



Surface materials engineering

# Ultrafast laser processing: new advances for display manufacturing



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# Introduction to Abrisa Technologies and the HEF Group



**Since 1953,**

70 years of expertise in surface material engineering.

**3200** employees (worldwide)

**650** in France

**317 M€**

Revenue - 2022

**66%**

Of the equity is owned by employees & 34% by the founders

**200+**

patents

**90** Industrial sites

in **21** countries

**55 M€**

investments in 2023

**6500** clients

## TRIBOLOGY



Study of phenomena linked to solids in dynamic interaction. Understanding of friction and wear mechanisms.

## PHOTONICS



Study of phenomena linked to the interaction between light and matter. Understanding of surfaces and optical interfaces.

## HYDROGEN



Fabrication, transport, storage and exploitation of hydrogen : electrolysis, compression, fuel cells, hydrogen engine.

# HEF close to its customers all over the world

We strive to provide our customers the best response, service, technology and expertise, with consistent international quality standards.



# HEF Group USA Footprint



- Springfield, OH – US HQ
- Kennebunk, ME
- Montreal, Canada
- Denver, NC (Calico Coatings) JV
- Kearney, NE
- Chattanooga, TN
- Phoenix, AZ (TS WEST) JV
- Benton Harbor, MI (Tech Nickel)
- Los Angeles, CA (ABRISA)

- ★ Liquid Nitriding
- ★ Liquid Nitriding + PVD/DLC Coatings
- ★ PVD/DLC Coatings + Phosphating + PTFE/FEP Coatings
- ★ Liquid Nitriding + Nickel Plating
- ★ Optical Coatings & Technical Glass

# About Abrisa Technologies



## Abrisa Technologies – Your Total Solution Partner



### **Abrisa Industrial Glass (AIG), Santa Paula, CA – ISO Cert**

This 100,000+ sq. ft. manufacturing facility is dedicated to solution-based, industrial flat glass manufacturing, products and services, including screen-printing, etching, cutting and edging, CNC machining, higher level assembly, and more.



### **ZC&R Coatings for Optics (ZC&R), Torrance, CA – ISO Cert**

This 21,000 sq. ft. manufacturing facility offers custom and OEM precision coating solutions for optical thin film products. ZC&R's PVD and ION-assist depositions provide a wide range of standard and custom coatings to meet our customer's ever evolving needs.

<https://abrisatechnologies.com/>

# Abrisa Facilities

## Abrisa Industrial Glass (AIG)

- 100,000+ sq. ft. manufacturing facility in Santa Paula, CA
- Quality Management System ISO 9001:2015 Certified
- Class 10,000, clean rooms, ITAR approved



## ZC&R Coatings for Optics (ZC&R)

- 21,000+ sq. ft. manufacturing facility in Torrance, CA
- Class 100, 1,000, and 10,000 clean rooms, ITAR approved
- Quality Management System ISO 9001:2015 Certified
- 13 Coating chambers of various sizes, large (73") and medium (64") chambers
- Ultrasonic Wafer Cleaning and Environmental Test Chamber



# Your Total Solution Partner



## Single Point Accountability



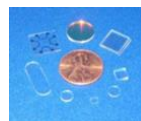
### Supplier partnerships

- Large offering of specialty glass sourced through key long-term supplier partnerships
- Extensive knowledge of glass substrates and properties
- Special rights to select brands of raw and specialty coated and processed glass



### Precision fabrication

- High volume cutting, shaping, seaming, grinding, polishing and CNC machining
- Industry leading range of glass sizes that can be processed from meters down to 0.1mm thick



Jumbo  
Sized

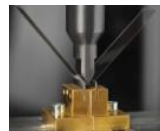


Ultra  
Small



### Specialized Glass Processing

- HIET™ strengthening: imparts high damage resistance to thin aluminosilicates for low profile devices
- Chemical strengthening: enhanced durability with minimal optical distortion
- Heat tempering: creates stronger, safer and more durable glass



### Customized Coatings and Graphics

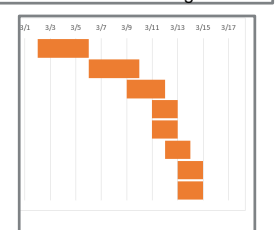
- Transparent conductive IMITO
- Low loss wide angle anti-reflection
- Selective signal filters and mirrors
- Heat and chemical protection
- Ultra-thin wafer coatings
- Deadfront and PMS matched graphics
- Electrical connectivity bus bars
- Damage, smudge and water resistance
- Optical, safety, aesthetic films and gaskets



### Program management

- Solutions engineering
- Concept to production
- Value-added assembly
- Inspection and verification
- Certification and testing
- Inventory management
- Special packaging

Workflow Scheduling

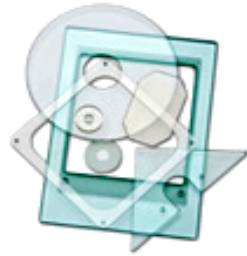




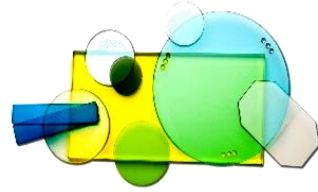
# Abrisa Technologies capabilities



HIE™ Glass



Fabrication



Coatings



Graphics



Protection



Films

Abrisa Technologies' broad scope of design and manufacturing capabilities, vertical integration, and single-point accountability allows you to put your trust in one company for supply chain simplicity, convenience, reduced cost of ownership, and delivery of verified and certified product(s) every time.

- **Float & Specialty HIE™ Glasses in mm to meter sizes**
- **Specializing in Ultra-Thin Glass – as low as 0.1 mm Boro & Aluminosilicates**
- **Fabrication for Shape & Features to Your Specific Needs**
- **Chemical or Heat Strengthening for Damage Resistance**
- **Coatings for Filtering, Throughput Reflection & Conductivity**
- **Screen Printing for Electrical Connectivity, Branding & Displays**
- **Value-Added Assembly Films, Chemistry, ID Marking**

# Abrisa Technologies in the display market



## Display – Digital, Immersive & Interactive Displays

- Damage Resistant HIE™ Thin & Ultra-Thin Aluminosilicates
- Hidden LCD Mirrors, Dead Front Graphics
- Sunlight Readable Coatings & UV/IR Blockers
- Near-to-Eye Display Partial Transmitters
- Ultra-Thin, Lightweight & Flexible Glass

# Ultrafast laser processing

Wavelength (UV – IR)

Pulse duration (fs to CW)

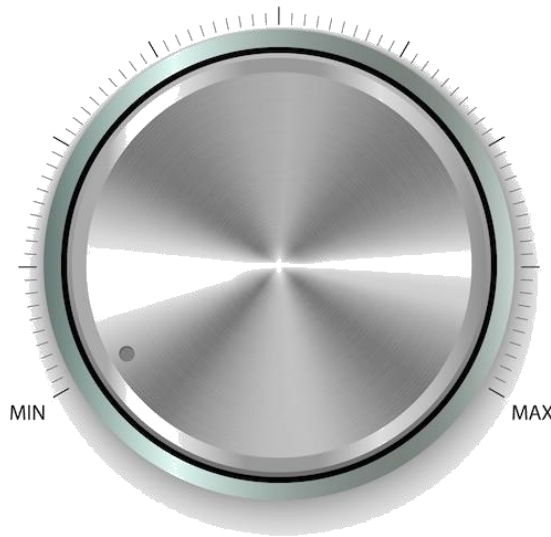
Repetition rate (up to GHz)

Pulse energy (nJ to J)

Spot size (down to few  $\mu\text{m}$ )

