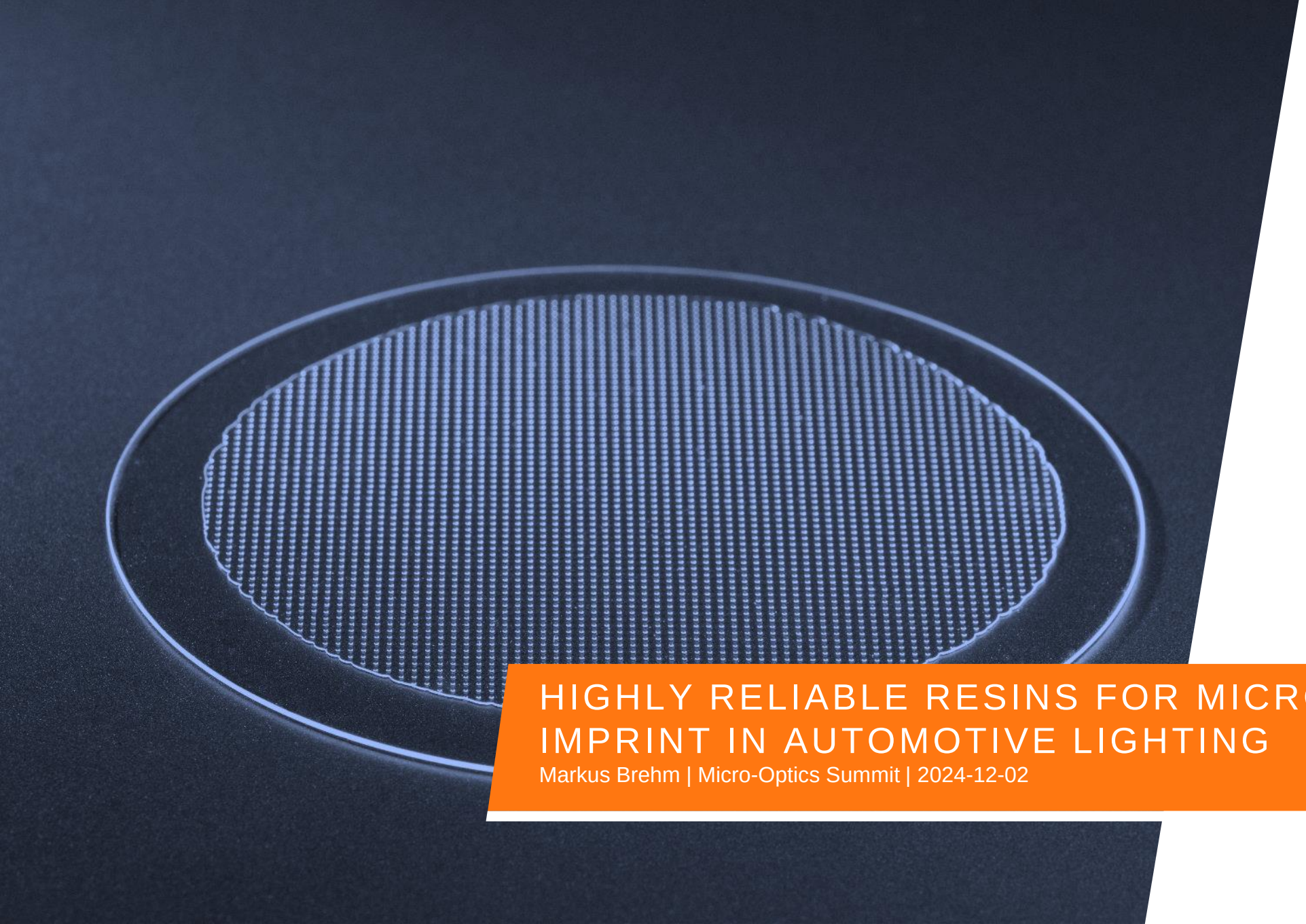


HIGHLY RELIABLE RESINS FOR MICRO-OPTICAL IMPRINT IN AUTOMOTIVE LIGHTING

Markus Brehm | Micro-Optics Summit | 2024-12-02

DELO

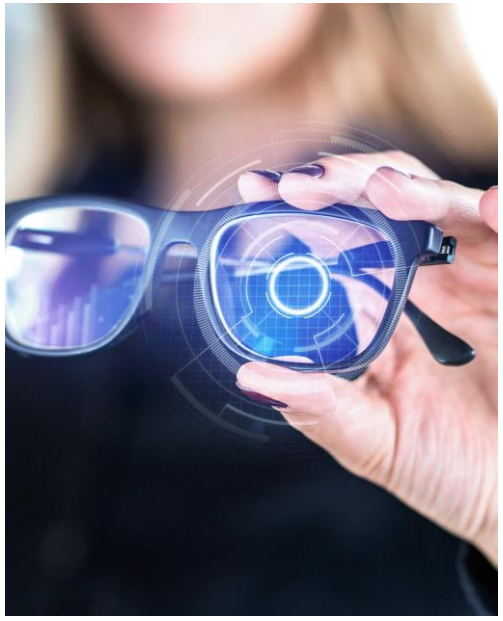
FAMILY-OWNED

€ 230 M. REVENUES

1100 EMPLOYEES


DELO
DELOMONOPOX® AD066
1 part epoxy adhesive
DELO
DELO-DOT PN3
DELO
DELO
DELO
Adhesives / Polymers
Dispensing Equipment
Curing Equipment

UV imprint technology applications



AUGMENTED REALITY

OPTICAL SENSING

AUTOMOTIVE LIGHTING

IMAGING

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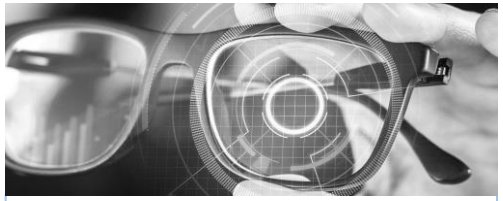
UV imprint technology applications



