



**Bio-inspired glass surfaces
using laser finishing**



Lotus leaf



Moth eye

Biomimetics
From nature to innovation



Self-cleaning on metal



Anti-reflection on glass

Lotus leaf –
made by nature



„Lotus leaf“ (on metal) –
Fusion Bionic's approach

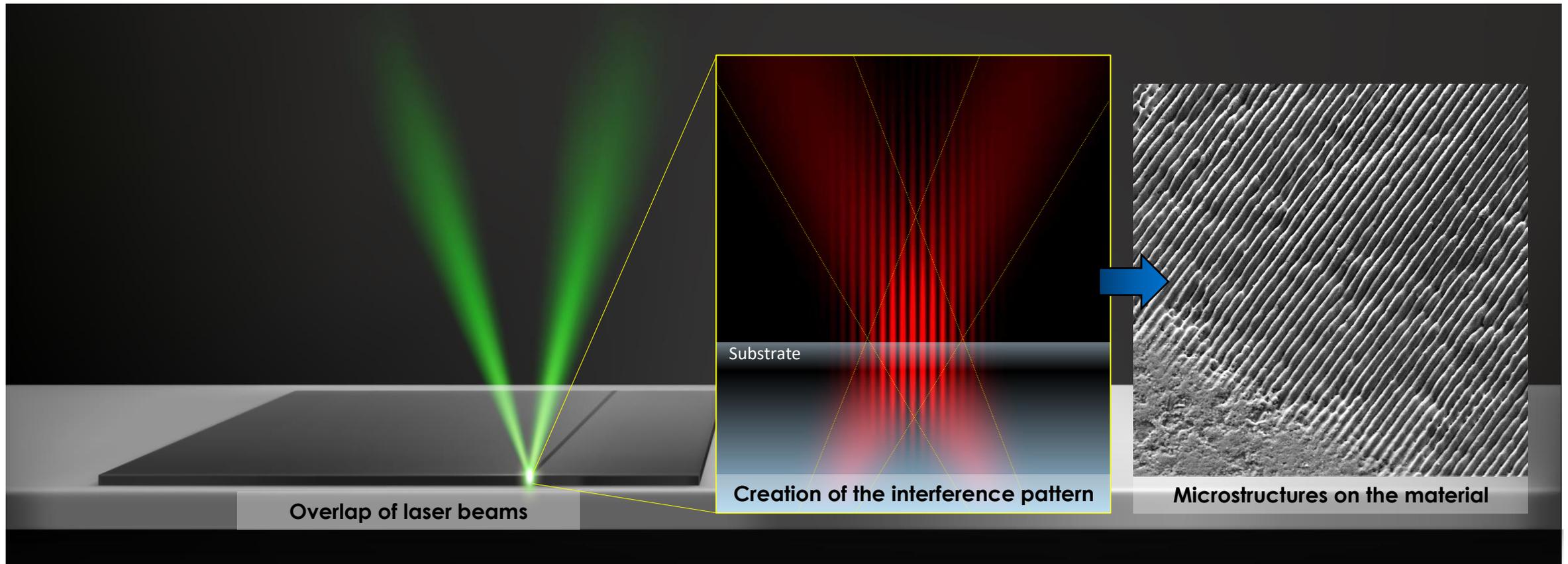
5 μ m

Fusion Bionic CORE module

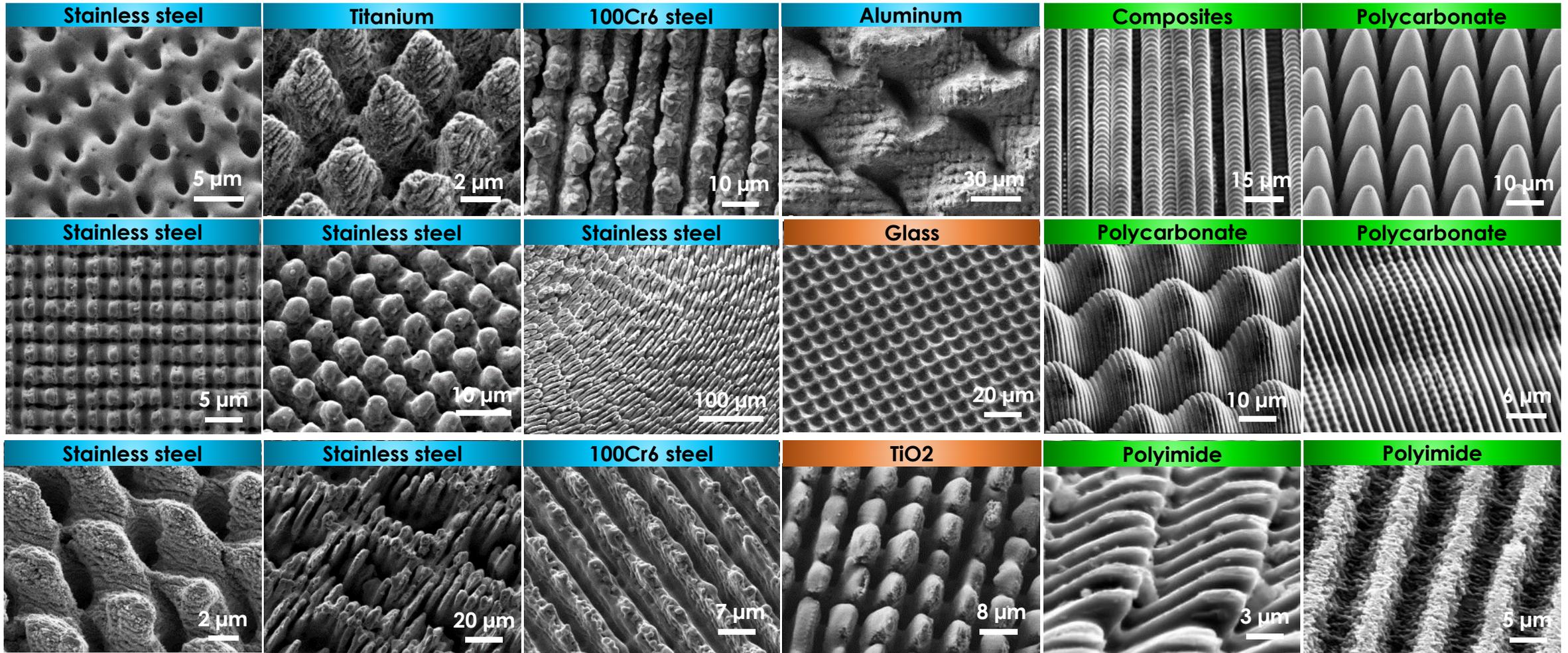