Spot shape

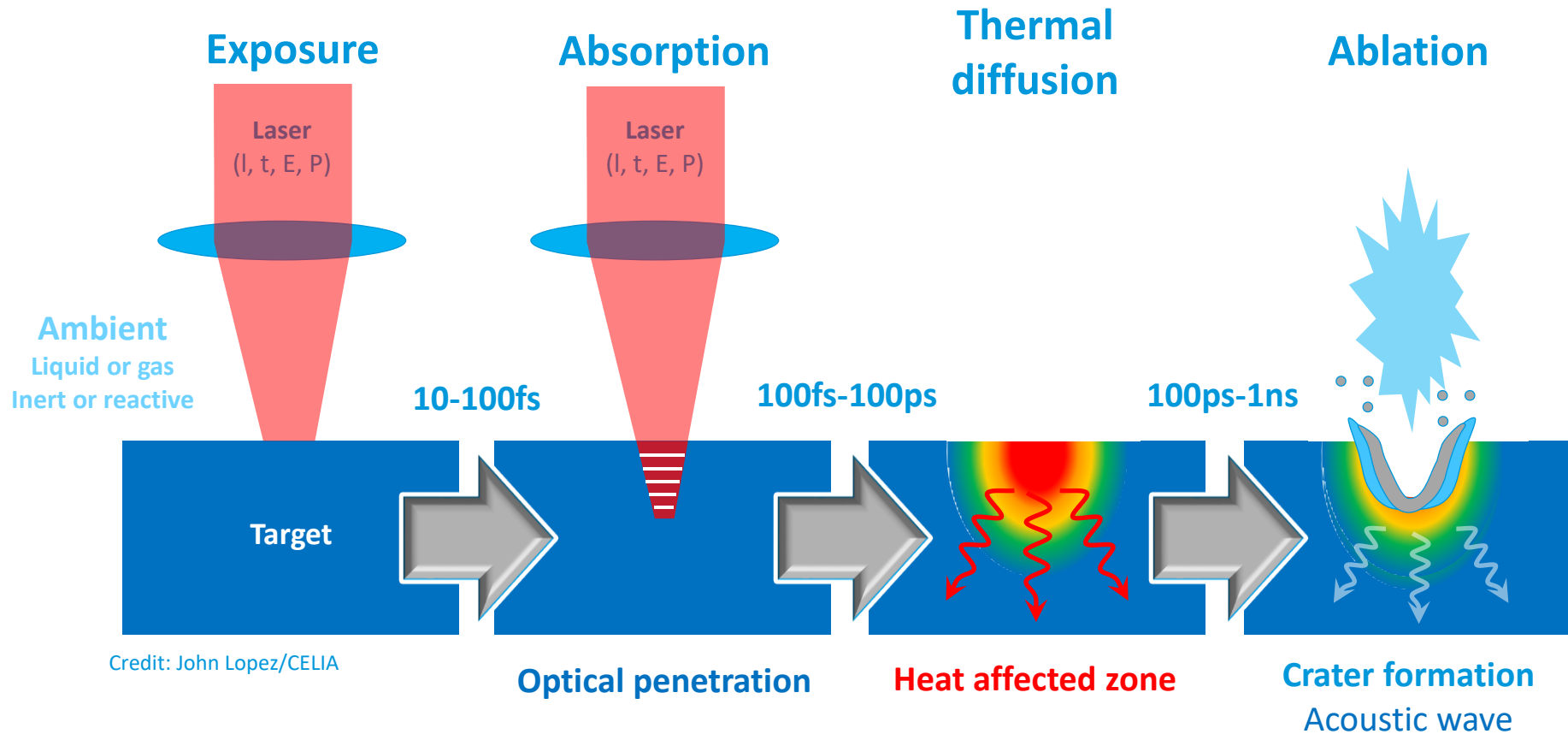
Polarization



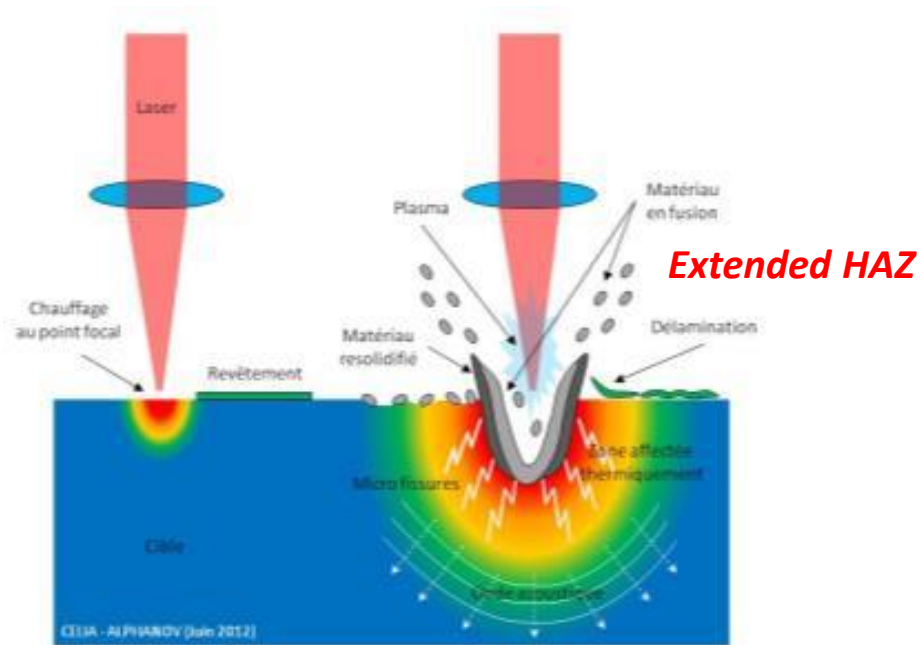
# Laser processing

Laser ablation : decomposition of the material under the effect of intense laser radiation

Ablation threshold : energy threshold beyond which there is ablation



# Laser-matter interaction process

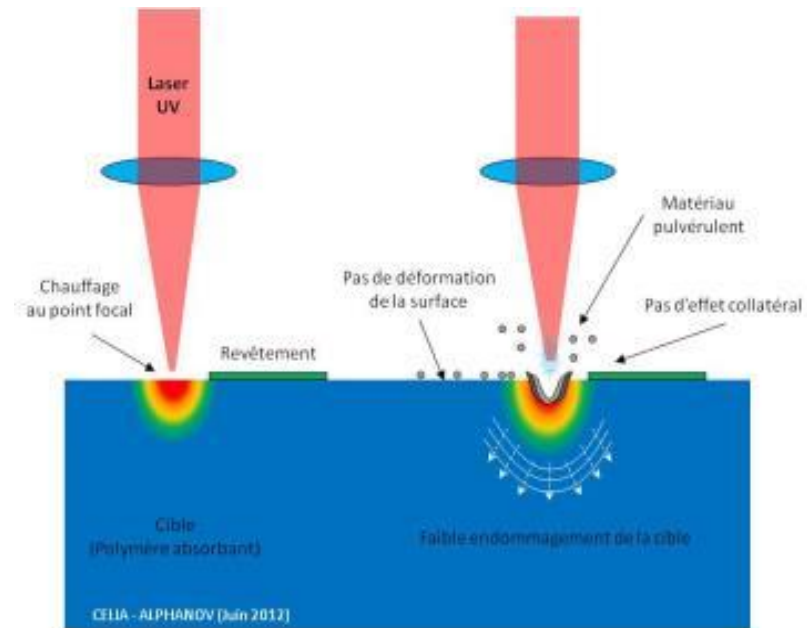


## Thermal process

Wavelength: IR -> UV  
Pulse duration: cw -> ns  
Material : all



**Absorption**



## Photo ablation

Wavelength: UV  
Pulse duration : ns  
Material : polymer

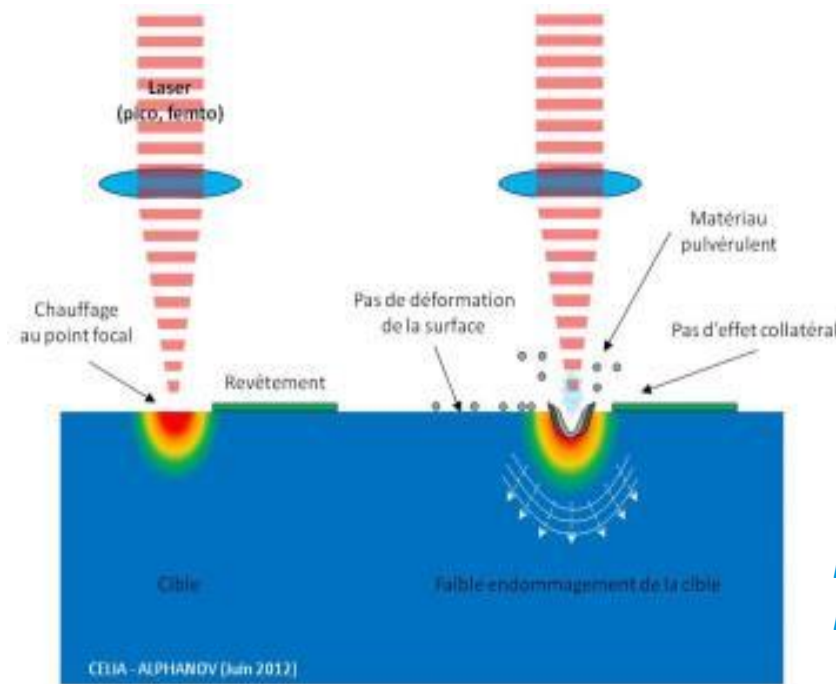


**Absorption**



# Laser-matter interaction process

*Pulse duration  $\ll$  heat diffusion time  
Small HAZ*



## Ultrashort process

*Wavelength : IR -> UV*

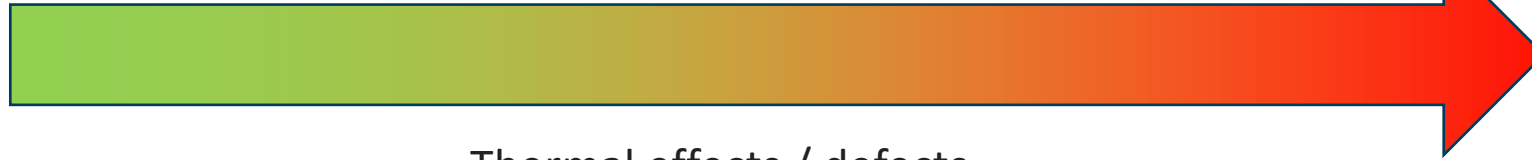
*Pulse duration : 5 ps -> 10 fs*

*Material : all*

# Thermal effects in laser ablation

Low ablation rates  
Little to no HAZ  
High precision  
All materials

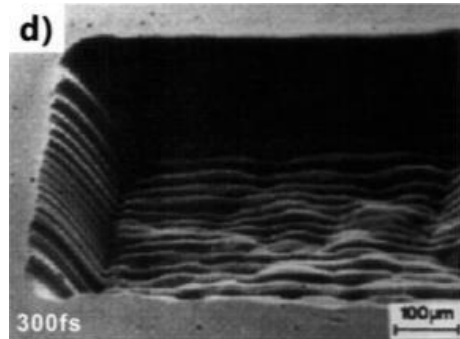
Pulse duration



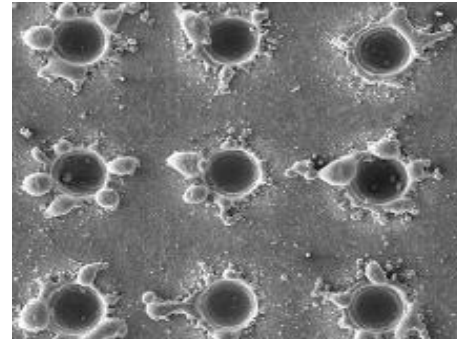
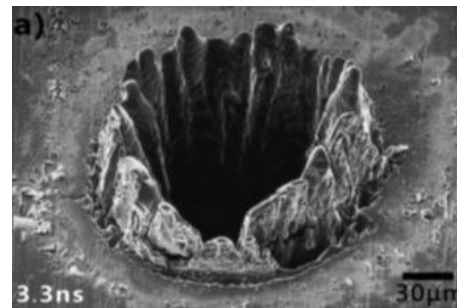
High ablation rates  
Large HAZ