AUGMENTED REALITY

Waveguides

Surface relief grating, high refractive index

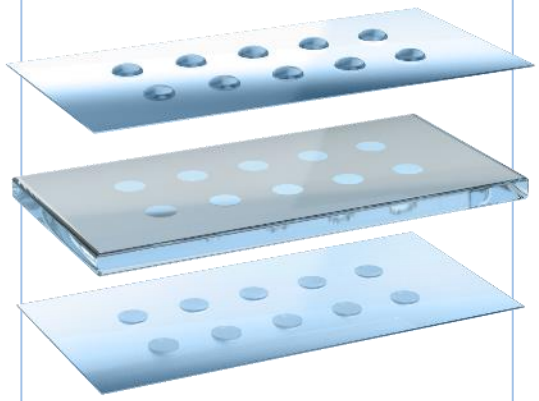
OPTICAL SENSING

Diffractive optical elements

Multi-level nanostructures

AUTOMOTIVE LIGHTING

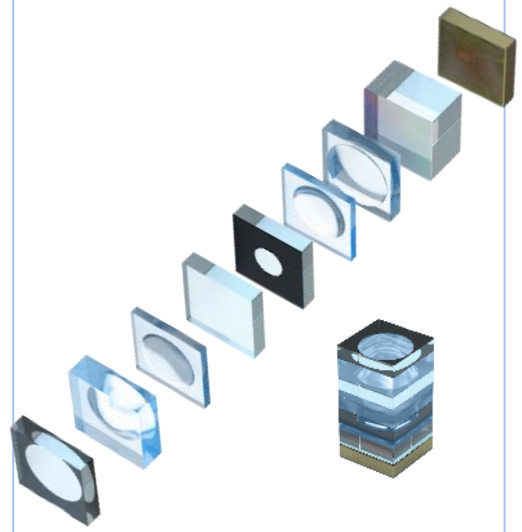
Projector / Headlamp



Precisely aligned micro-lens arrays

IMAGING

Miniaturized camera modules



Achromatic lens doublet, functional layers

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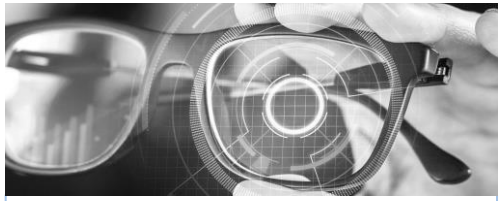
UV imprint technology applications



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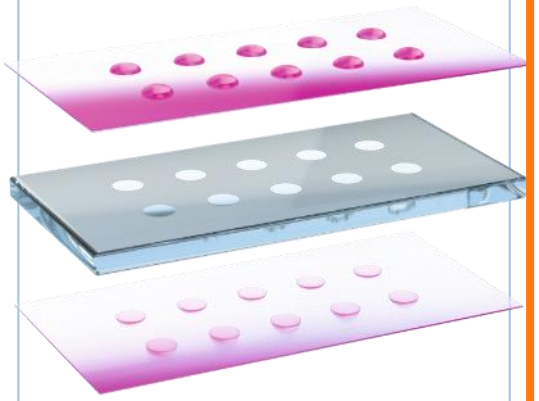
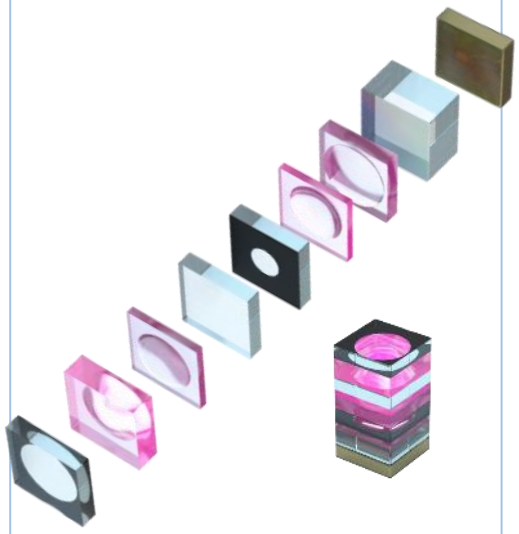


Precisely aligned micro-lens arrays

IMAGING

Miniaturized camera modules



Achromatic lens doublet, functional layers

Functional polymers are highlighted in magenta.

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Image: Lucid

Image: Genesis

Image: BMW

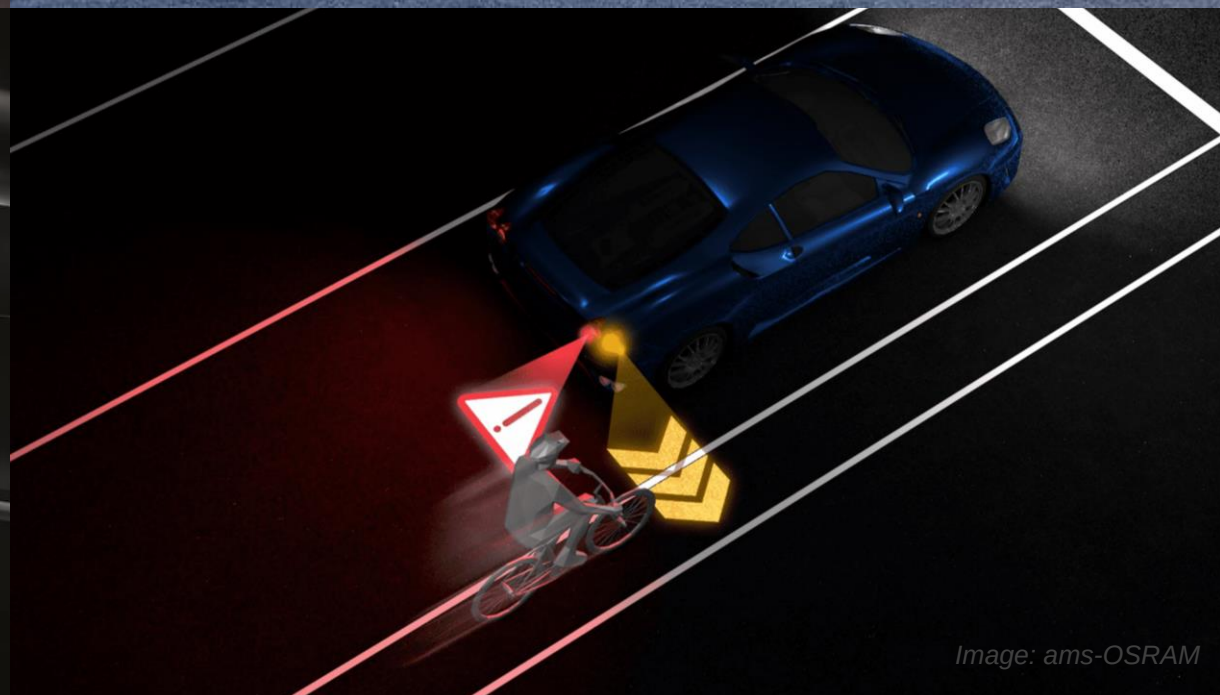
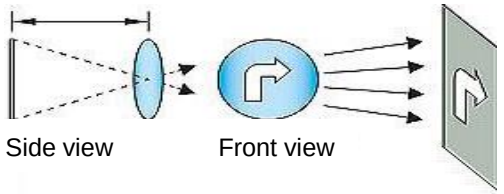


Image: ams-OSRAM

MLA projection systems - functionality

Projector with one single lens



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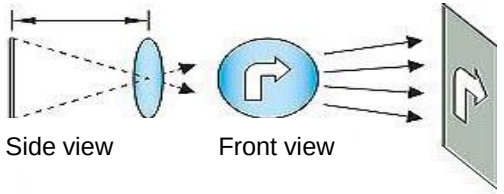
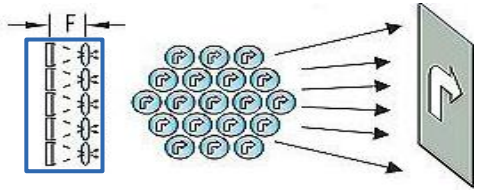
MLA projection systems - functionality

Projector with one single lens



vs.

