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Advantages of crosslinkable interlayer films for application in laminated safety glasses

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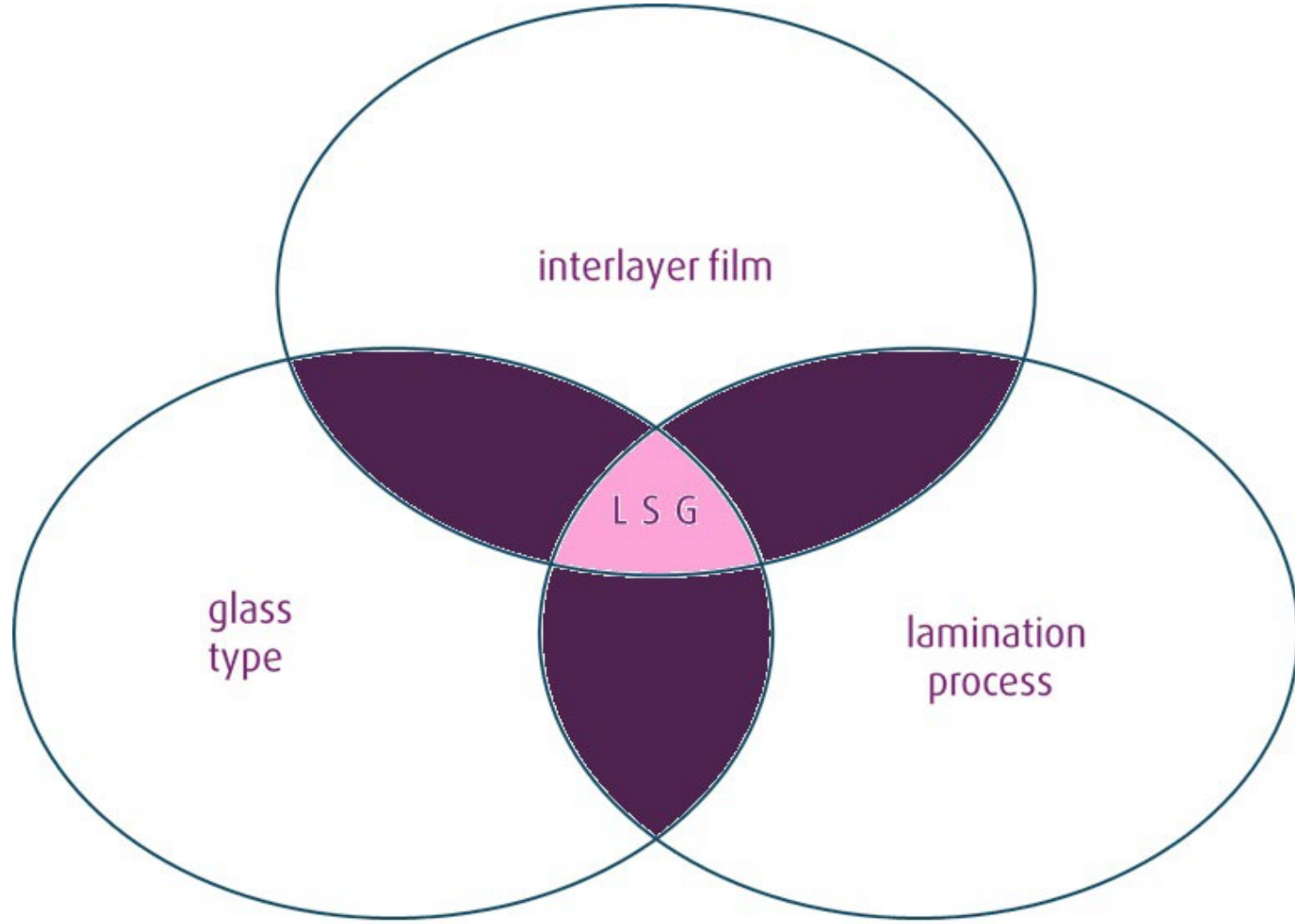
GPD Conference, Tampere, June 11th, 2025