Thermal effects / defects

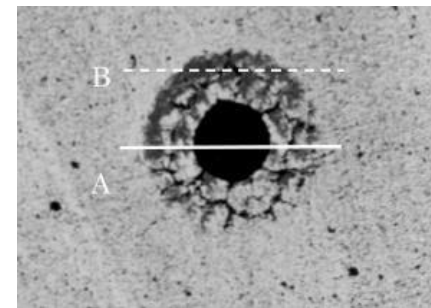
Femtosecond (fs)



Nanosecond (ns)



Continuous laser (CW)

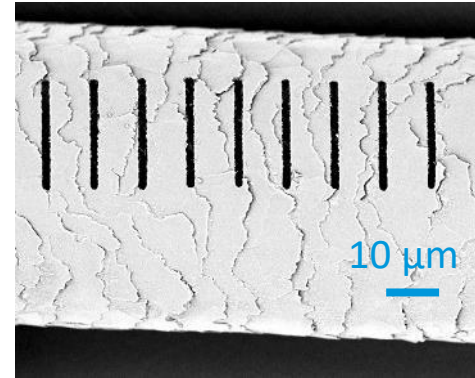




# Advantages of ultrafast laser processing

Ultrafast :  $Dt < \sim 10\text{ps}$

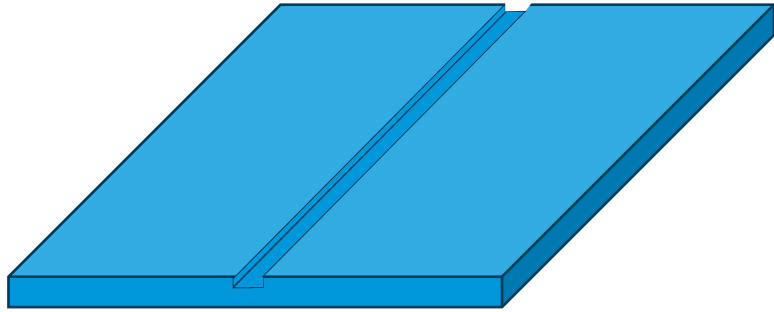
- Fast
- Precise
- Flexible
- Non contact
- No consumables
- No pre- or post-treatment
- Maintains structural integrity (no cracks)
- Edge finish suitable for many applications
- Higher yields than traditional scribe-and-break processing



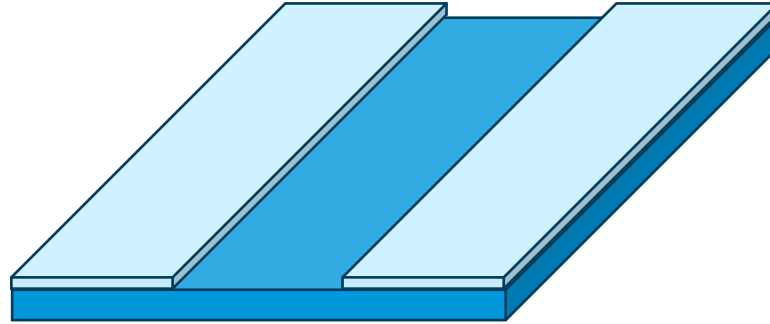
Credit: Brad Amos,  
MRC, Laboratory of  
Molecular Biology,  
Cambridge



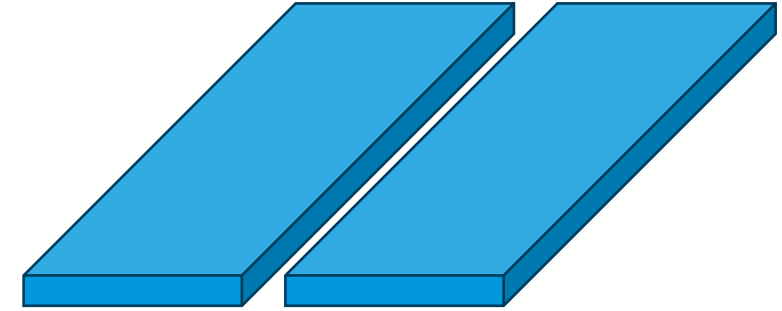
# Ultrafast lasers: a Swiss knife in micromachining



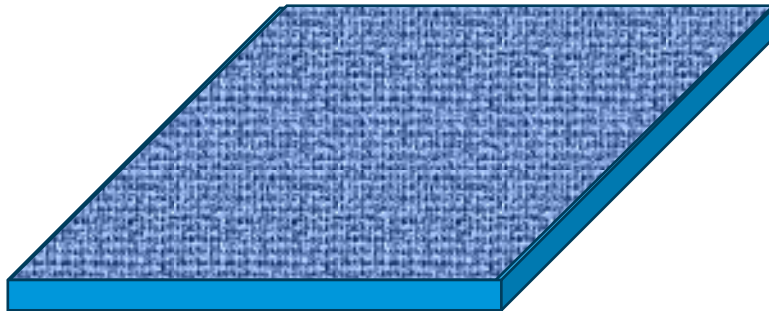
Engraving



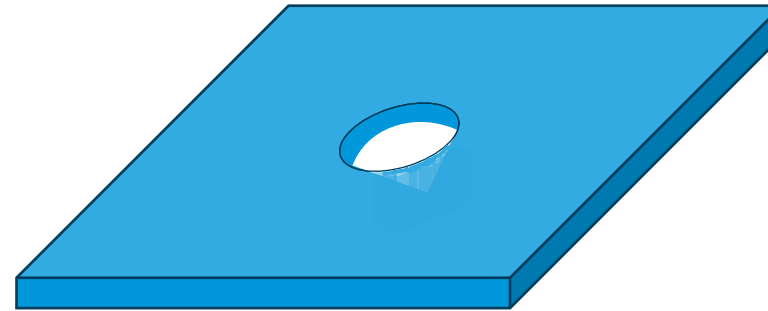
Selective ablation



Cutting



Surface texturation

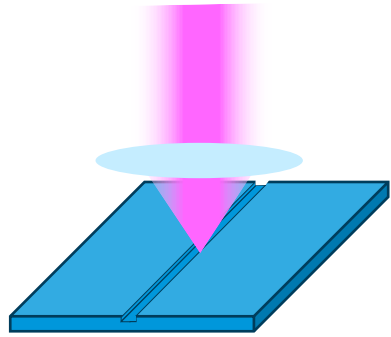


Laser hole drilling

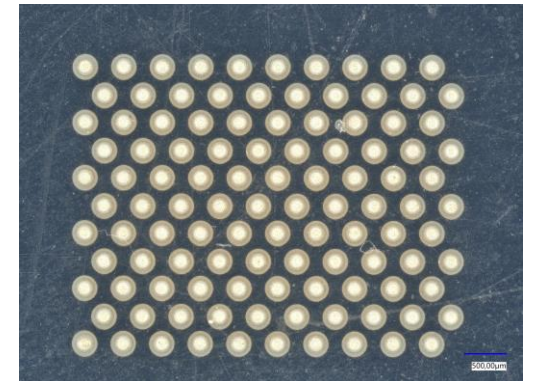
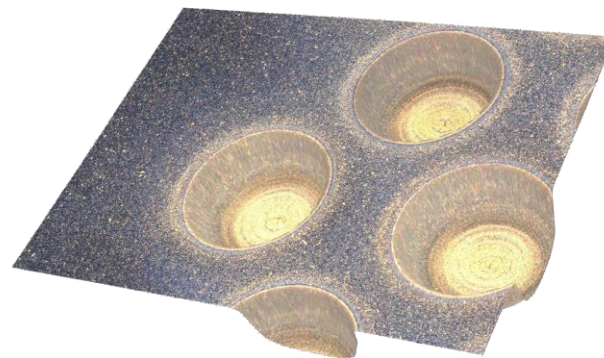
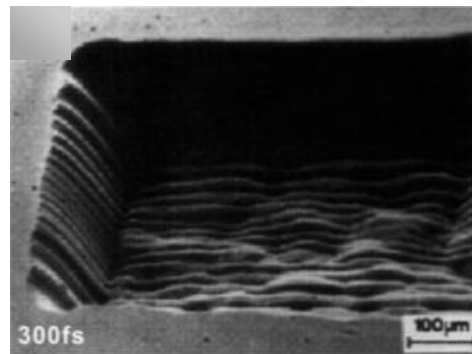
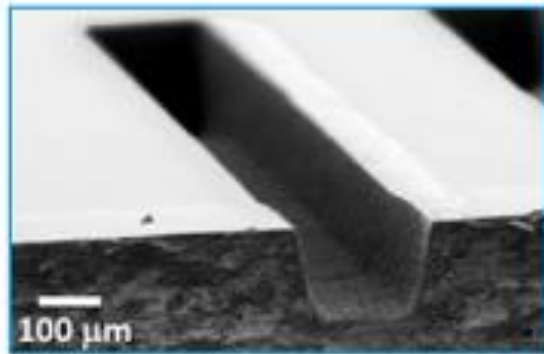
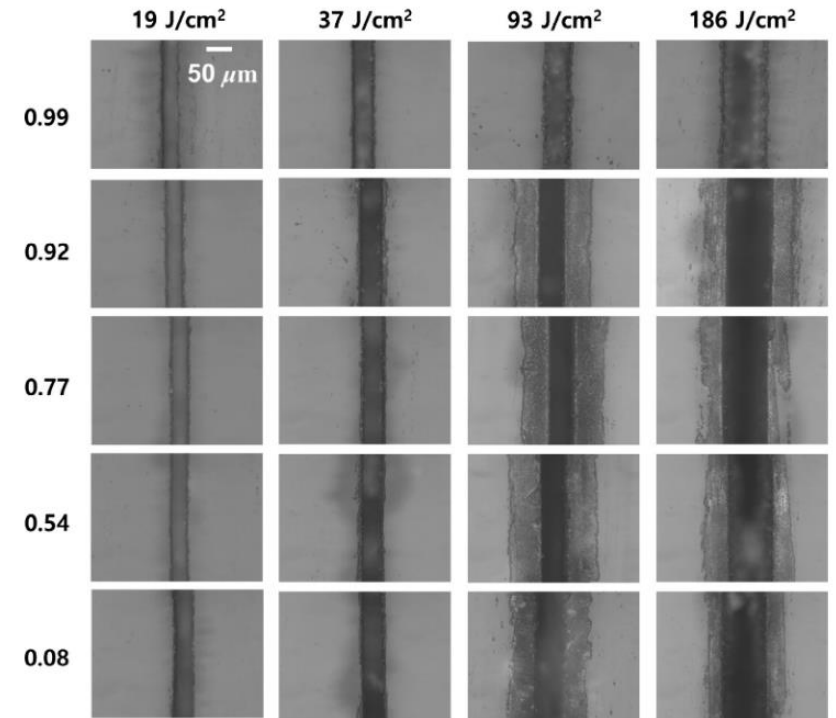


