not pressure vessels.

Less Space

EVA laminating ovens are comparatively small and occupy little space.

No Foundation

Unlike an autoclave, EVA glass laminating ovens require no pit or slot.

No Climatic Control Room

EVA is stored, handled and laminated under room temperature. No climatic control room is required.

No Air Conditioner or Dehumidifier

EVA is almost inert to water moisture. It requires no air conditioning or dehumidifying.

Easy Operation

EVA glass laminating ovens come with a PLC where only temperature and time parameters are required to be input. The oven will run itself until the EVA laminated glass is done. It is just that simple.

Maximize Labor Efficiency

Once the glass and materials are loaded, the operator is not required to oversee the process, but can start to work on the next set-up to be put in the oven.

Labor Reduction

If the glass is not large, one operator can assemble the glass and operate the EVA laminating oven.

Low Power Consumption

The EVA laminating oven consumes less than 1.2 kW/m² calculated base on 5+5mm glass with 90% loadings.

Low Operating and Maintenance Costs

Operating cost can be minimized when all silicon pads are fully loaded with as much glass as possible per batch. The oven design is a simple construction and requires very little maintenance.

EVA Instead of PVB

EVA Has Been Proven To Be One Of The Best Alternatives To Costly PVB

- Traditional glass lamination and encapsulation is made by sandwiching PVB interlayers in between two pieces of glass.
- The final bonding of PVB is done with an autoclave. EVA glass lamination can be done without autoclave.
- This new type of process with EVA also does not require a roller press, vacuum bags or rubber rings.
- Similar to PVB, EVA is also sandwiched in between two pieces of glass.
- Thanks to the advancement and update in technology production equipment and relevant processes for EVA, glass lamination is much easier and simple than conventional PVB lamination.
- Only one single machine is required to fabricate EVA laminated glass.

EVA Becomes Popular

More Glass Fabricators Employ EVA To Be The Priority Interlayer For Glass Lamination And Encapsulation

- As glass design for furnishing, decoration and buildings become more and more sophisticated, versatile glass with better aesthetic visual effect and functions are required at a drastically low cost.
- EVA laminated glass meets the requests that simply could not be done or were done at a high cost previously.
- As more designers are well aware of the versatility of EVA laminated glass, it is becoming more popular.
- EVA laminated glass begins to play a significant role for architects, interior and environmental designers.

Comparison Of Plastic Films

Description		Plastic Film	
		EVA	PVB
Technical Data	Density	0.97 g/cm ³	1.07 g/cm ³
	Bonding Temperature	≤ 100°C	140°C
	Flow Temperature	80°C	90°C
	Flow Rate	1.2 cm ³ /s°C	0.4 cm ³ /s°C
	Haze Rate	1%	0.4%
	Visible Light Transmission	≥ 85%	≥ 88%
	UV Screening	98%	99%
	Luminous Efficiency	87%	88%
	Water Absorption (23°C for 24 hrs)	0.1%	3.6%
	Tensile Strength at Break	290 kg/cm ²	339 kg/cm ²
	Elongation at Break	2340 kg/cm ²	455 kg/cm ²
Colour Availability		Excellent	Good
Compatibility to Various Design Intertayer Materials		Excellent	Fair
Adhesion to Glass & Polycarbonate		Excellent	Fair
Orientation of Water Moisture		No	Yes
Handling		Room Temperature	Climatic Control Required
Film Cost		Fair	Costly
Film Availability		Many Qualified Suppliers	Few Qualified Suppliers

Comparison of Laminated Glass Production

Description		Laminated Glass Production	
		EVA	PVB
Autoclave	Autoclave	No	Yes
	Careful Operation and Maintenance	N/A	Yes
	Occupy Space	N/A	Yes
	Pit Construction Required for Foundation	N/A	Yes
	Water Circulation System Required for Cooling	N/A	Yes
Pre-Laminating Facilities	Climatic Control Room	No	Yes
	Air Conditioner	No	Yes
	Dehumidifier	No	Yes
	Roller Conveyor	No	Yes
	Roller Press	No	Yes
	Heating Oven	No	Yes
	Space Occupied	Little	Large
Labor Force		Few	More
Labor Working Environment		Room Temperature in Free Space	Dry and Cold Inside Climatic Control Room
Power Consumed per m ² of Glass		Low	High
Operating Cost		Low	High
Maintenance Cost		Low	High
Production Cycle		Short	Long
Production Type		Batch	Continuous
Variable Glass Thicknesses Production		Feasible Within Same Batch	Always Constant Thickness
Production Process		One Single Step	Several Steps