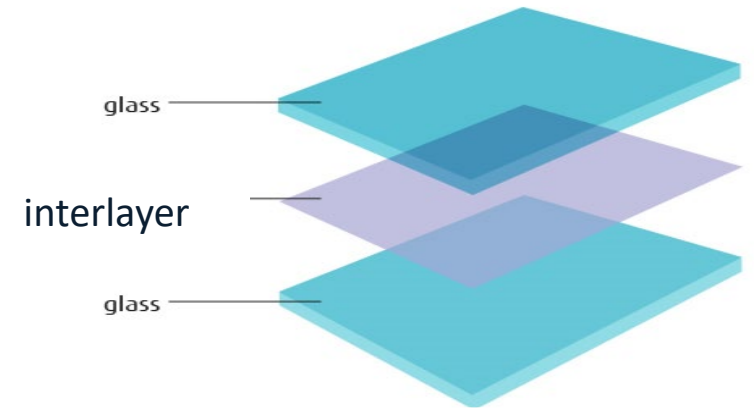
SUSTAINABILITY



LAMINATED SAFETY GLASS

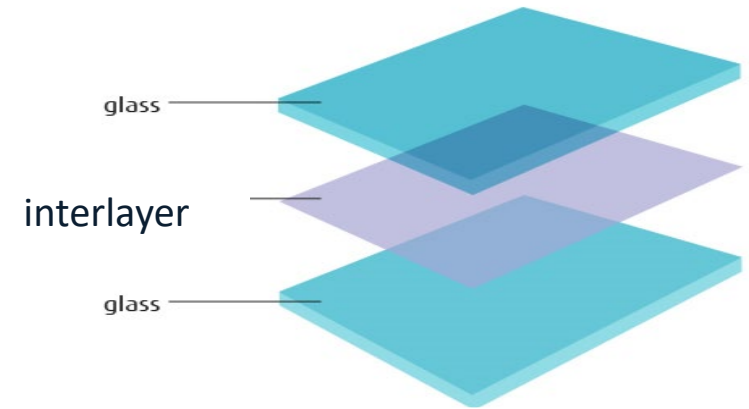


basic characteristics



	Thermoplastic	
Description	Material behavior determined by glass transition temperature and melting point	
Examples	Polyvinylbutyral (PVB), Ionomer	

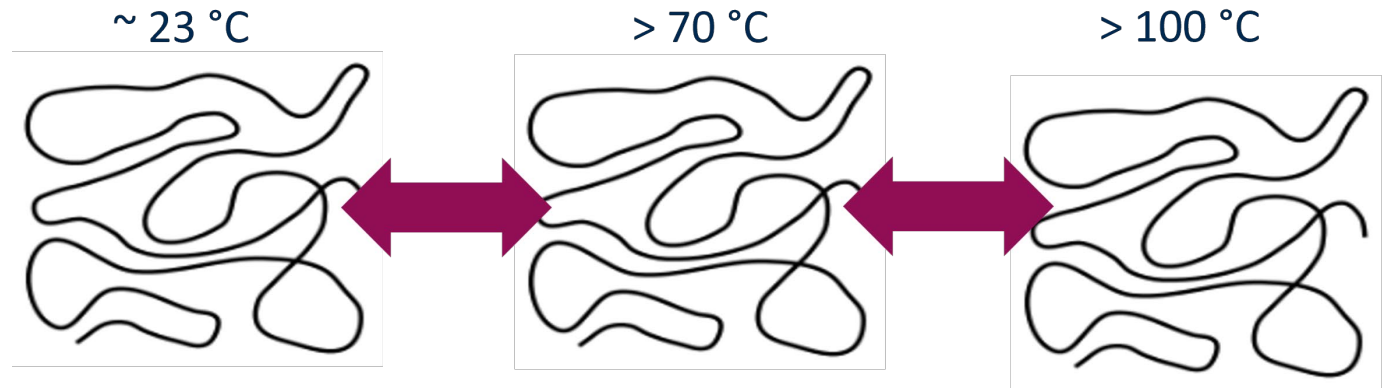
basic characteristics



	Thermoplastic	Duroplastic-elastomeric
Description	Material behavior determined by glass transition temperature and melting point	Material behavior determined by processing, as delivered thermoplastic, becomes duroplastic-elastomeric after crosslinking
Examples	Polyvinylbutyral (PVB), Ionomer	Ethylen-Vinylacetat-Copolymer (EVA)
	combination with other interlayers possible, i.e. special polyesters	

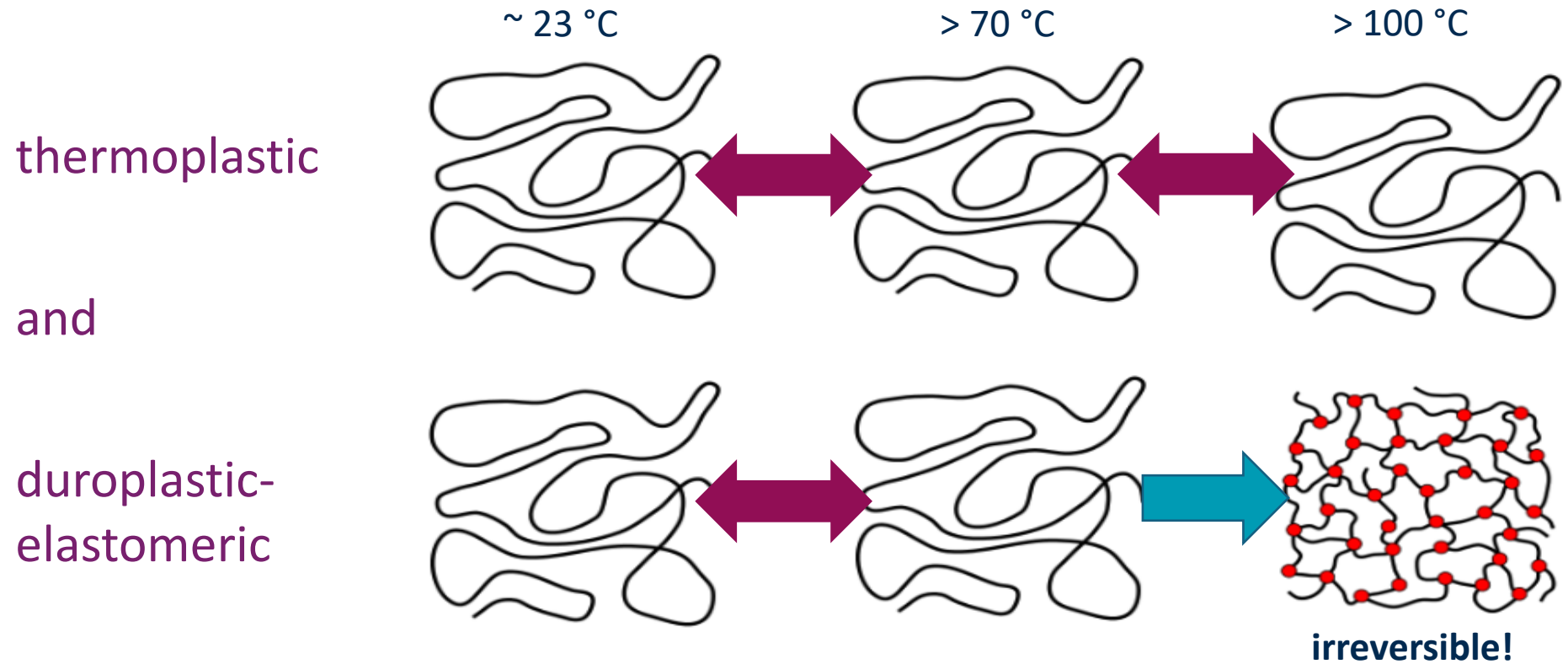
The difference between...