# Engraving

Material is ablated from the surface

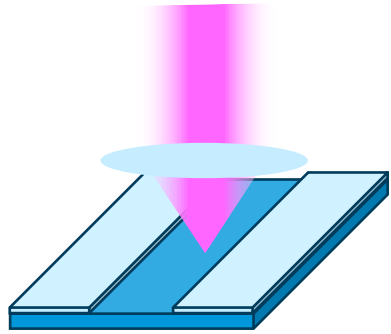


Laser parameters are finely tuned for cut quality

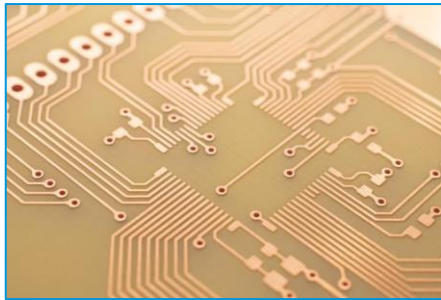


# Selective ablation (de-coating)

Material is ablated from the surface leaving the substrate intact

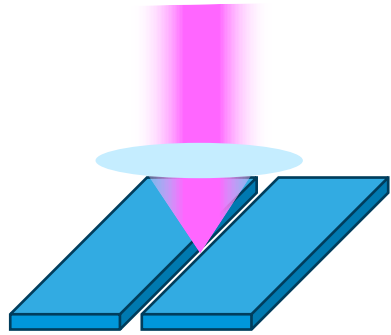


Works best when top layer and substrate have very different ablation thresholds

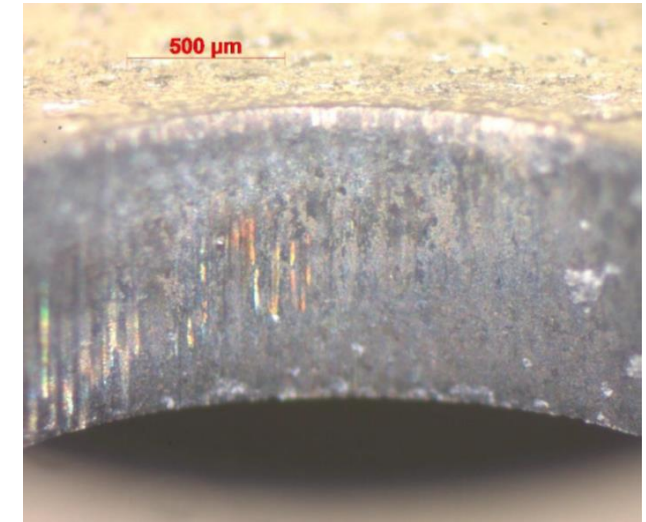


# Laser cutting (by ablation)

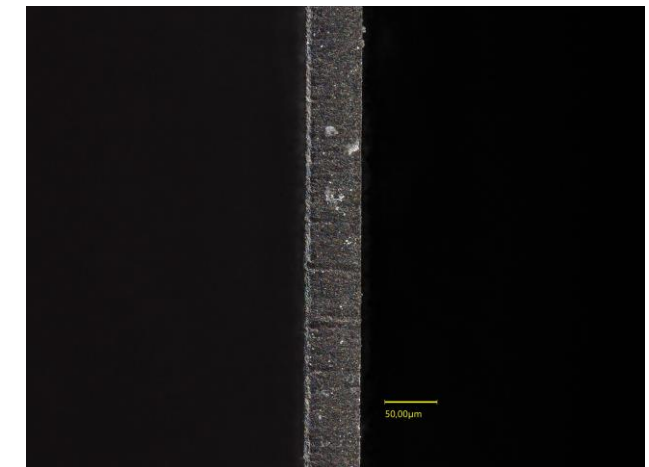
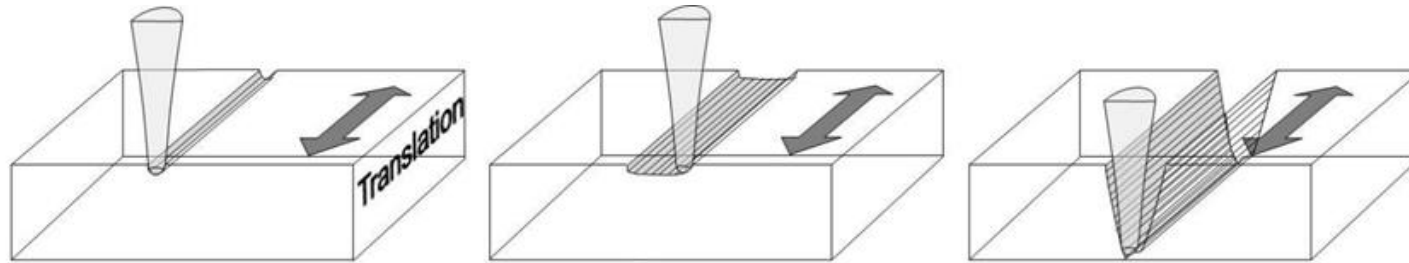
Material is ablated down to the bottom surface