Our CORE technology

Direct Laser Interference Patterning (DLIP)



Structures behind the functions



© Fraunhofer IWS

Our CORE technology

Direct Laser Interference Patterning (DLIP)



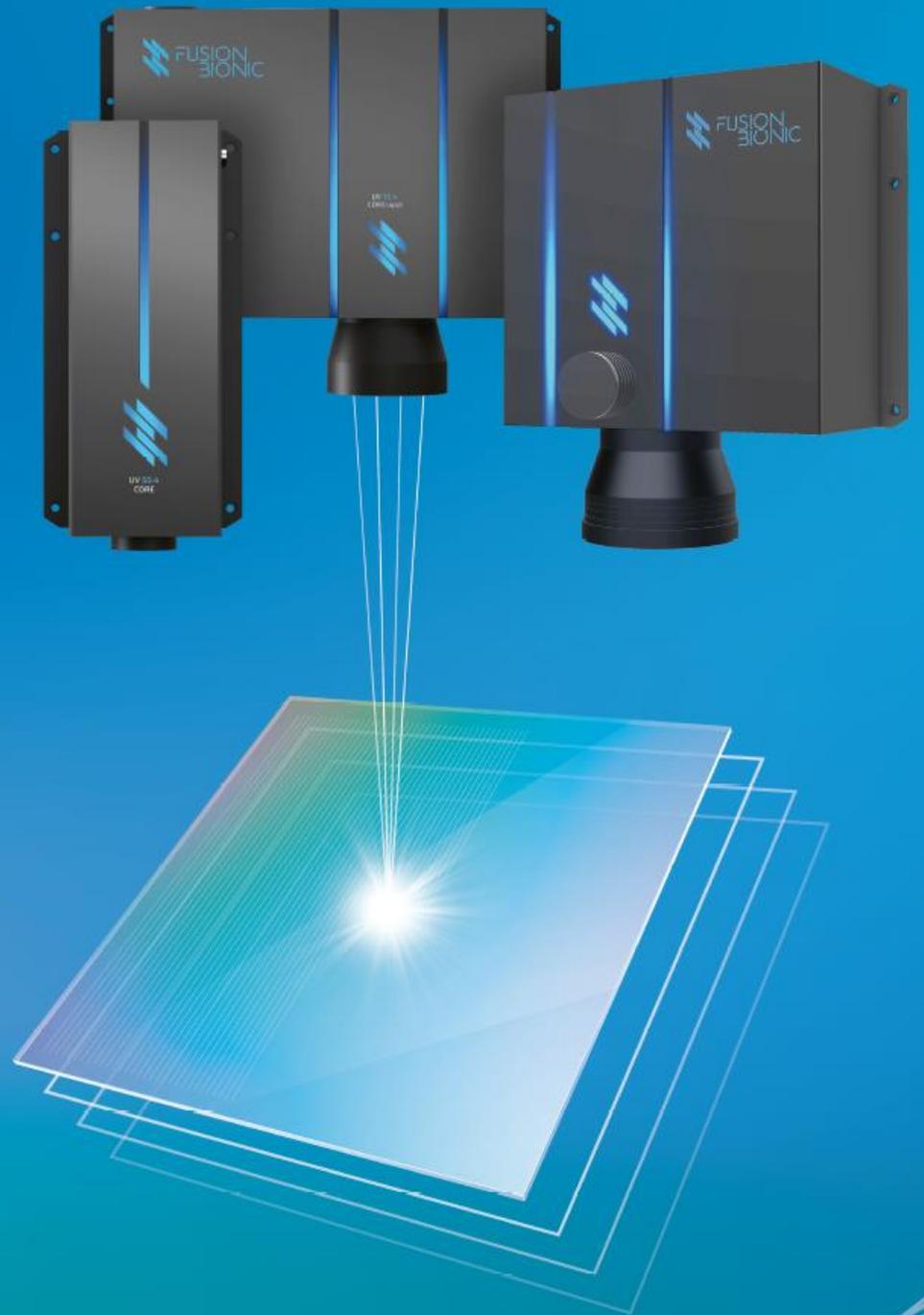
Our core technology is based on laser interference principles and designed into compact and versatile laser modules