thermoplastic



INTERLAYER FILMS

The difference between...



The crosslinking step

“invented” by nature

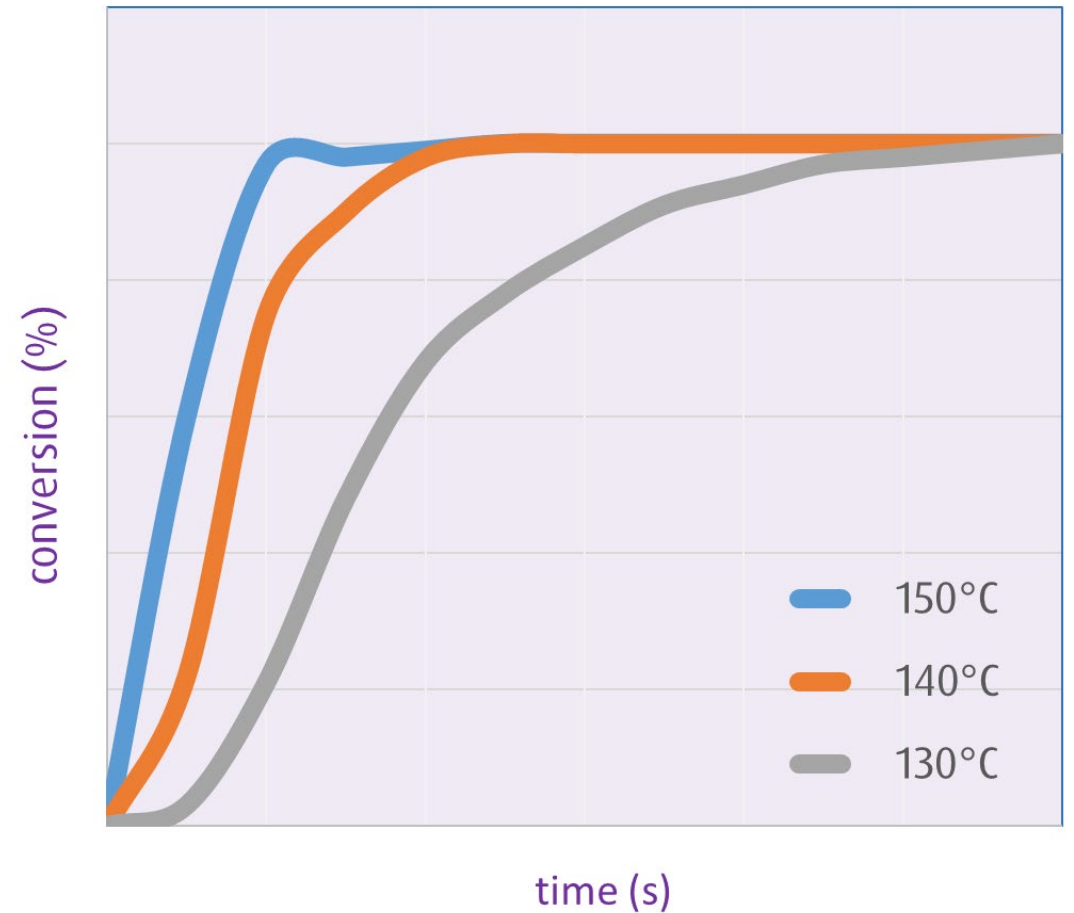