Best used for very thin samples when conventional mechanical cutting can't work

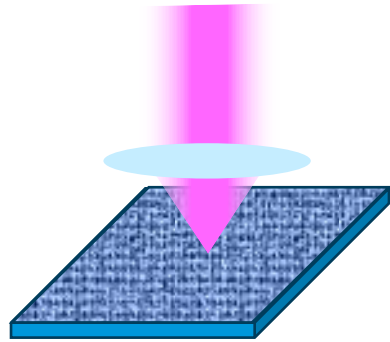


1-mm Nickel sheet

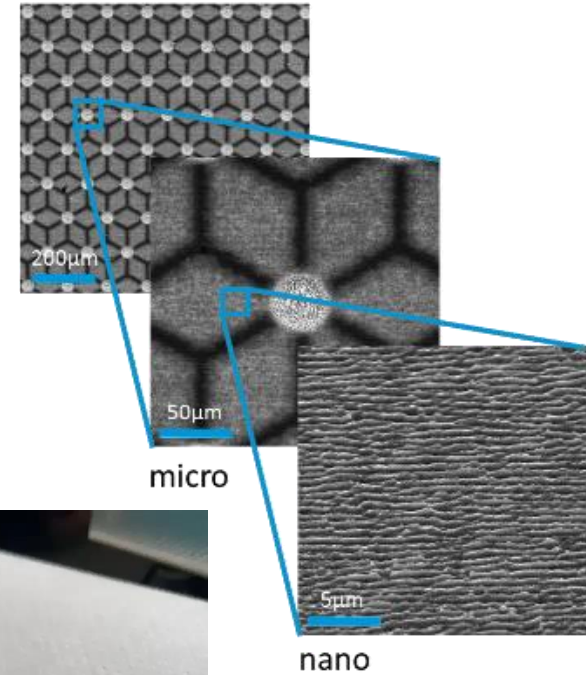


50 μm metal sheet, Ra = 0.1 μm

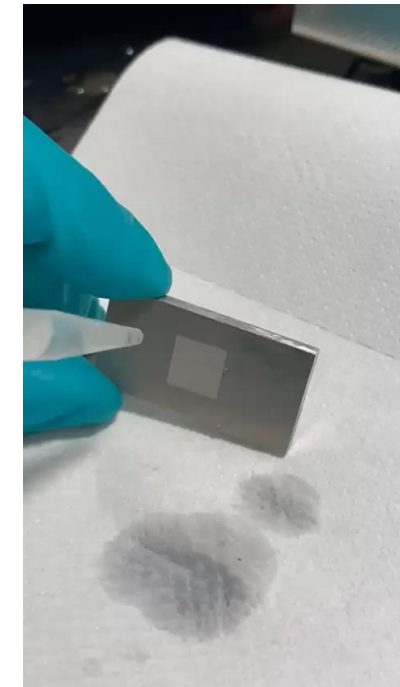
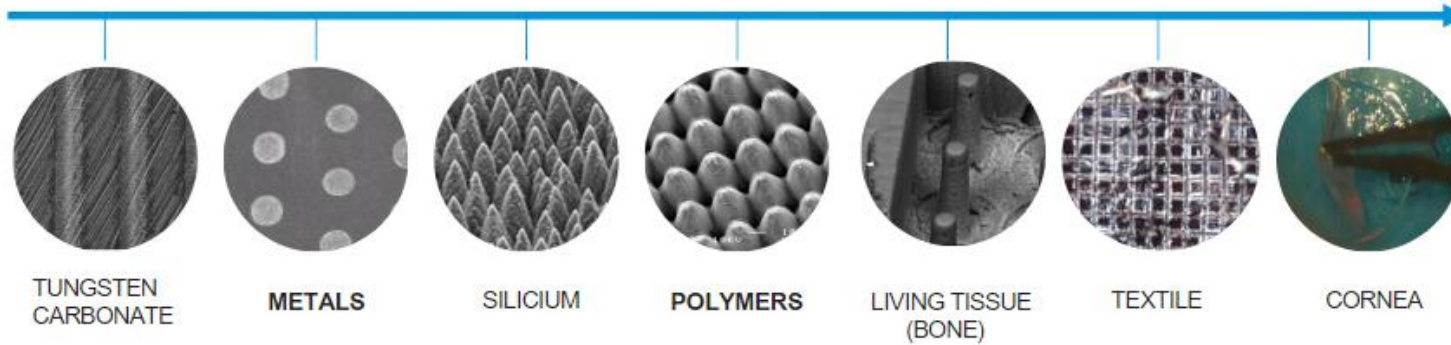
# Surface texturation



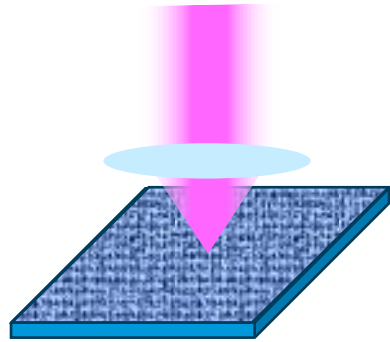
Possibility of combining micrometric and nanometric surface structuring to obtain multi-scale texturations.



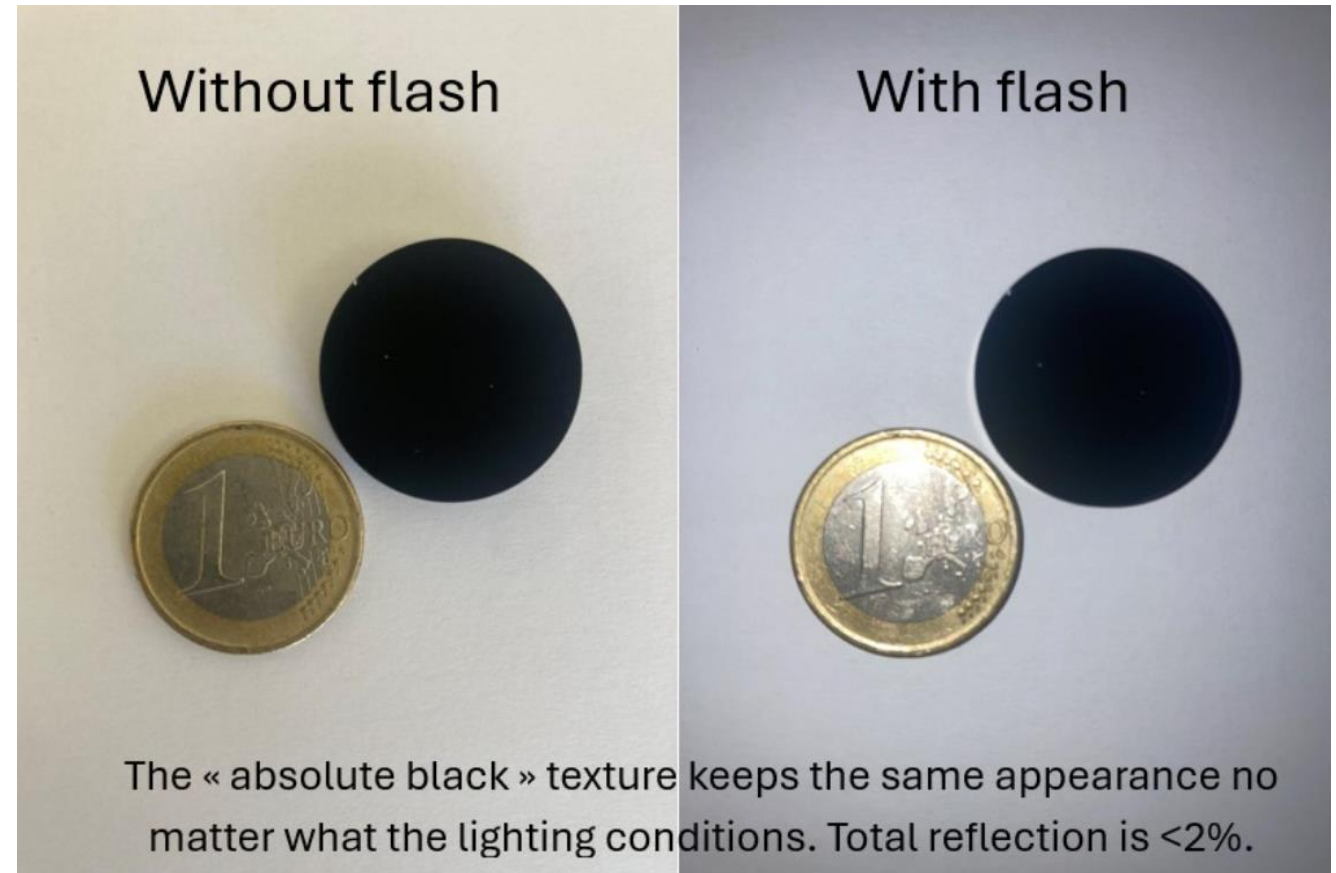
From the hardest to the most delicate  
From a few nm to several hundred µm



# Surface texturation / Absolute black

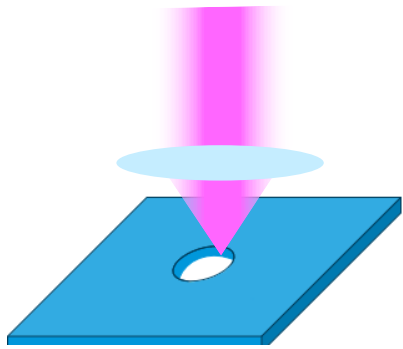


Laser texturation enables « absolute black » coloring on any metallic surface for blocking stray light and unwanted reflection



# Laser hole drilling

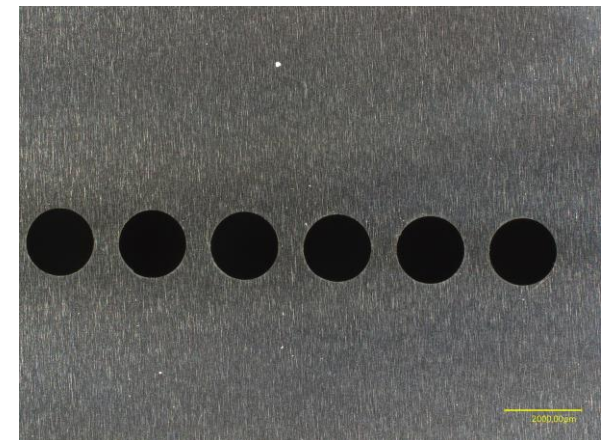
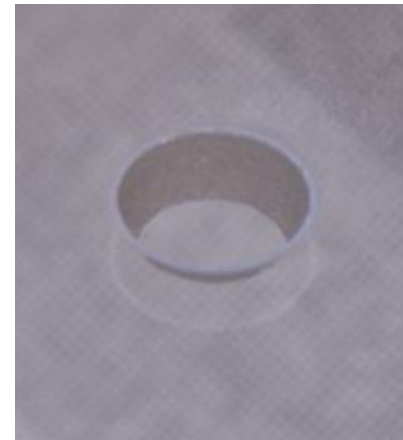
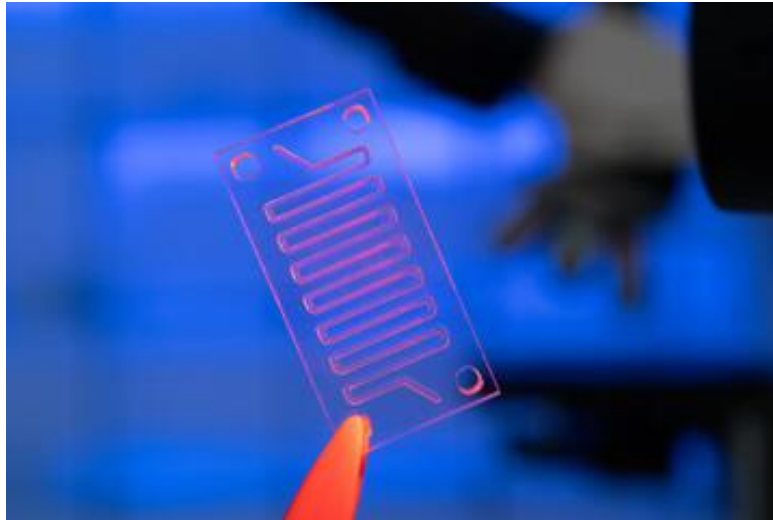
Material is ablated down to the bottom surface