Micro lens array (MLA)



- Enables very sharp and controlled projection
- Allows to project under shallow angles
- Benefit: lower distance between light source and optics

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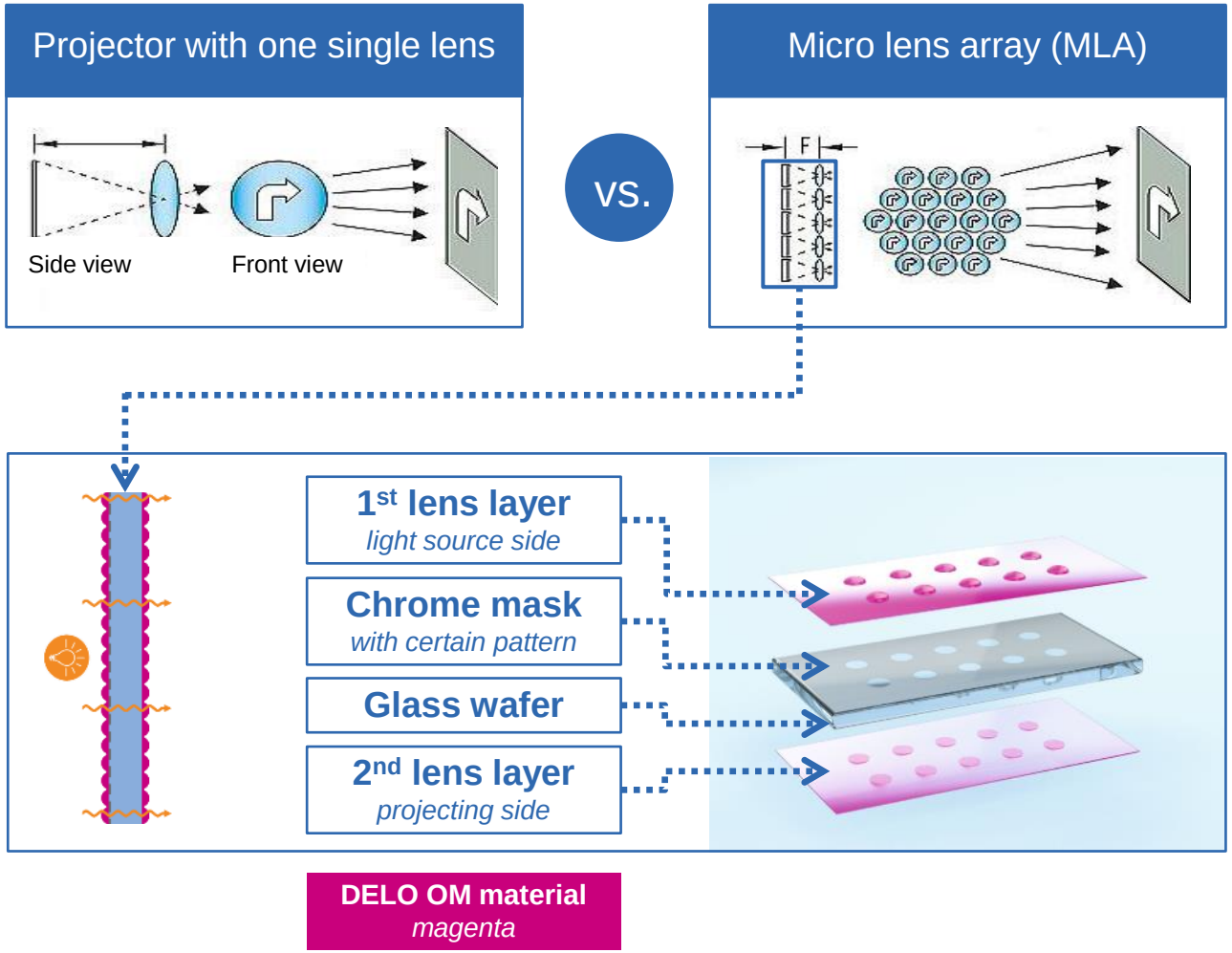
MLA projection systems - functionality



- Enables very sharp and controlled projection
- Allows to project under shallow angles
- Benefit: lower distance between light source and optics

- Technology: double-sided imprinted lens structure on substrate
- Very accurate alignment of the chrome mask to MLA thanks to imprint process