The crosslinking step

“invented” by nature



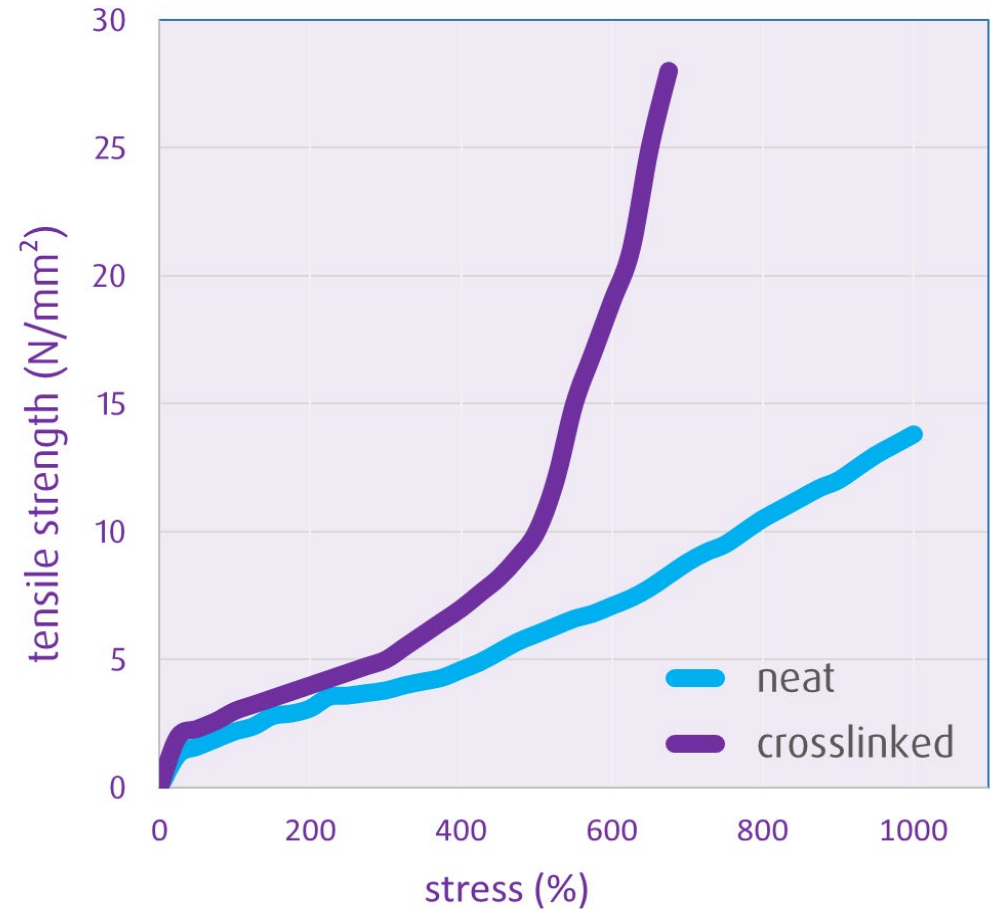
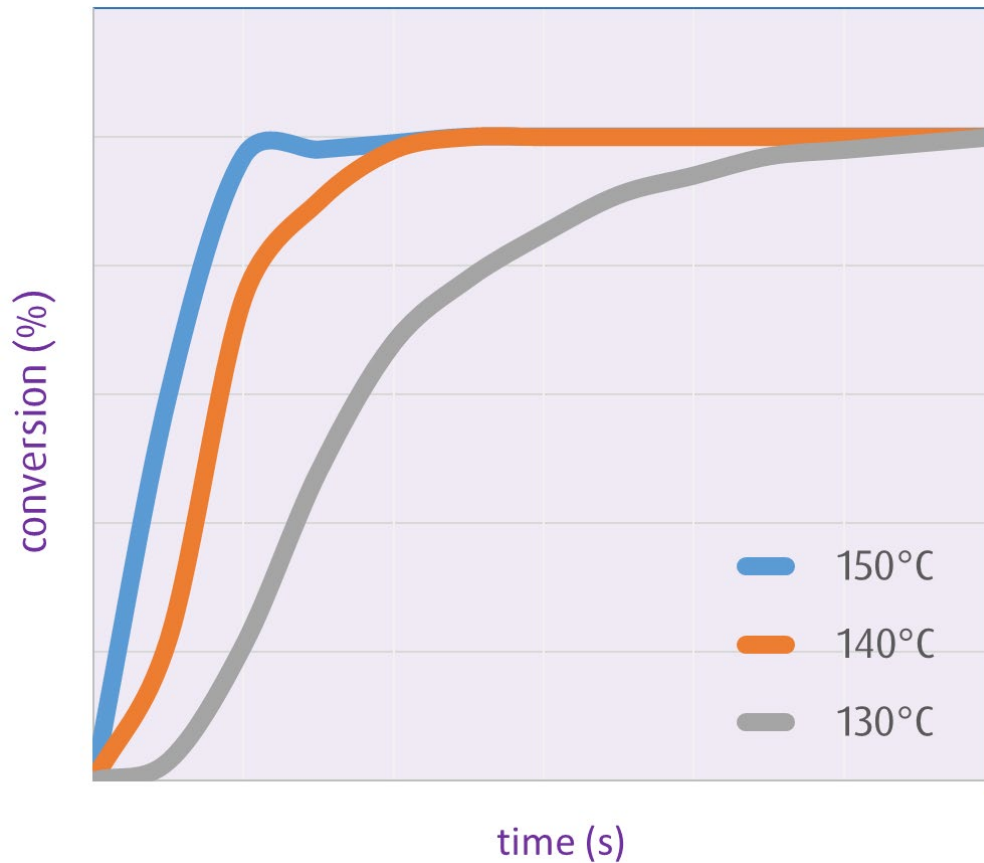
conversion rate of the crosslinking step