Comparison of Laminated Glass

Description	Laminated Glass	
	EVA	PVB
Anti-Shatter Peel Off	Excellent	Good
Inert with Sealants and Adhesives	Excellent	Good
Anti-Delamination	Excellent	Good
Impact Strength	Good	Excellent
UV Aging for 3000 hrs (JIS)	No Visible Change	No Visible Change
Environmental Resistance	No Visible Change	No Visible Change
Heat Resistance (100°C for 3 months)	No Visible Change	No Visible Change
Moisture Resistance (50°C at RH 95%)	No Visible Change	No Visible Change

Moisture Proof Test

Sample	300 x 300 x (5+0.38+5) mm
Inspection Instrument	HS-500B Temperature and Moisture Testing Chamber
Room Temperature at Test	23 °C (73°F)
Room Relative Humidity at Test	44%
Testing Requests	No bubbles and no defects are allowed 15mm or more from glass edges, 25mm or more from new cut edges and 10mm or more from cracks.

Samples Nr.	Testing Results
569-7	No visible change
569-8	No visible change
569-9	No visible change

Ball Drop Impact Test

Sample	610 x 610 x (5+0.38+5) mm
Inspection Instrument	SGH-III Ball Drop Testing Equipment
Room Temperature at Test	23 °C (73°F)
Room Relative Humidity at Test	44%
Testing Requests	No tearing of interlayer is allowed. Interlayer is not allowed to be exposed.

Samples Nr.	Samples Thickness	Ball Weight	Dropping Height	Testing Results
569-10	10.20 mm	1040 g	1500 mm	Impact side is broken. Interlayer is not torn and unexposed.
569-11	10.18 mm	1040 g	1500 mm	
569-12	10.19 mm	1040 g	1500 mm	
569-13	10.20 mm	1040 g	1500 mm	
569-14	10.19 mm	1040 g	1500 mm	
569-15	10.20 mm	1040 g	1500 mm	

Lead Shot Impact Test

Sample	1930 x 864 x (5+0.38+5) mm
Inspection Instrument	SBI-III Lead Shot Bag Impacting Equipment
Room Temperature at Test	23 °C (73°F)
Room Relative Humidity at Test	44%
Testing Requests	No tearing of interlayer is allowed

Samples Nr.	Samples Thickness	Dropping Height	Testing Results
569-16	10.18 mm	750 mm	Interlayer is not torn.
569-17	10.19 mm	750 mm	
569-18	10.19 mm	750 mm	
569-19	10.17 mm	750 mm	