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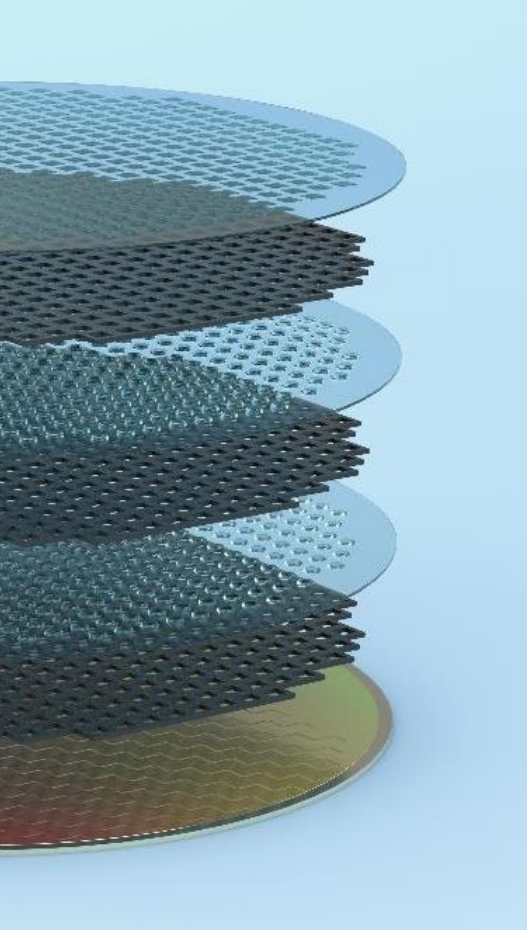
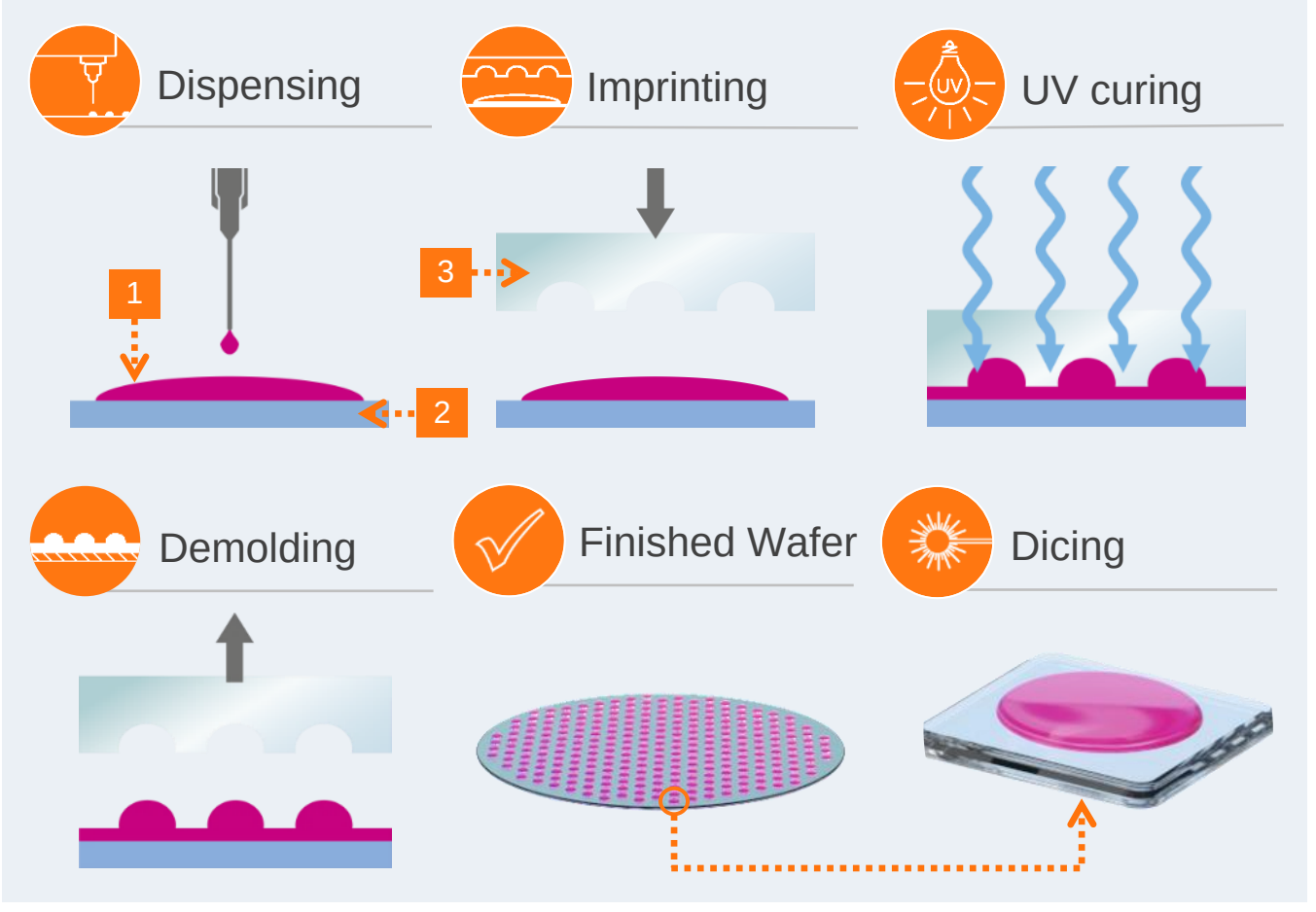
Manufacturing process: wafer level imprint





1 DELO OM material

2 Glass wafer

3 Transparent stamp

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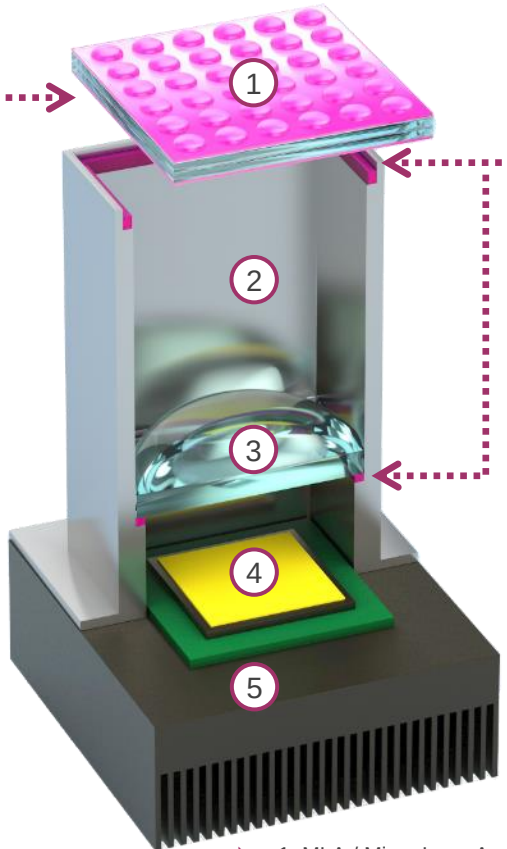
Materials and adhesives in MLA modules

Micro Lens Arrays (MLA) are used in **headlamp** and **projection system** modules, because they enable an accurate light control by simultaneously having a very compact module for slim designs

Optical Materials
for imprint of lenses in MLA

DELO KATIOBOND OM6113 & OM6115

- High transmission in the range of visible light
- Optical stability after humidity, high temperature and UV radiation
- Mechanical stability to withstand stresses from temperature changes



1: MLA / Micro Lens Array
2: Housing
3: Collimating Lens
4: LED
5: Heatsink

Optical Adhesives
for MLA and lens bonding

DELO PHOTOBOND OB4189 & OB4116

- High aspect ratio for Active Alignment of MLA
- Low outgassing: Total mass loss < 1.0 %
- High optical and temperature stability