The crosslinking step

conversion rate of the crosslinking step

change of mechanical properties



Bake test

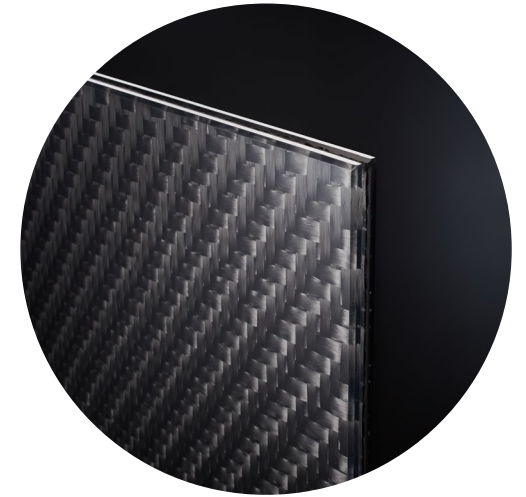
DIN EN ISO 12543:

Standard requirement: 2 h at 100°C

→ normally OK for all interlayers

What happens at higher temperature?

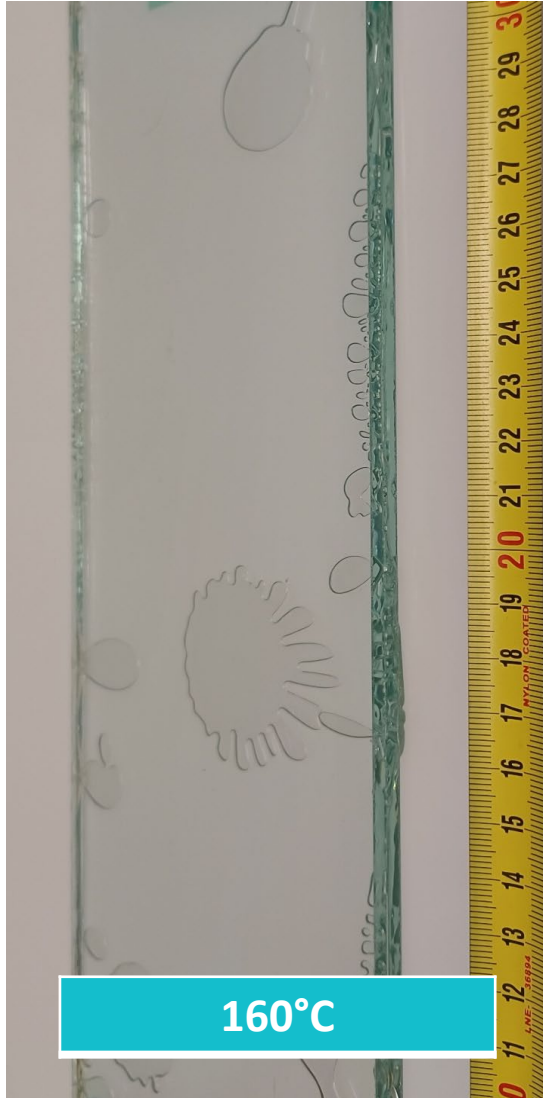
Customer requirement: stable at at least 200°C



THERMAL PROPERTIES

Bake test

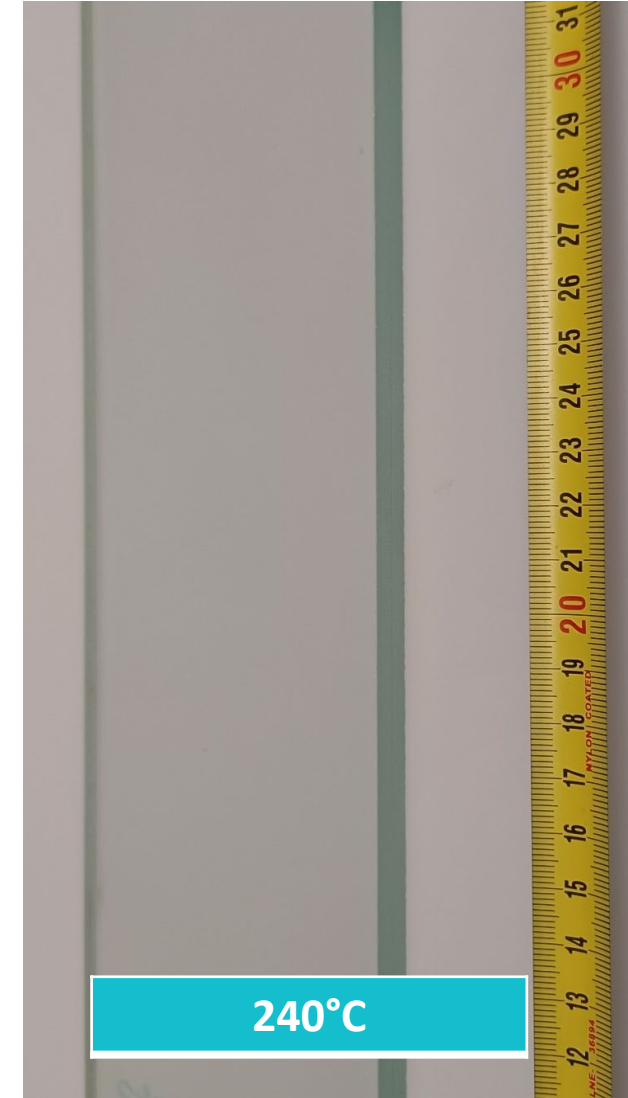
thermoplastic PVB



thermoplastic ionomer



crosslinked EVA



Bake test

Reason for the findings:

- thermoplastic materials flow above melting temperature
- moisture uptake in case of humidity will increase the effect
- loss of the adhesion to the glass
 - Risk of delamination!
 - Risk of loss of functionality!