Direct drilling (single-shot) → Fast but limited depth and taper

Percussion drilling (multiple) → High aspect ratio, but small diameter only

Trepanning (~cutting) → Large diameter, no taper but slow





# Ultrafast laser processing for the display industry



## 3 main applications :

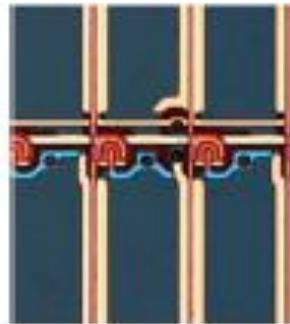
- Repair process
- Hole In Active Area (HIAA) process
- Cutting process on flexible or foldable OLED



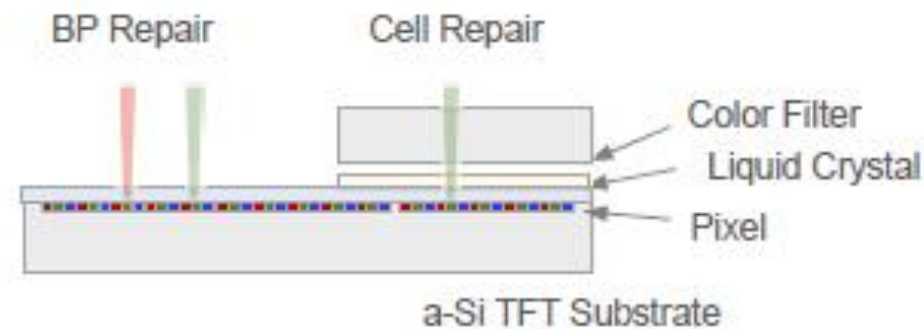
# Repair process – controlled energy deposition on the defect

## LCD

Thickness to remove : 0.1 ~ 0.5um  
Target Layer : Metal, ITO, Color Filter  
Laser : Nano (IR, Green, UV) ~ 5W

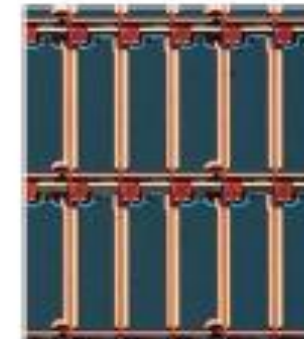


<200 ppi

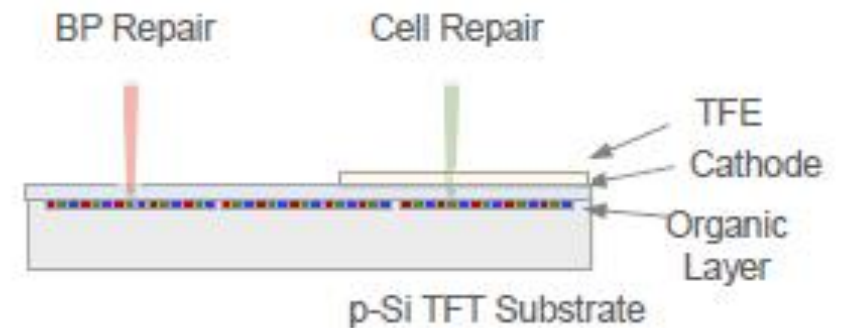


## OLED

Thickness to remove : 0.1 ~ 0.5um  
Target Layer : Metal, Oxide, OC ※ Overcoat  
Laser : Femto (IR 5W, Green, DUV 2W)

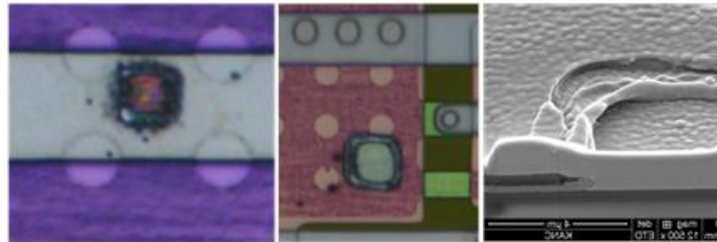


> 300 ppi



## Typical repair processes

### Point shot



S/D remove  
@S/D+Gate+p-Si

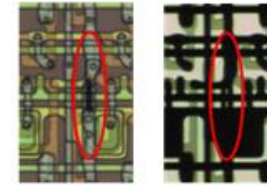
Gate remove  
@Gate+p-Si

S/D remove  
@S/D+Gate/p-Si

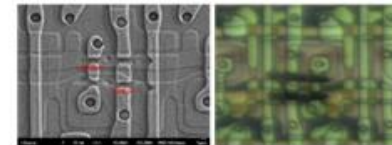
	FIB image	OM image	
Gate			
S/D			

### Scan shot

Line cutting (fuselective ablation)

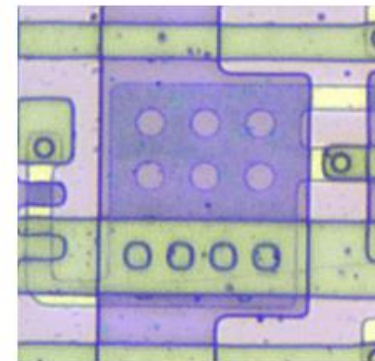


Line cutting (selective ablation)



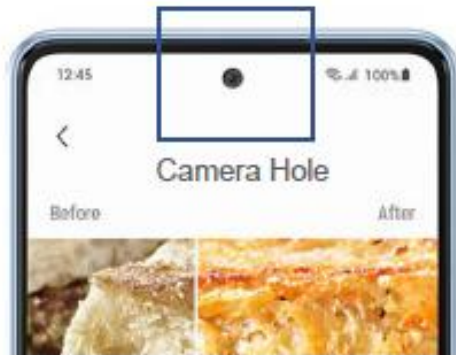
Metal remove  
@Metal+Gate+p-Si

### Block removal

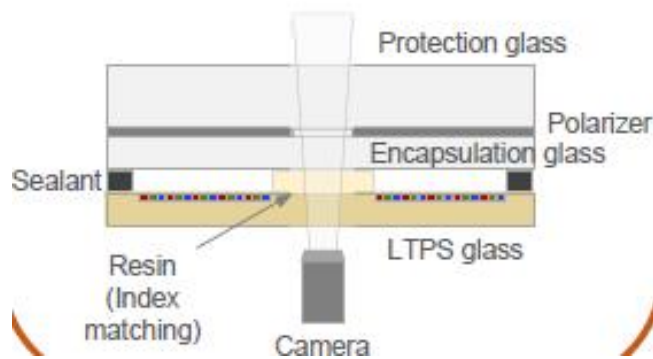


# Hole In Active Area (HIAA) process

Rigid OLED  
Etching  
Laser : Femto, GR 10W



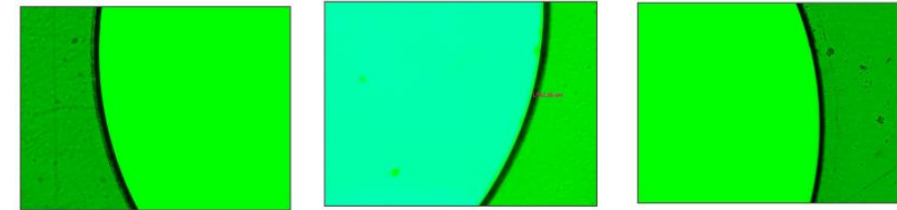
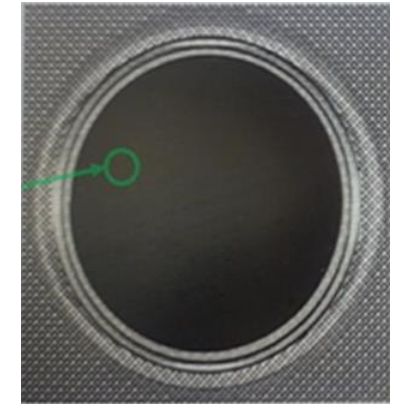
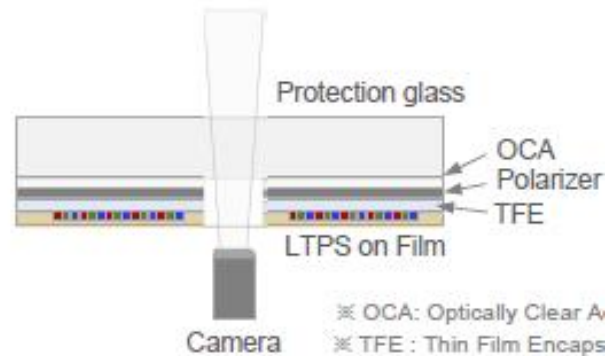
HIAA  
※ Hole In Active Area



Flexible OLED  
Through Hole Cut  
Laser : Femto, UV 30W



HIAA  
※ Hole In Active Area



- ✓ No Burr
- ✓ No delamination
- ✓ No microcracking
- ✓ Low HAZ

# Cutting process on flexible or foldable OLED

## Flexible OLED

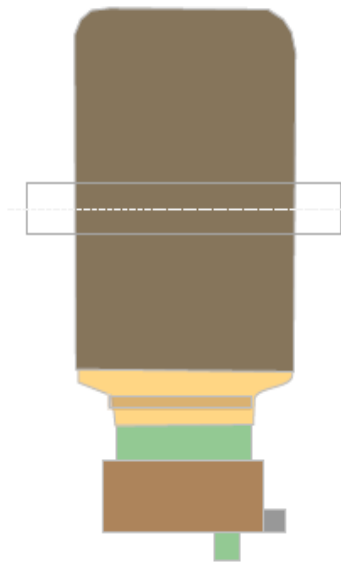
Thickness to remove: 600 ~ 800 $\mu$ m  
Target layer: Polymeric Films  
(PI/PSA/Pol/PET etc.)  
Laser: Pico or Femto UV 30W