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RELIABILITY IS ESSENTIAL


Image: Lucid

Image: Genesis


Image: BMW

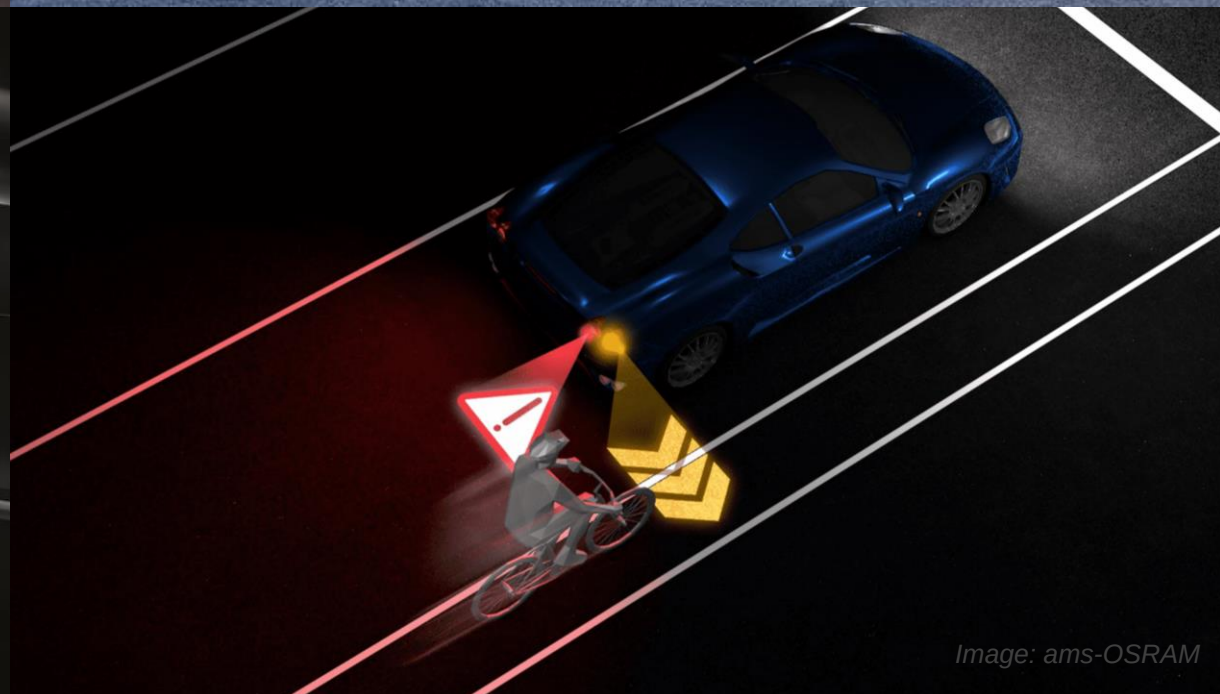


Image: ams-OSRAM

RELIABILITY IS ESSENTIAL

But what does reiliability mean?

Image: Lucid

Image: Genesis

Image: BMW

Image: ams-OSRAM

RELIABILITY IS ESSENTIAL

Image: Lucid

Image: Genesis

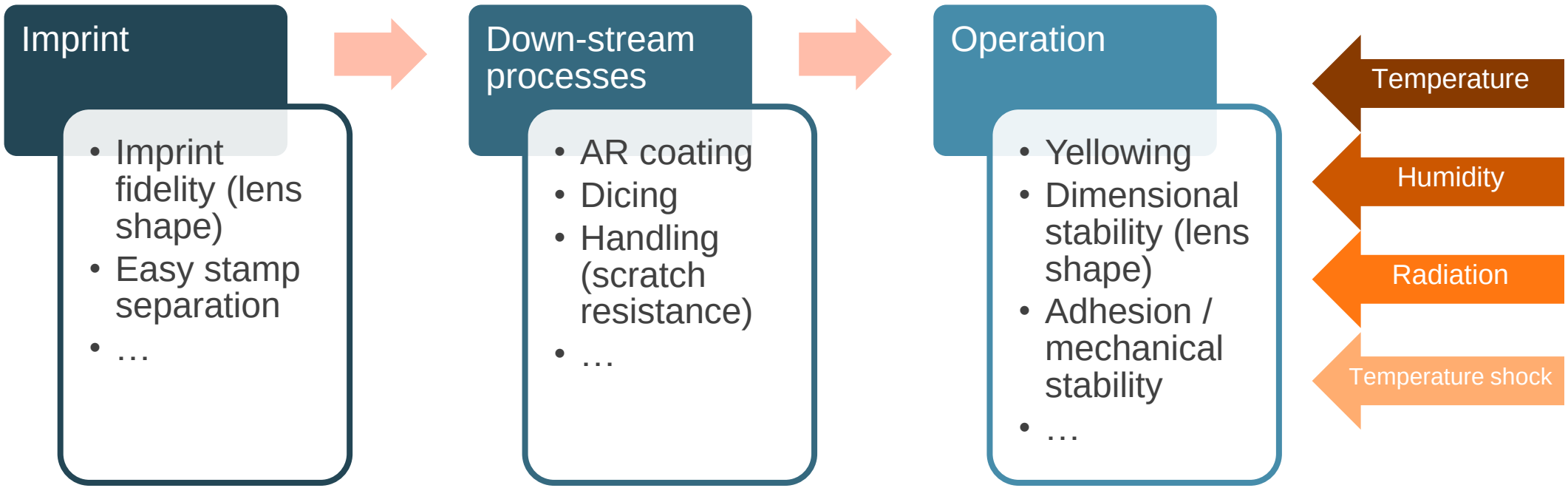
But what does reiliability mean?

Many aspects & different for each application

Image: BMW

Image: ams-OSRAM

Aspects of reliability



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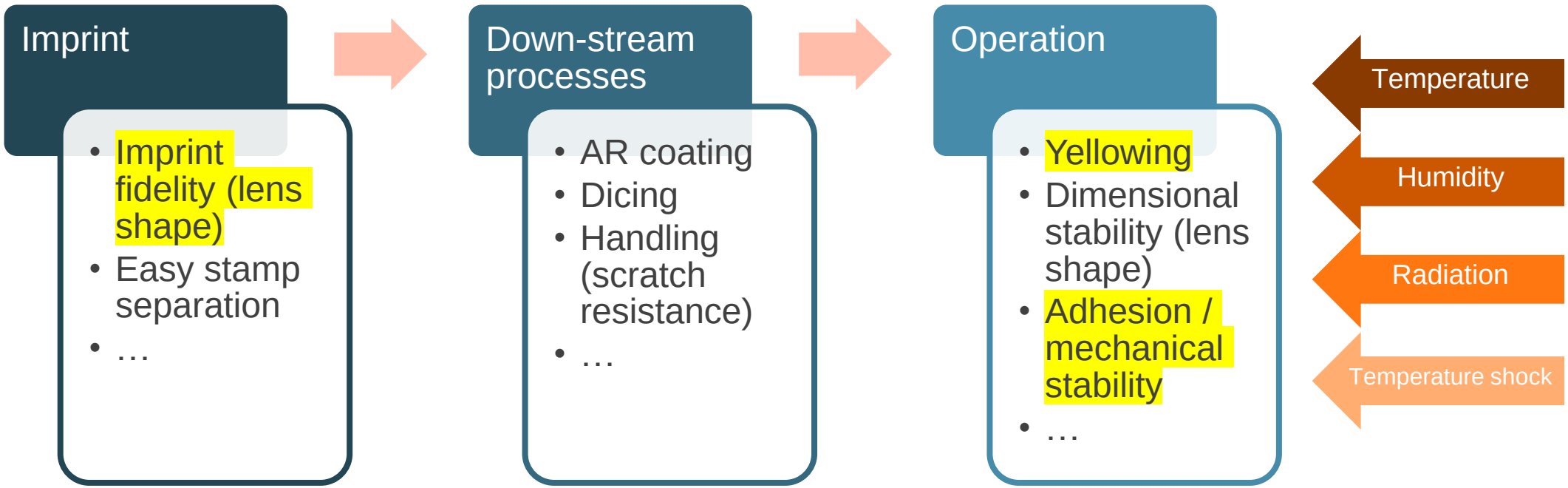
Aspects of reliability