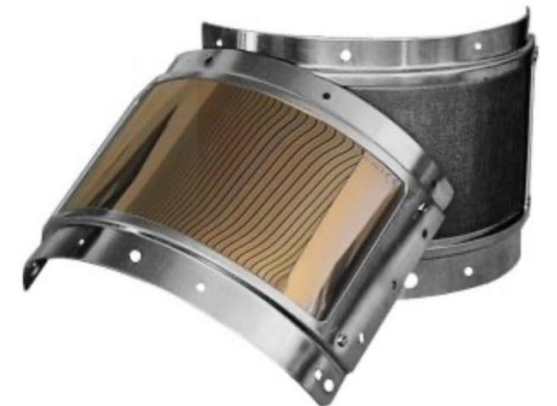
Bake test

Reason for the findings:

- thermoplastic materials flow above melting temperature
- moisture uptake in case of humidity will increase the effect
- loss of the adhesion to the glass

Applications:

- high temperature stabile glass laminates
(houseware, fire protection)



Safety glass under load

Free standing barrier glass

Standard: BS 6180

Load of 0.74 kN/m will be applied and the deflection is measured:

limit 25 mm

holding time at load: 5 min.

Afterwards, 1.5 times overload is applied as safety requirement

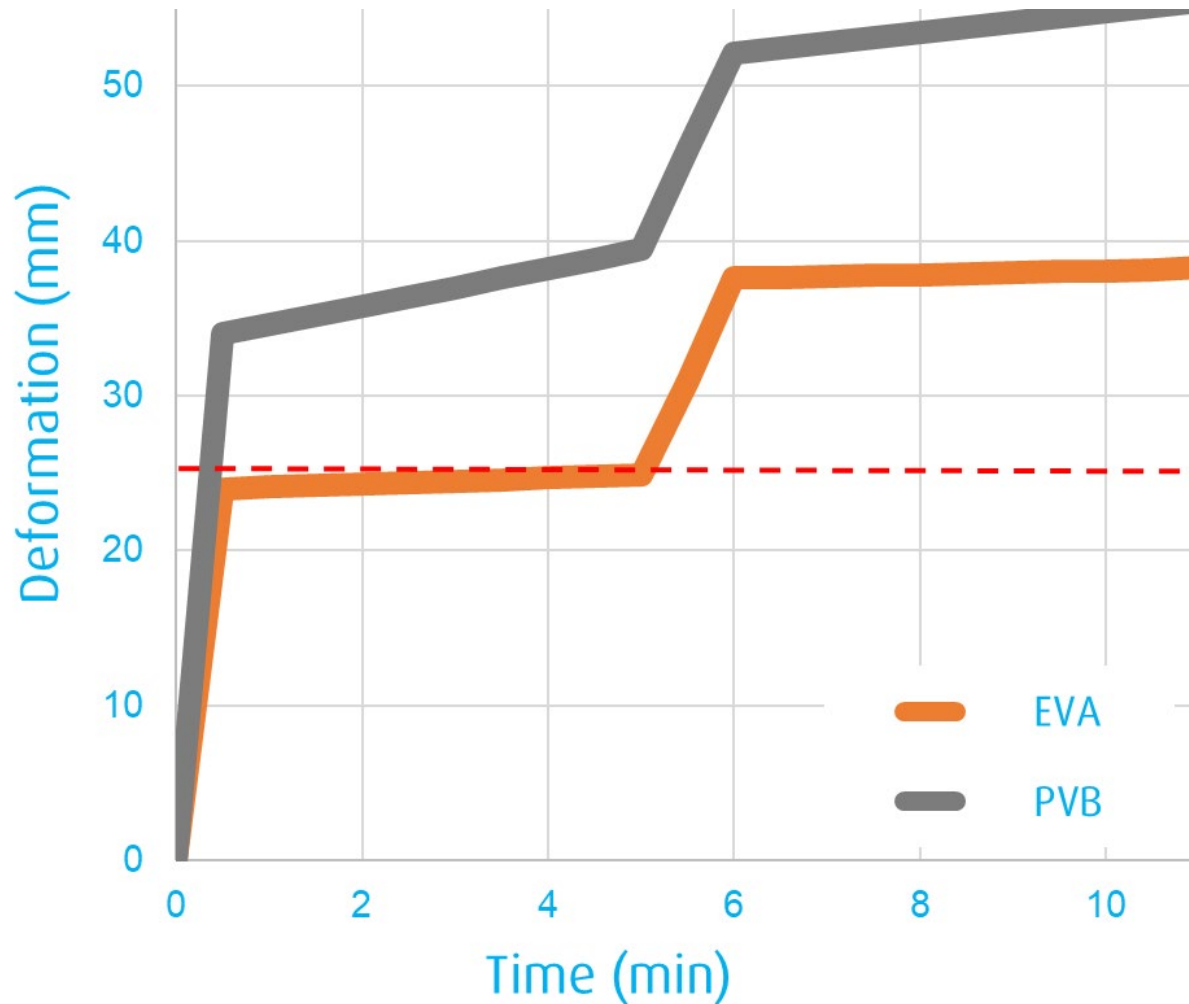


Test criteria: BS 6180

Report JBC 4696/01 (John Colvin)