Applicable to almost any technical surface, almost of any shape



Unprecedented high processing speed (up to 3 m²/min demonstrated)





Consumer electronics

Problem: optical properties



Photovoltaics

Problem: contamination



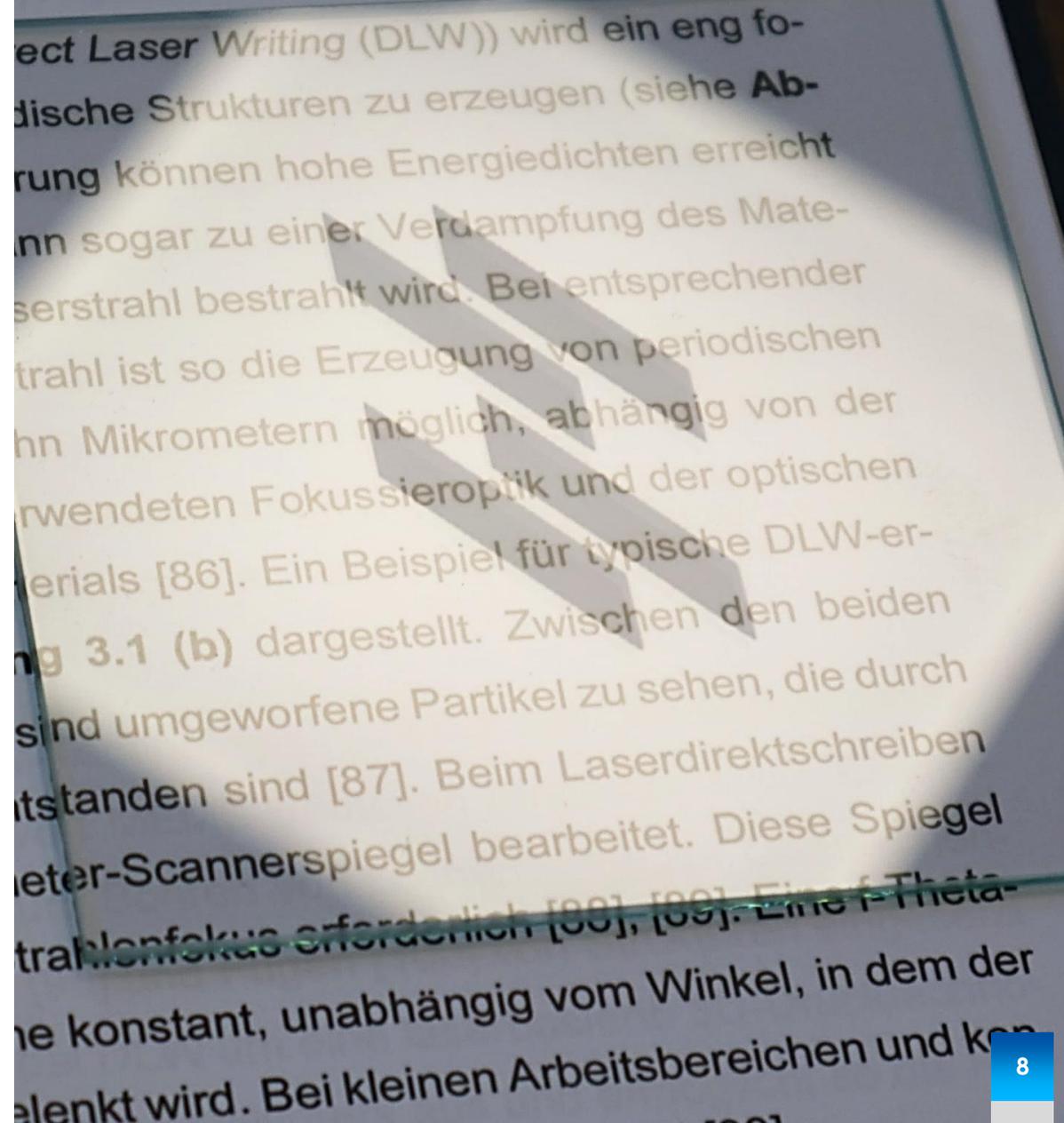
Aesthetics/Protection



Sensors

Anti-glare