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Imprint fidelity

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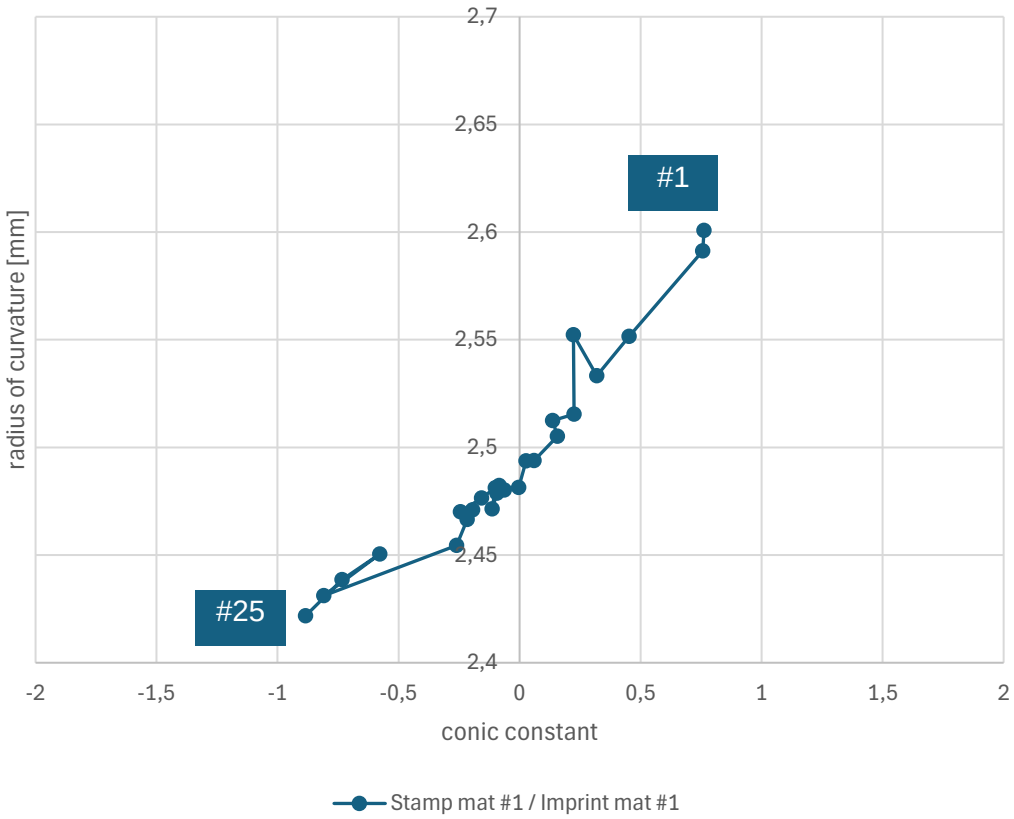
Imprint fidelity



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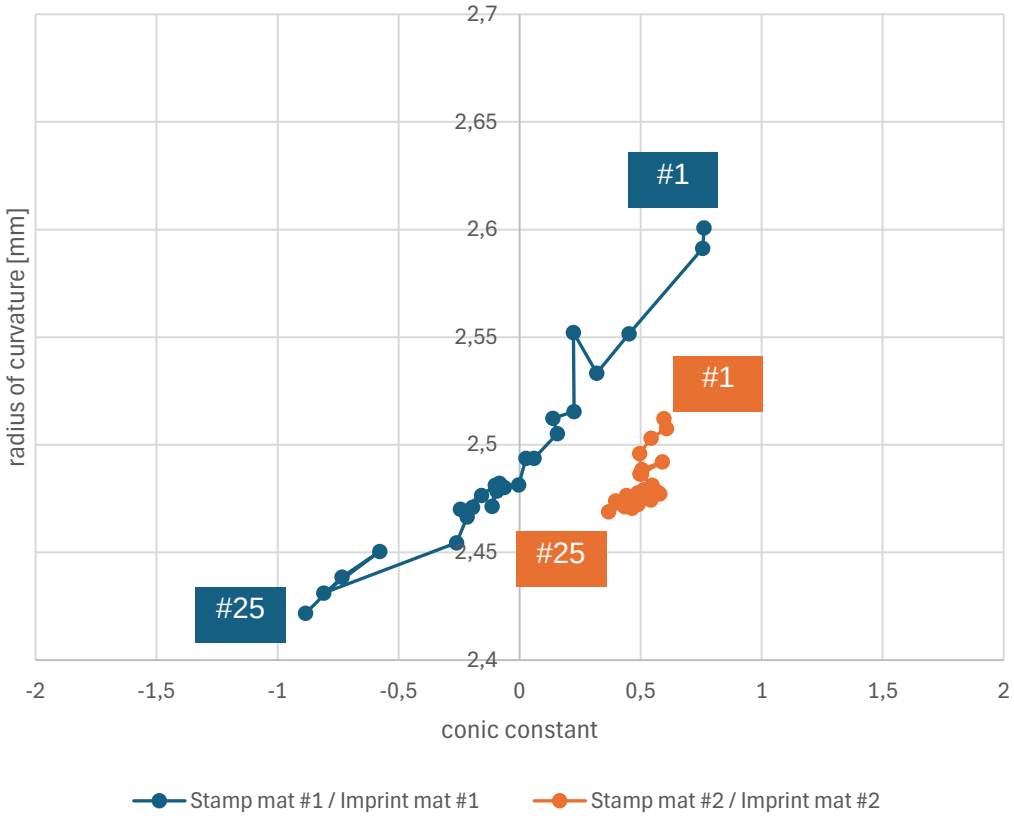
Imprint fidelity