Safety glass under load

Free standing barrier glass

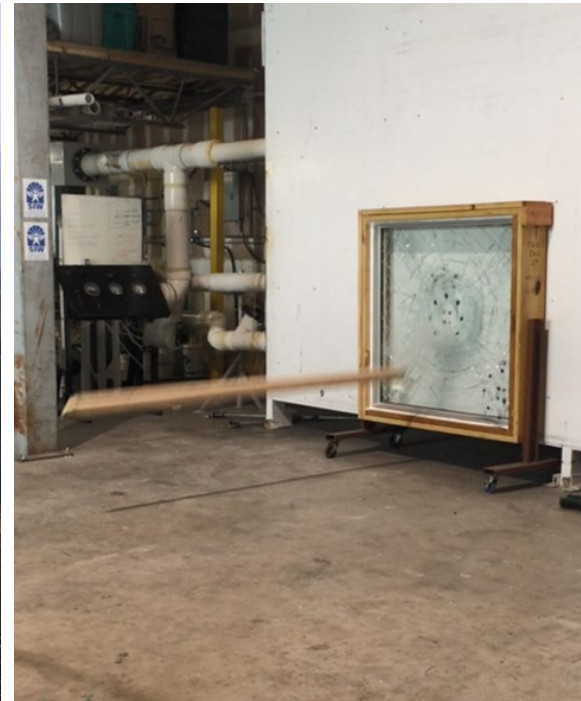


Test criteria: BS 6180
Report JBC 4696/01 (John Colvin)

Free standing barrier glass

Applications:

- balustrades, balconies, safety glass under load (stadium)
- further improvement by combination of interlayers



Laminates with thin glass

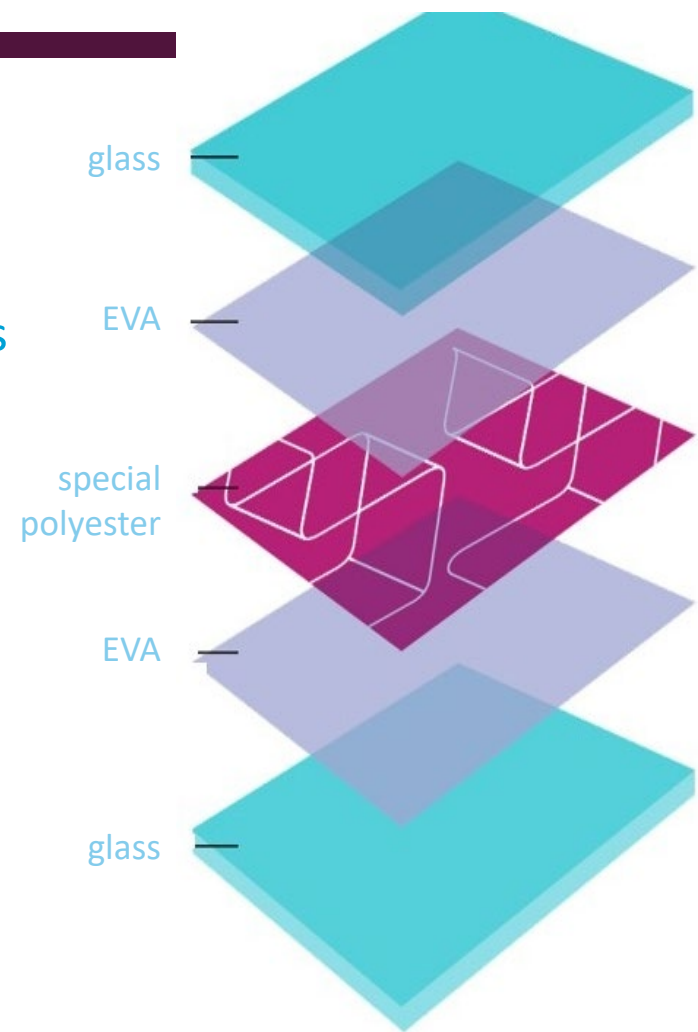
Lamination of thin glass ($\leq 2\text{mm}$) by using interlayer combinations

Transfer of knowledge from „standard“ LSG to thin laminates



applications:

- light weight construction
- automotive...
- ballistic...