IGE Supply Solutions

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No.	CODE	THICKNESS	SIZE (roll)	UNIT	Sell price	total roll/ft	total sell price per roll	TEMPERTUR E	TIME KEEPING
	OUTDOOR USE (No. 1--No. 3)								
1	PA-0.76	0.76MM super clear	6.56*164.04	ft ²	\$1.36	1076.10	\$1,459.20	>135°C	45MIN
2	PA-0.38	0.38MM super clear	6.56*328.08	ft ²	\$0.74	2152.20	\$1,601.25	>135°C	45MIN
3	PA-0.025	0.25MM super clear	6.56*492.13	ft ²	\$0.61	3208.69	\$1,963.70	>135°C	45MIN
	INDOOR USE ONLY (No.4--No.24)								
4	EVA K9	0.38MM CLEAR	6.56*328.08	ft ²	\$0.47	2152.20	\$1,007.23	110-120°C	45MIN
5	EVA K15	0.25MM CLEAR	6.56*492.13	ft ²	\$0.36	3208.69	\$1,155.13	110-120°C	45MIN
6	EVA K15-1	0.15mm CLEAR	6.56*656.17	ft ²	\$0.22	4304.48	\$929.77	110-120°C	45MIN
	No.7--No.13 ARE TRANSPARENT								
7	EVA-1	0.38MM SIGNAL RED	6.56*114.83	ft ²	\$1.27	753.28	\$947.38	110-120°C	30MIN
8	EVA-2	0.38MM yellow	6.56*114.83	ft ²	\$1.27	753.28	\$947.38	110-120°C	30MIN
9	EVA-3	0.38MM orange	6.56*114.83	ft ²	\$1.27	753.28	\$947.38	110-120°C	30MIN
10	EVA-4	0.38MM navy blue	6.56*114.83	ft ²	\$1.27	753.28	\$947.38	110-120°C	30MIN
11	EVA-5	0.38MM dark green	6.56*114.83	ft ²	\$1.27	753.28	\$947.38	110-120°C	30MIN
12	EVA-6	0.38MM light green	6.56*114.83	ft ²	\$1.27	753.28	\$947.38	110-120°C	30MIN
13	EVA-8	0.38MM purple	6.56*114.83	ft ²	\$1.27	753.28	\$947.38	110-120°C	30MIN
	No.14--No.17 ARE TRANSLUCENCY								
14	EVA-9	0.38MM orange	6.56*164.04	ft ²	\$1.36	1076.10	\$1,459.20	110-120°C	30MIN
15	EVA-10	0.38MM dark blue	6.56*164.04	ft ²	\$1.36	1076.10	\$1,459.20	110-120°C	30MIN
16	EVA-11	0.38MM apple green	6.56*164.04	ft ²	\$1.36	1076.10	\$1,459.20	110-120°C	30MIN
17	EVA K7	0.38MM LIGHT WHITE	6.56*328.08	ft ²	\$0.72	2152.20	\$1,549.58	110-120°C	45MIN
	No.18--No.24 ARE OPAQUE								
18	EVA-7	0.38MM black	6.56*164.04	ft ²	\$1.36	1076.10	\$1,459.20	110-120°C	30MIN
19	EVA-12	0.38MM red	6.56*164.04	ft ²	\$1.36	1076.10	\$1,459.20	110-120°C	30MIN
20	EVA-13	0.38MM Light blue	6.56*164.04	ft ²	\$1.36	1076.10	\$1,459.20	110-120°C	30MIN
21	EVA-14	0.38MM yellow	6.56*164.04	ft ²	\$1.36	1076.10	\$1,459.20	110-120°C	30MIN
22	EVA-15	0.38MM purple	6.56*164.04	ft ²	\$1.36	1076.10	\$1,459.20	110-120°C	30MIN
23	EVA-16	0.38MM frosted	6.56*328.08	ft ²	\$0.72	2152.20	\$1,549.58	110-120°C	30MIN
24	EVA K2	0.38MM MILKY opaque	6.56*328.08	ft ²	\$0.72	2152.20	\$1,549.58	110-120°C	45MIN

IGE Glass Technologies' Lammy Can (Decorative Lamination)

The “Lammy Can” is a new piece of equipment that is geared toward the fabricator looking for “new and different” without spending a fortune. The process uses glass, EVA (Ethylene Vinyl Acetate) film, as well as materials similar to wallpaper, and transforms them into real beauty for decorative products such as, but certainly not limited to, back splashes, office partitions, shower doors and store fronts.

Here is how it works: heat and vacuum take the EVA, glass and materials from an opaque to a crystal clear transparent product, transforming the glass adhesive film and material into one. Better than PVB with regards to water repellency, UV radiation and heat, this product will perform well indoors as well as outdoor environments.



Rated Voltage	480V-600V
Frequency	60Hz
Rated Current	60A
Installation Wattage	≤ 40Kw
Heating Winding	36Kw
Winding Wattage	2.25Kw
Glass Size	1700mm (w) 3200mm (h)
Machine Size	4200mm (L) 2250mm (H) 2200mm (w)
Number of Beds	5
Price	\$48,900-\$58,900



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