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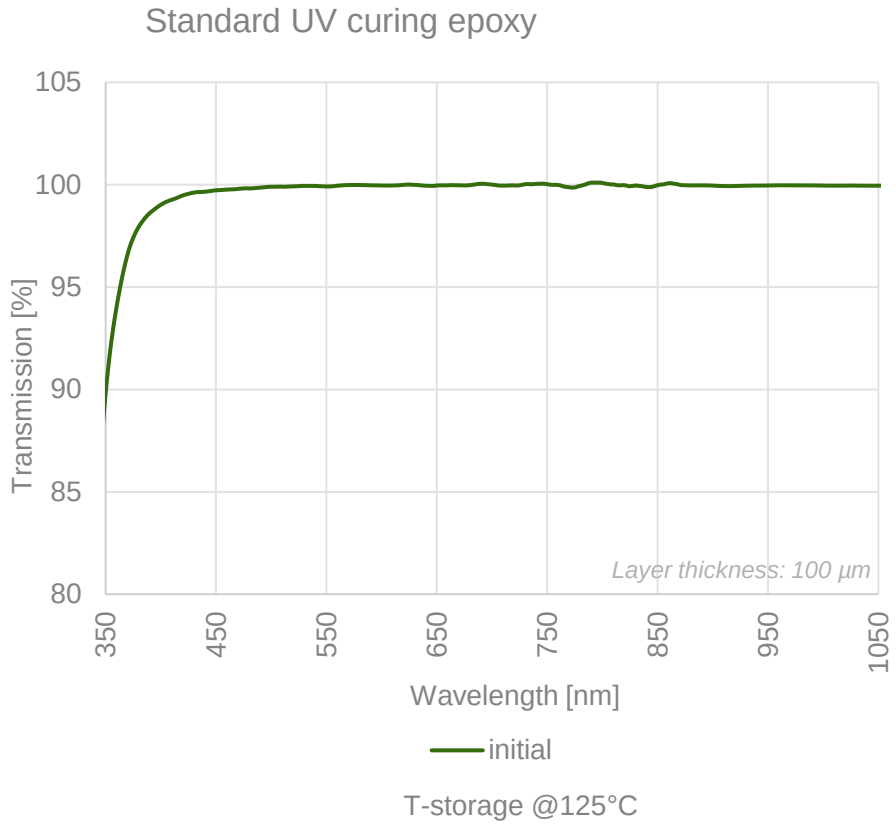
Transmission



High transmission in the range of visible light

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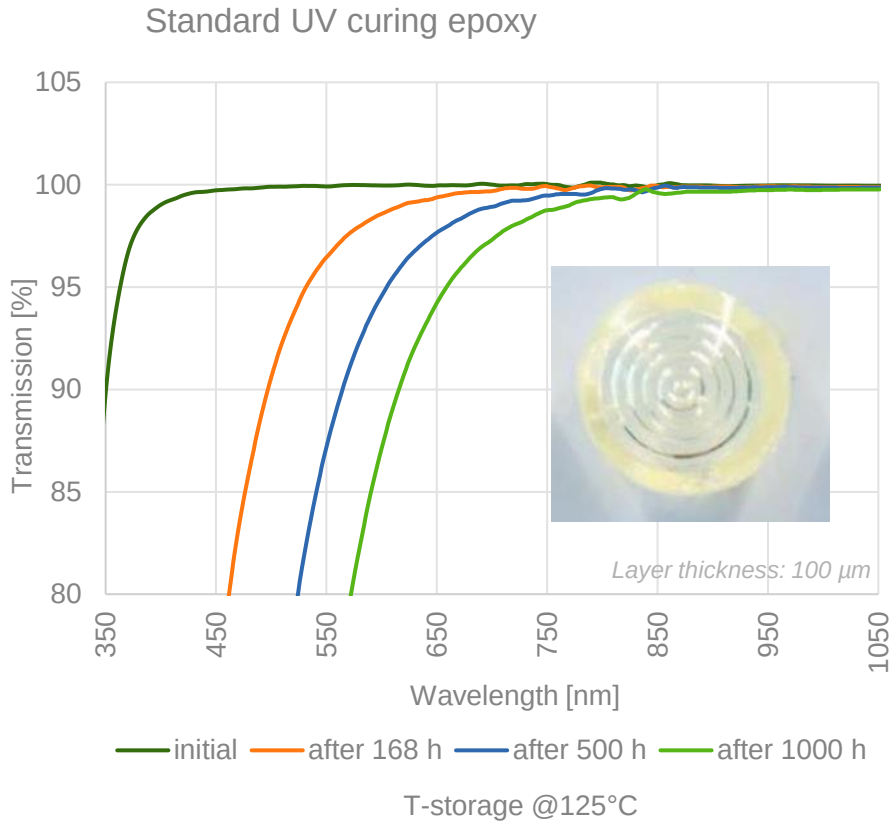
Transmission after 125°C storage



High transmission in the range of visible light

Optical stability after humidity, high temperature and UV radiation

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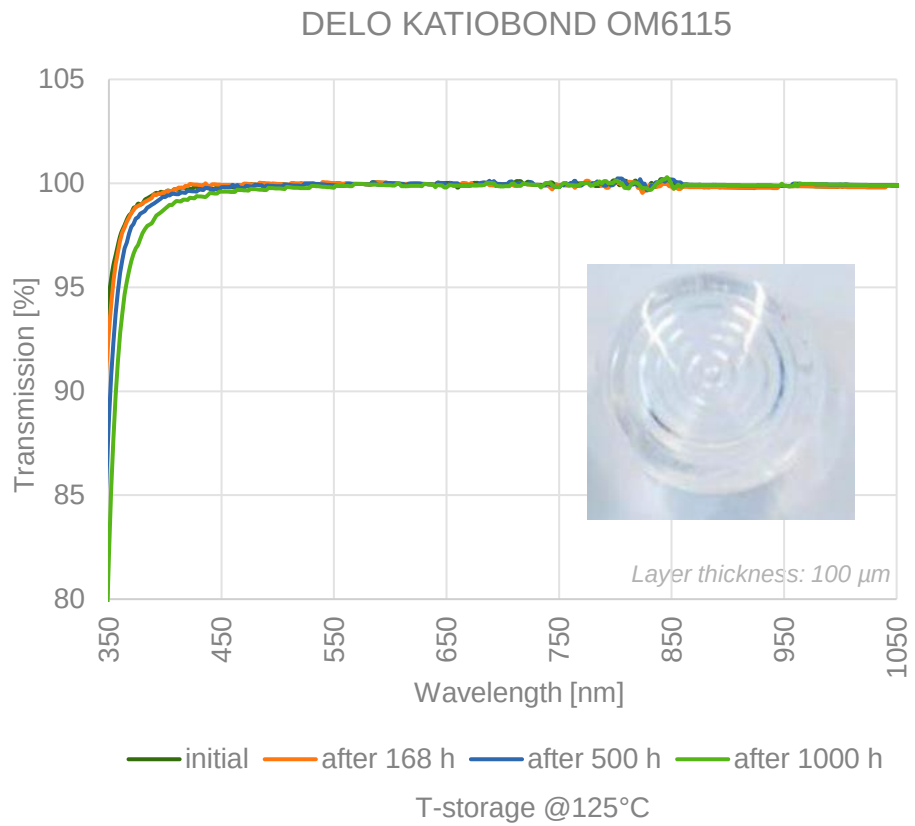
Transmission after 125°C storage