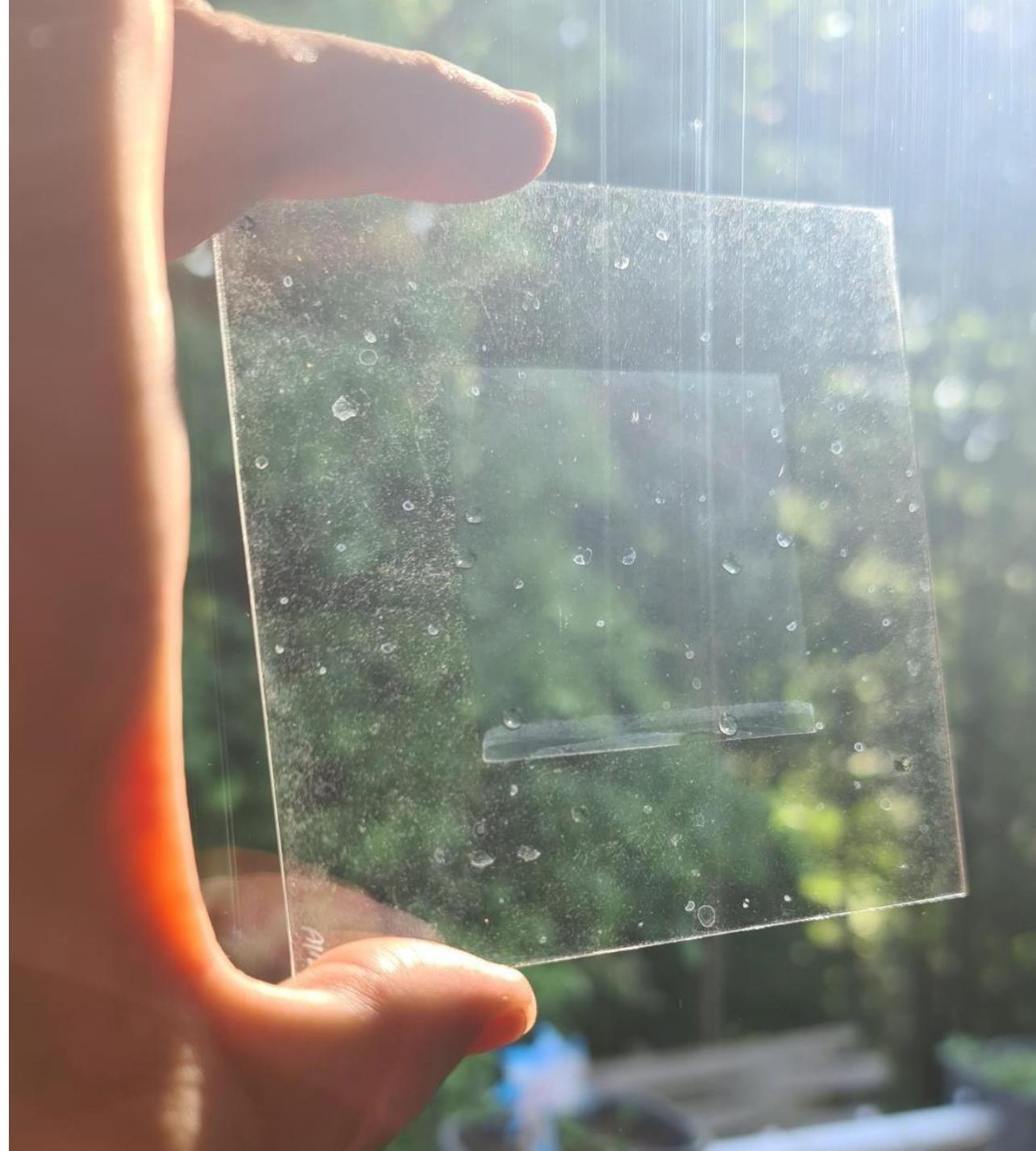
- Glare is the reflection of light off of a surface, which can make it hard to see what is behind or near the
 - Currently achieved by wet etching
 - Usually associated with enhanced haptics
 - Employed in consumer goods, electronics
- Our treatment acts on scattering reflected light from the surface