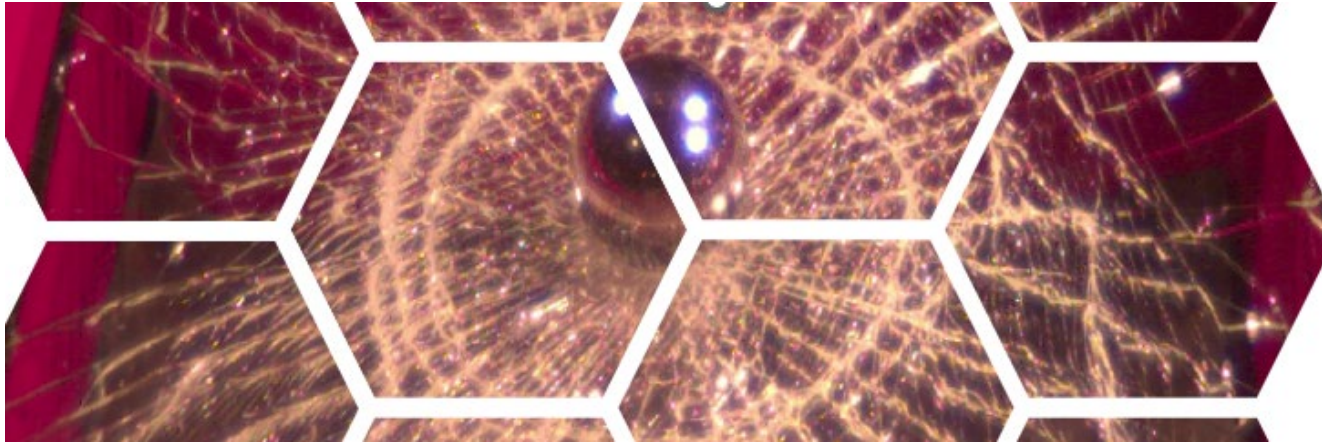


Gefördert durch:

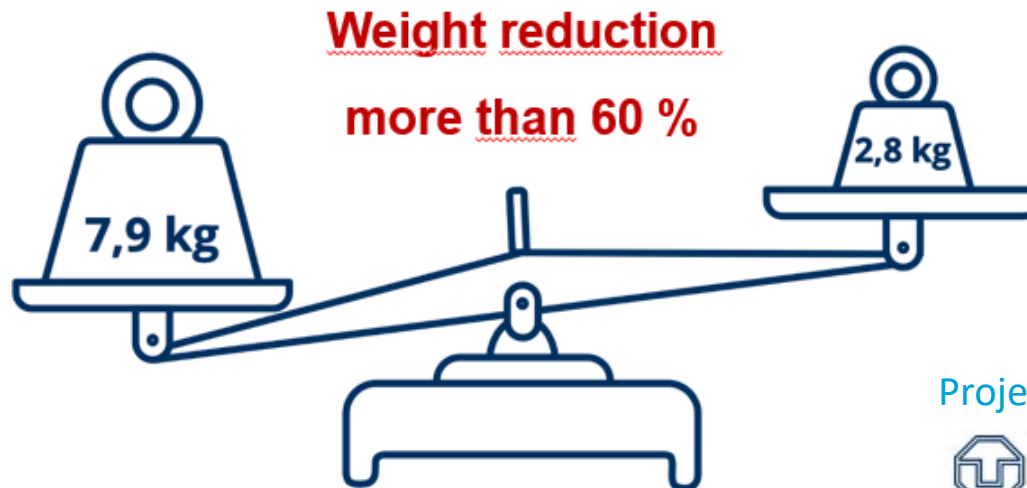
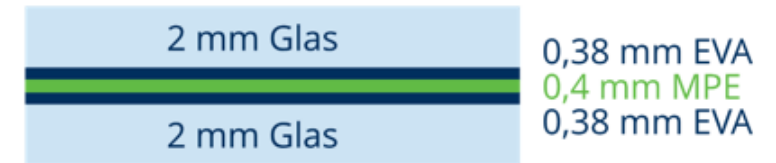
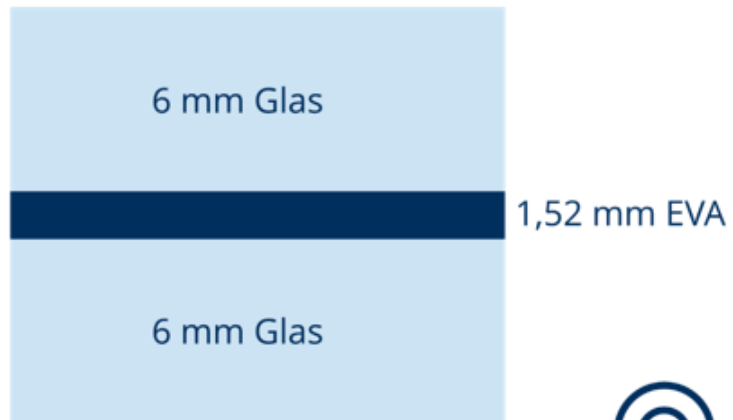
Project in cooperation with:



aufgrund eines Beschlusses des Deutschen Bundestages



Ball drop test (DIN EN ISO 14449)



Project in cooperation with:

SUMMARY

- ✓ crosslinkable interlayers in glass lamination offer different applications due to changed behavior
- ✓ Crosslinking step will influence both the lamination process and the key properties of the glass laminates
- ✓ higher temperature stability and less creep
- ✓ light weight material and thickness reduction of LSG accessible by combination of crosslinkable interlayers and high strength films



COME & TALK



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