- High transmission in the range of visible light
- Optical stability after humidity, high temperature and UV radiation

High and stable material transmission achieved

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Mechanical stability

T = +23 °C

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Mechanical stability

T = +120 °C

T = +23 °C

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Mechanical stability

T = +120 °C

T = +23 °C

T = -40 °C

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Mechanical stability

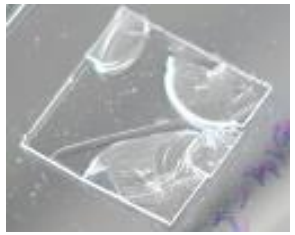
T = +120 °C

T = +23 °C

T = -40 °C

Performance after T-shock

-40°C / +120°C for 500 cycles



✘

✓

⇨ Need to optimize / balance Young‘s modulus, glass transition temperature, CTE, …

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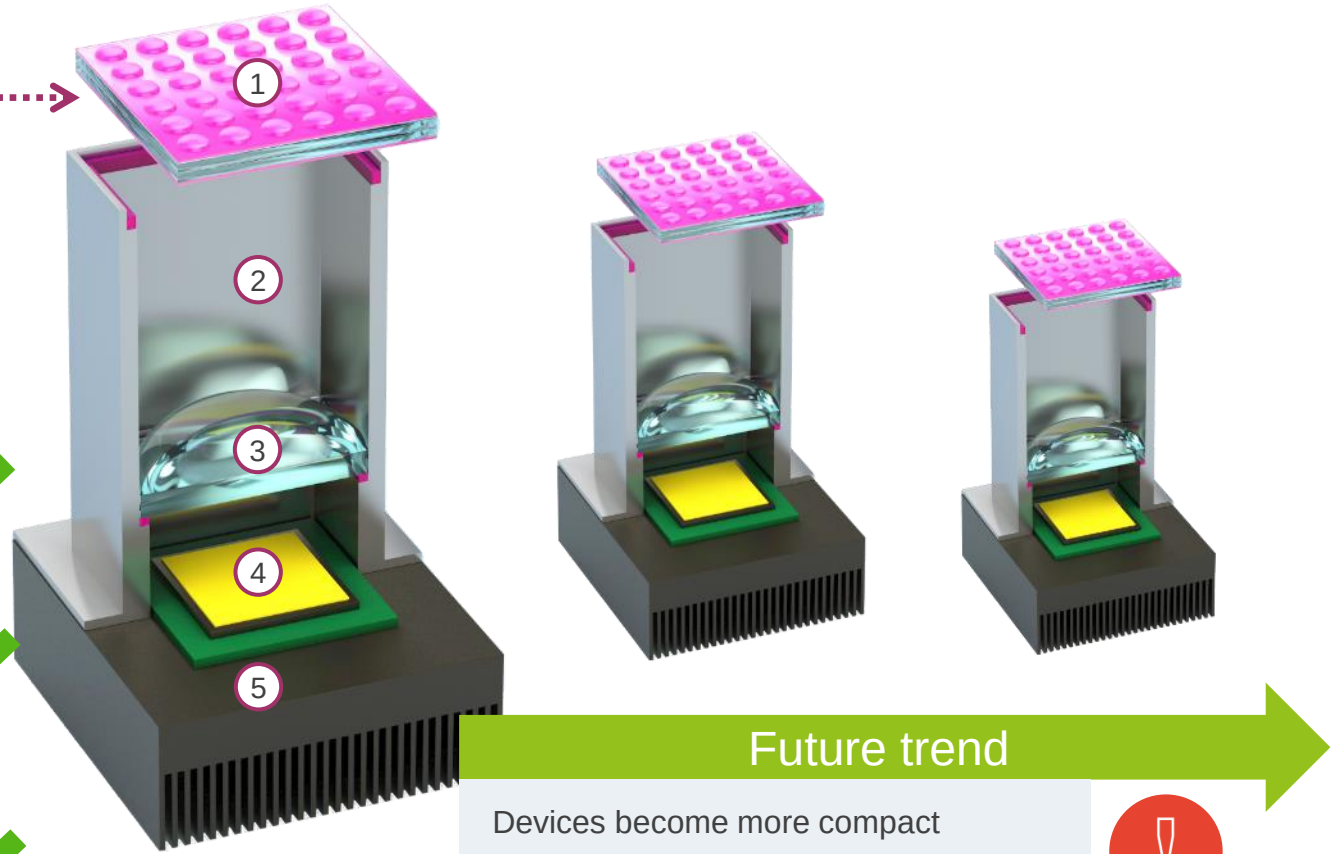

Future trend

Devices become more compact

→ **intensities and temperatures incease**

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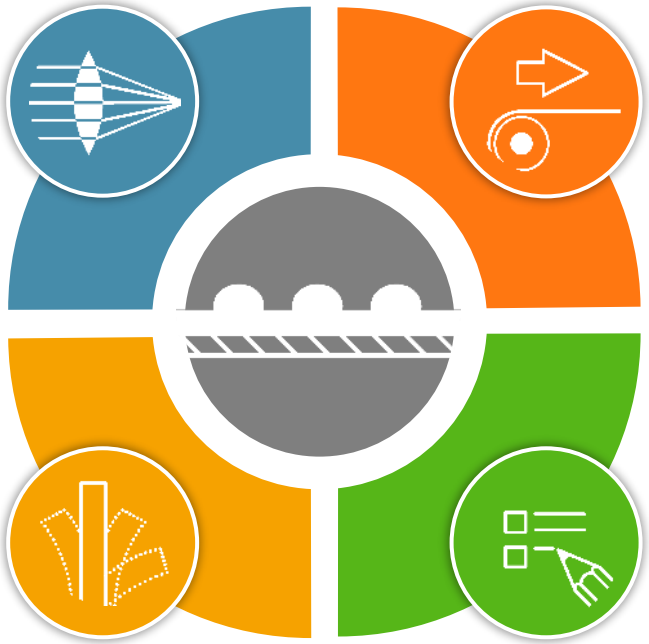
Material properties

Optical properties
Index of refraction
Dispersion
Transmission
Scattering

Mechanical properties
Young’s modulus
Glass transition temperature
Thermal expansion
Scratch resistance



Processing
Good filling of structures
Stamp interaction
Demolding
Shrinkage control
UV curing

Reliability
Optical stability
Dimensional stability
Adhesion to substrate

- Material properties can be tailored
- Which material properties does your application need?

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2024-12-02

Get in touch!

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