A microscopic view of a surface with anti-glare treatment. The surface is covered with a complex, textured pattern of small, interconnected structures. The text on the surface is partially obscured by a bright, circular glare. The text is in German and discusses Direct Laser Writing (DLW) and its application in creating periodic structures. The text is partially obscured by a bright, circular glare.

Direct Laser Writing (DLW)) wird ein eng fo-
dische Strukturen zu erzeugen (siehe **Ab-**
rung können hohe Energiedichten erreicht
nn sogar zu einer Verdampfung des Mate-
erstrahl bestrahlt wird. Bei entsprechender
trahl ist so die Erzeugung von periodischen
nn Mikrometern möglich, abhängig von der
wendeten Fokussieroptik und der optischen
aterials [86]. Ein Beispiel für typische DLW-er-
ng 3.1 (b) dargestellt. Zwischen den beiden
sind umgeworfene Partikel zu sehen, die durch
tstanden sind [87]. Beim Laserdirektschreiben
eter-Scannerspiegel bearbeitet. Diese Spiegel
trahlenfokus erforderlich [88], [89]. Eine f-Theta-
ne konstant, unabhängig vom Winkel, in dem der
elenkt wird. Bei kleinen Arbeitsbereichen und kon-

Anti-soiling

- Soiling: mineral dust, bird droppings, algae, Pollen, engine exhaust, agriculture emissions
 - Soiling is estimated to have reduced global solar power production by at least 3 – 4 % in 2018, causing global revenue losses of at least 3–5 billion €.
 - Currently addressed by (water) cleaning, anti-soiling coatings, tilting approaches, electrodynamic screens, etc.
 - Relevant for solar cells / photovoltaic panels
- Our treatment acts reduces the soiling tendency of glass surfaces



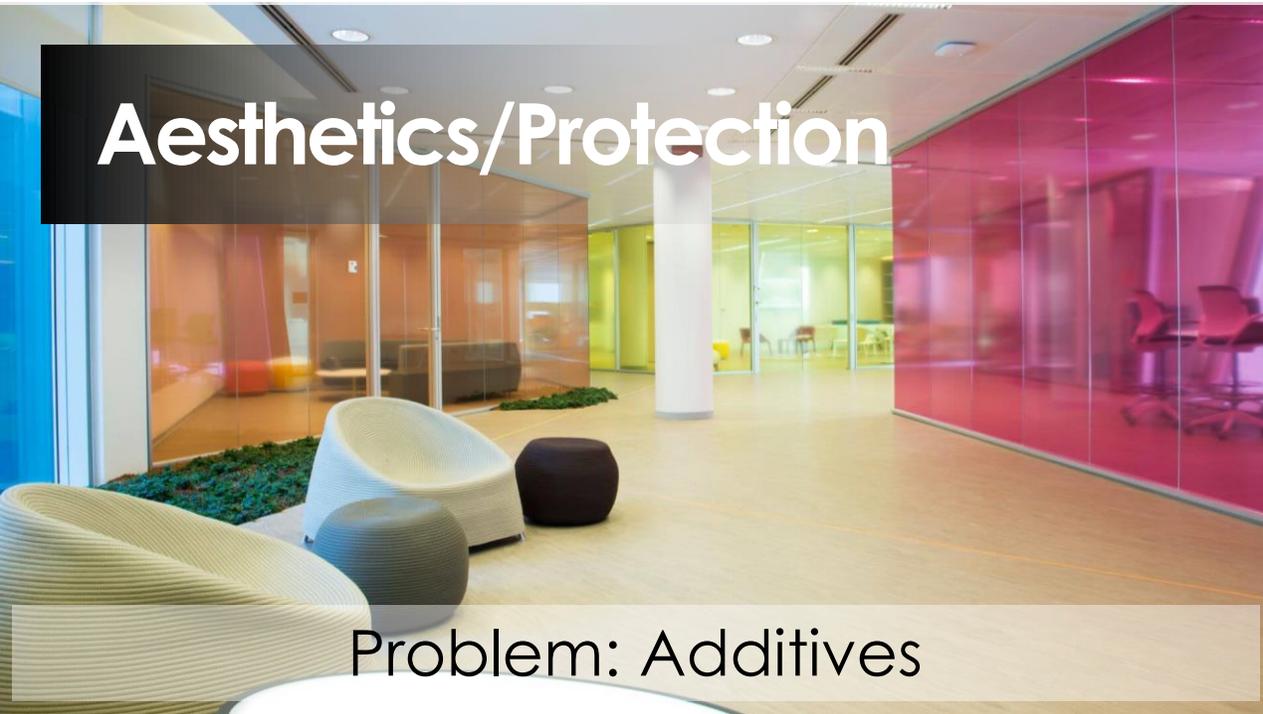
Consumer electronics



Photovoltaics

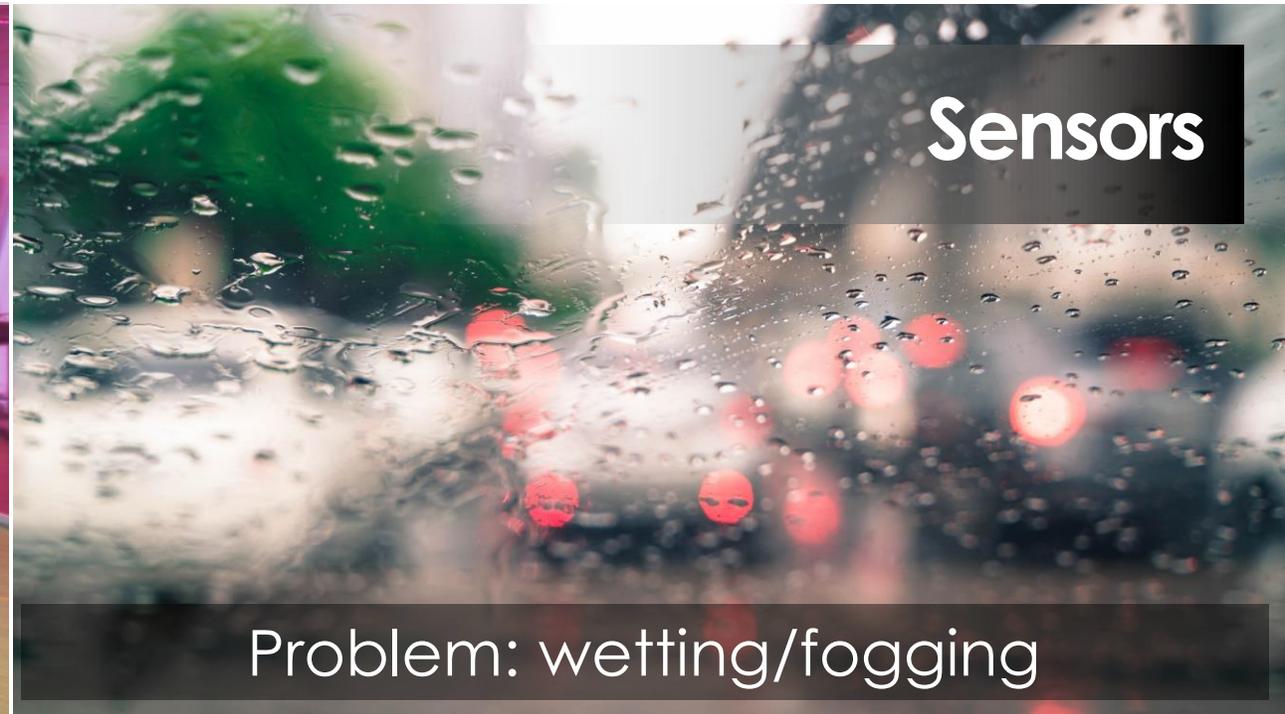


Aesthetics/Protection



Problem: Additives

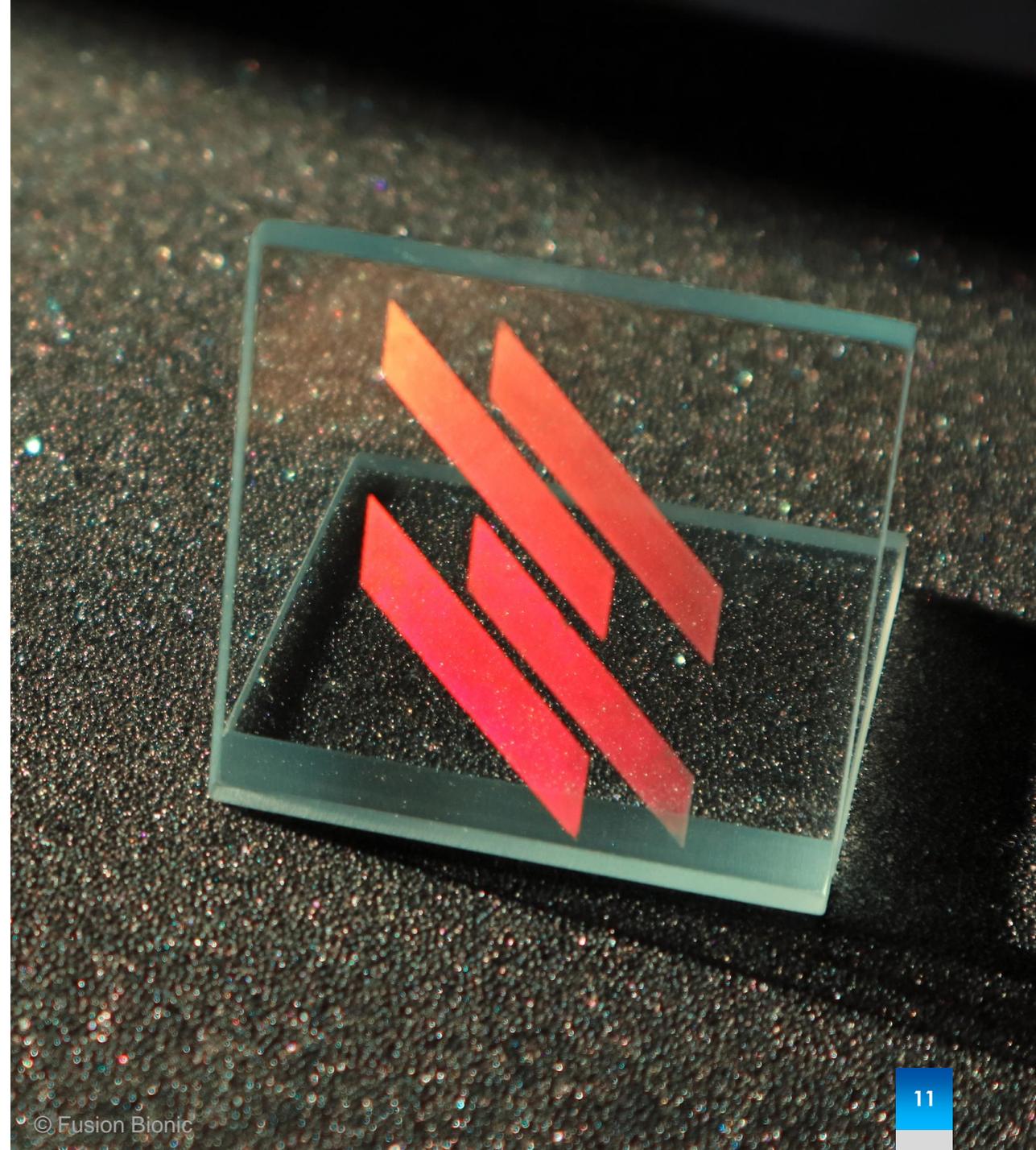
Sensors



Problem: wetting/fogging

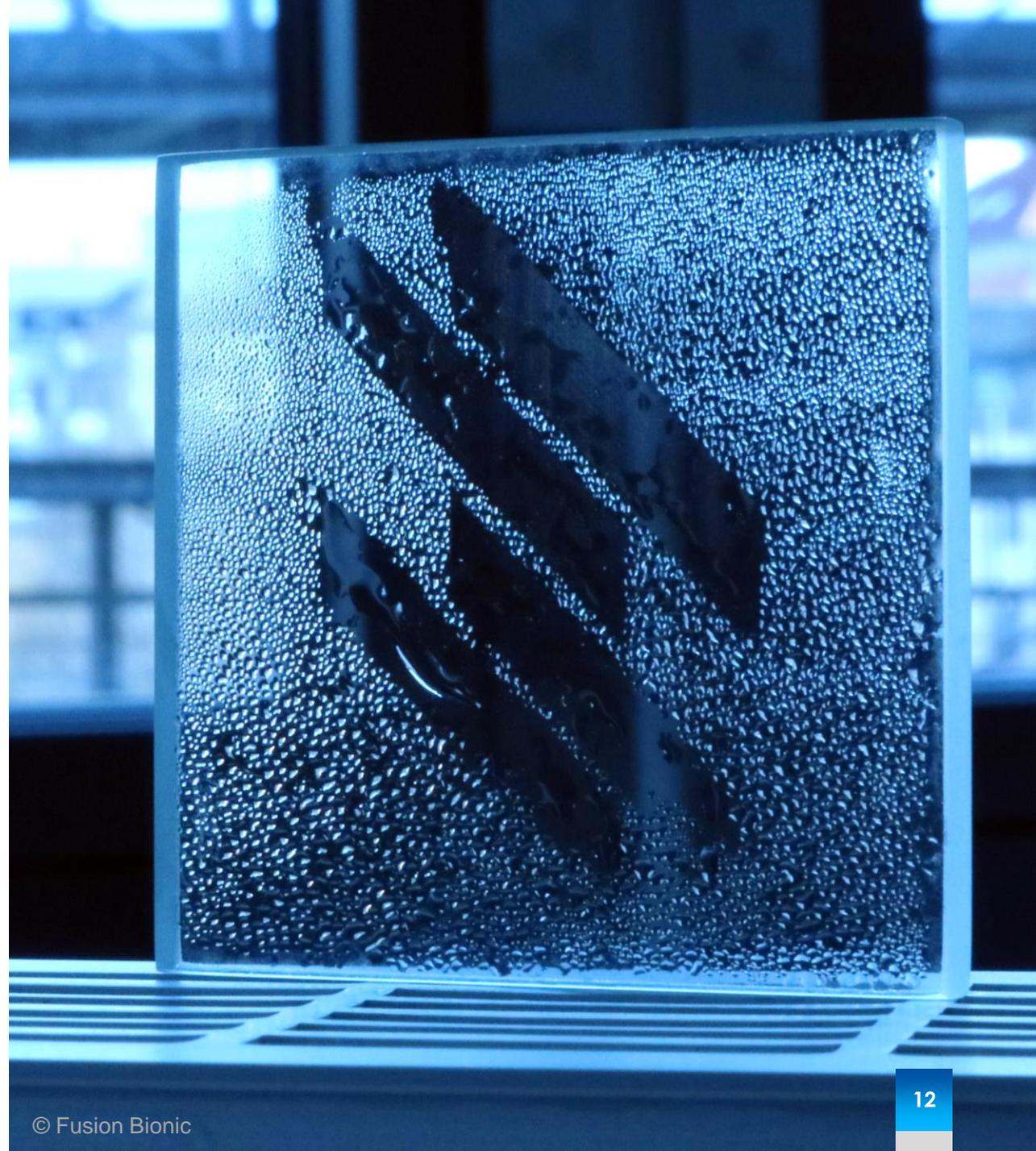
Decoration

- Adding surface decoration or product protection features to glass surfaces.
 - Currently achieved by printing solutions or pigments
 - Present treatments are additively added
 - Applied on goods and components from consumer, beauty, and medical industry
- Our treatment works by adding surface structures, resulting in angle-dependent diffraction effects.



Anti-fogging

- Prevent fogging on the surface by inhibiting the condensation of water.
 - Currently achieved by (spray) coatings
 - Present treatments wear off after time
 - Applied on goggles, dive masks, car windows, visors, kitchen backsplash and other glasses.
- Our treatment works by minimizing surface tension, resulting in a non-scattering film of water instead of single droplets.



What we can do for you

- We are a **solution provider** for laser-based surface finishing to aim for advanced functionalities:
 - Anti-Glare
 - Anti-Soiling
 - Decoration
 - Anti-Fogging
 - ...
- **Customization of surfaces** (as a service) for a wide range of materials/products
- **Manufacturing solutions** based on DLIP technology

What you can do for us

- We are looking for **customers interested in alternatives to established solutions** for glass finishing (other materials also possible)
- We are interested to **work closely with you** on:
 - Joint developments on surface functionalities
 - Upscaling scenarios for your functionalized products



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We evolutionize surfaces!