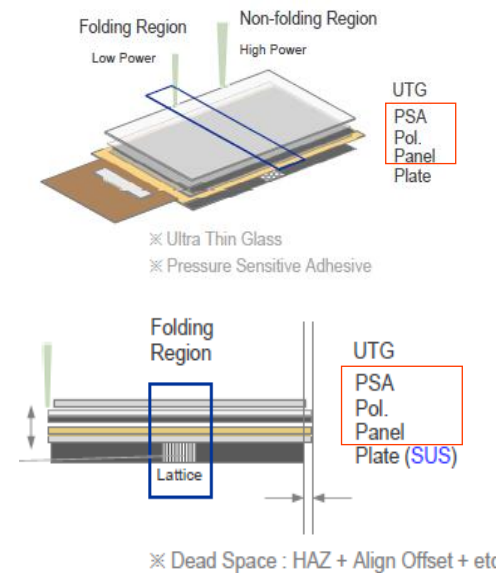
Shape Cut

## Foldable OLED

Thickness to remove: 500 ~ 600 $\mu$ m  
Target layer: Polymeric Films  
(PI/PSA/Pol/PET etc.)  
Laser: Femto UV 30W



Shape Cut



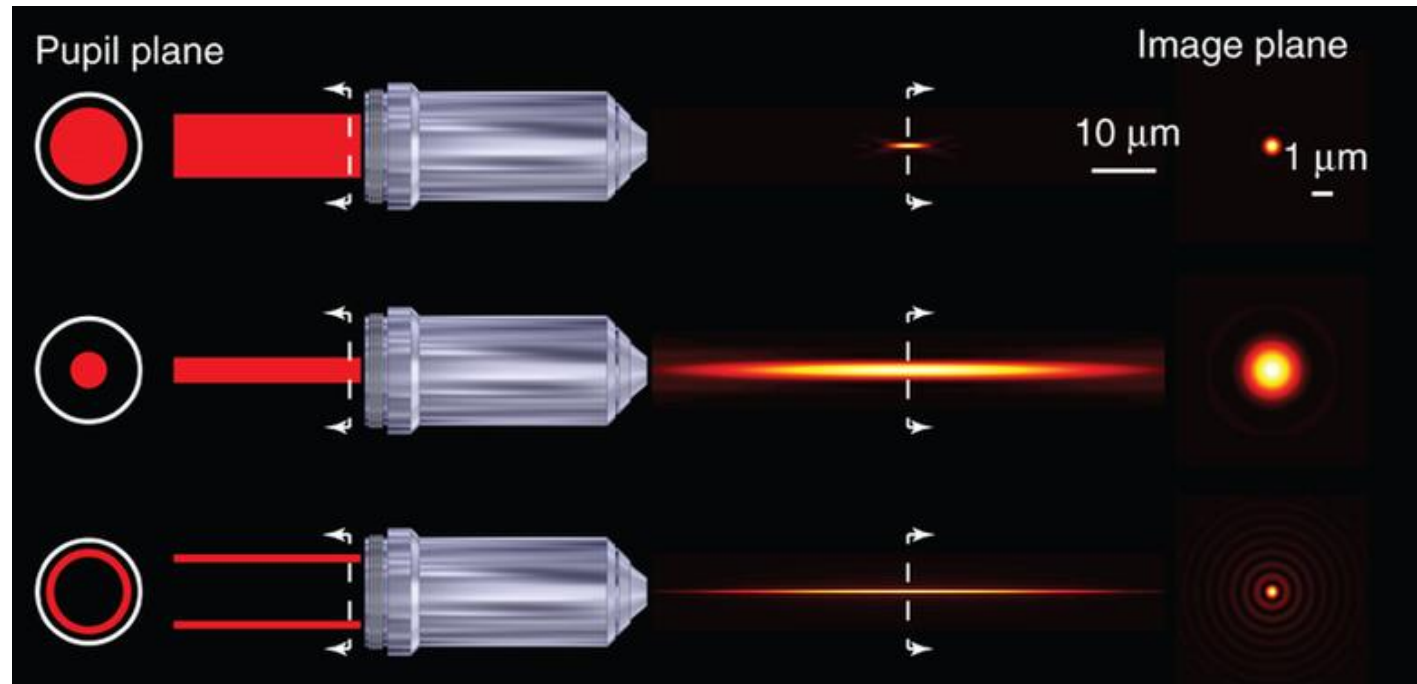
- ✓ No Burr
- ✓ No delamination
- ✓ No microcracking
- ✓ HAZ around 15 $\mu$ m
- ✓ Typical cutting speed: 50 to 100mm/s
- ✓ Typical time per panel: 8 seconds

# Beam shaping for glass cutting

## Incoming Beam Profile

- Gaussian w/ Large diameter
- Gaussian w/ Small diameter
- Bessel (collimated)

## Beam focusing with a lens/objective



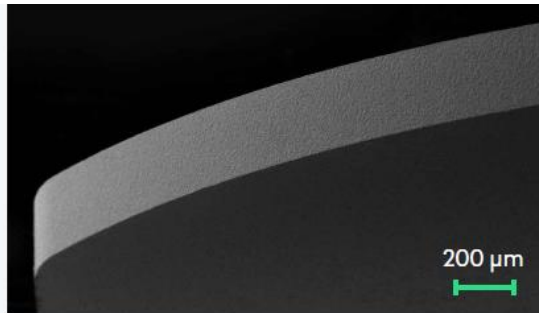
## Focus

- **Small** spot size
- **Short** Depth-of-field
- **Large** spot size
- **Long** DOF
- **Small** spot size
- **Long** DOF
- « Filament beam »

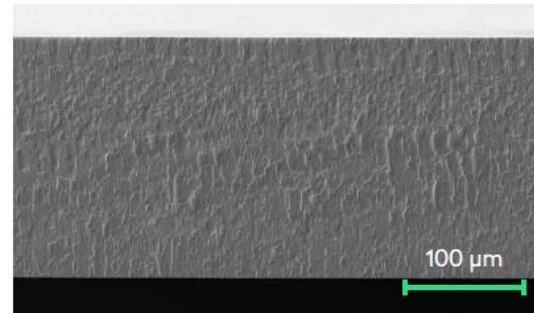
Gao *et al.*, DOI:10.1038/nprot.2014.087 (2020)

# Beam shaping

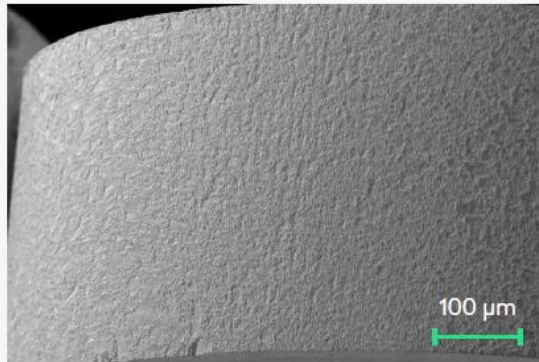
Best commercial cut quality available  
Quasi-bessel beams:



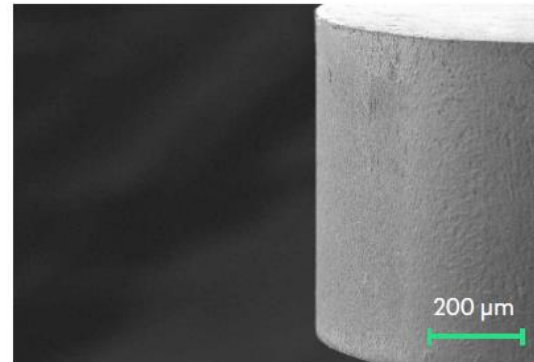
D263T glass, thickness 300 μm



Fused silica glass, thickness 250 μm



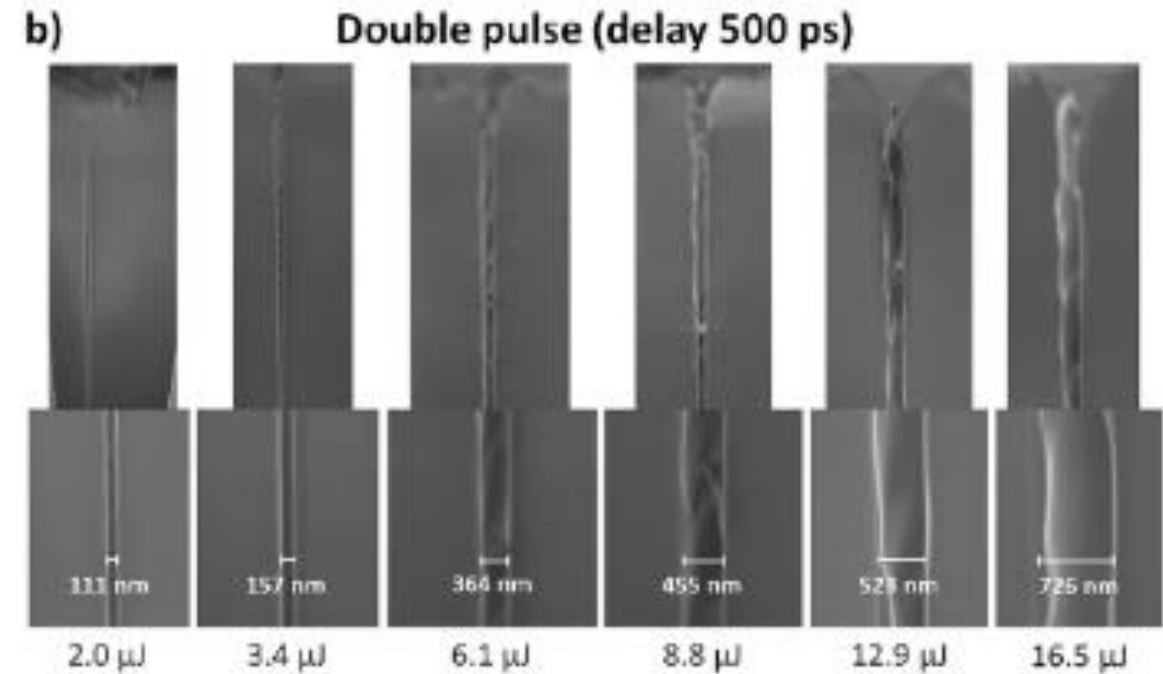
Sapphire, thickness 400 μm



Sapphire, thickness 700 μm

Credit: WOP

Multi-pulses technologies for drilling  
100 μm long Microcanals on BK7



Credit: FemtoST

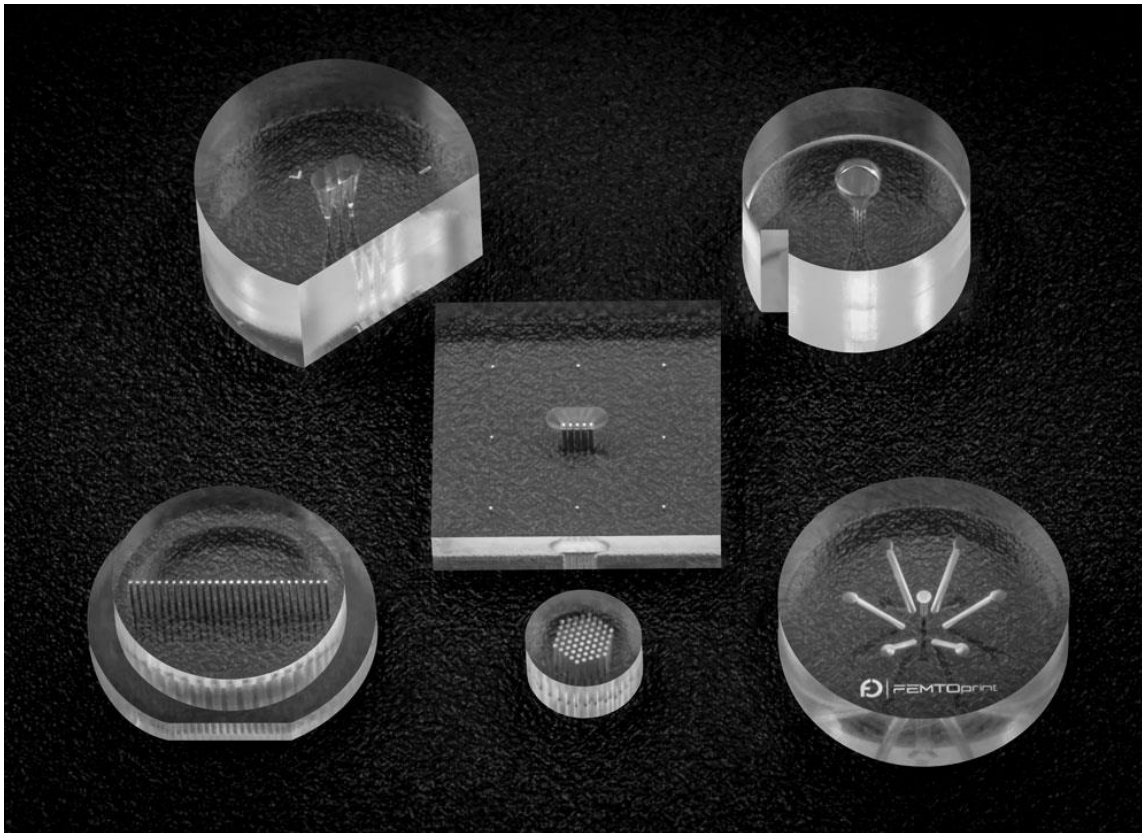
Source: 10.1515/nanoph-2020-0457 (2021), FEMTO-ST



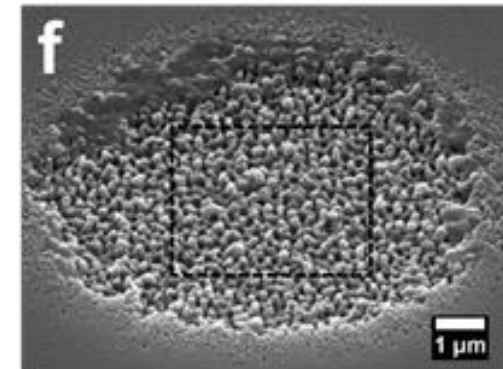
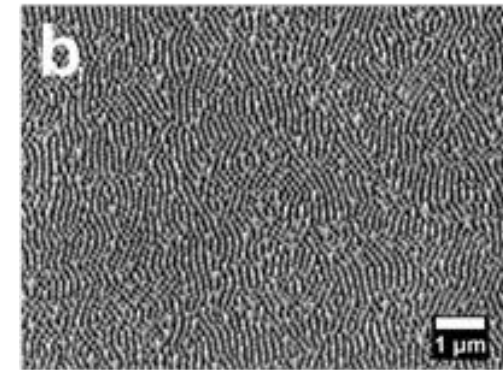
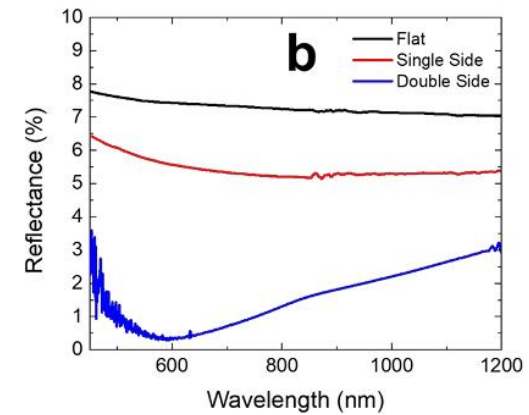
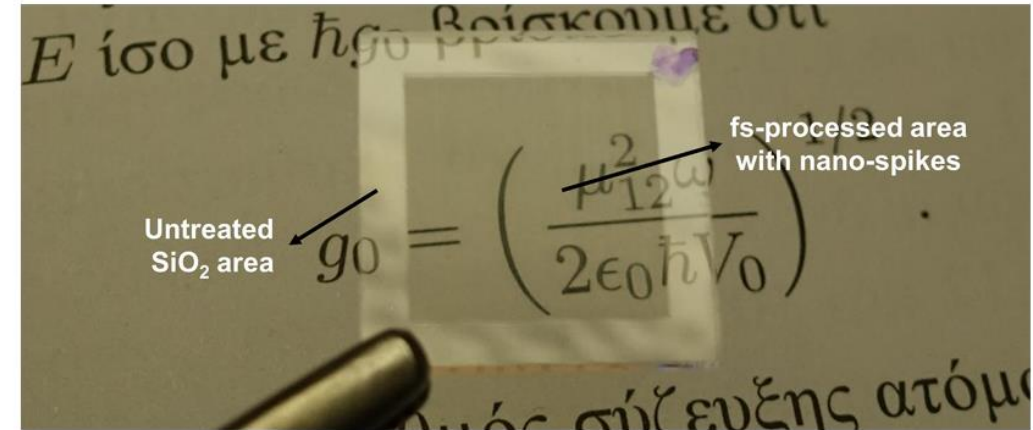
# Thin glass cutting

Volume modification + chemical etching

➤ Freeform in glass

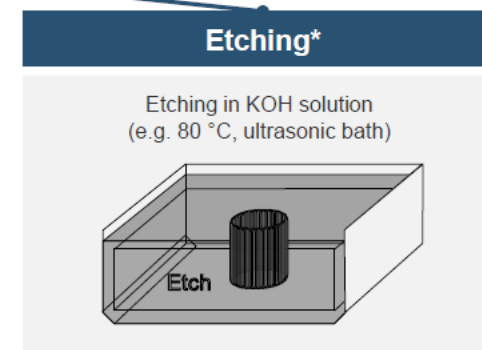
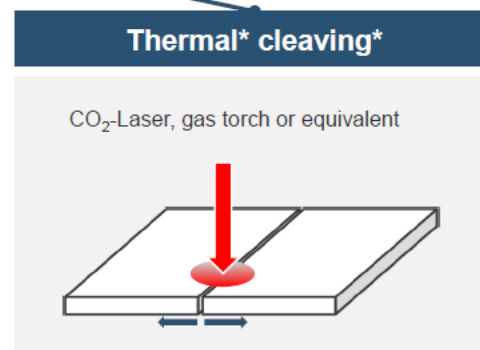
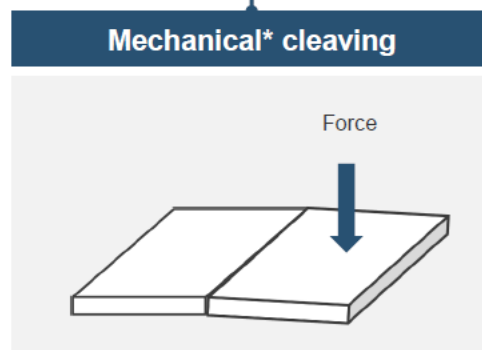
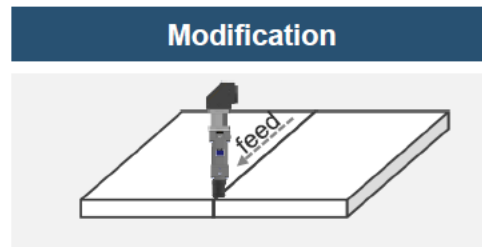
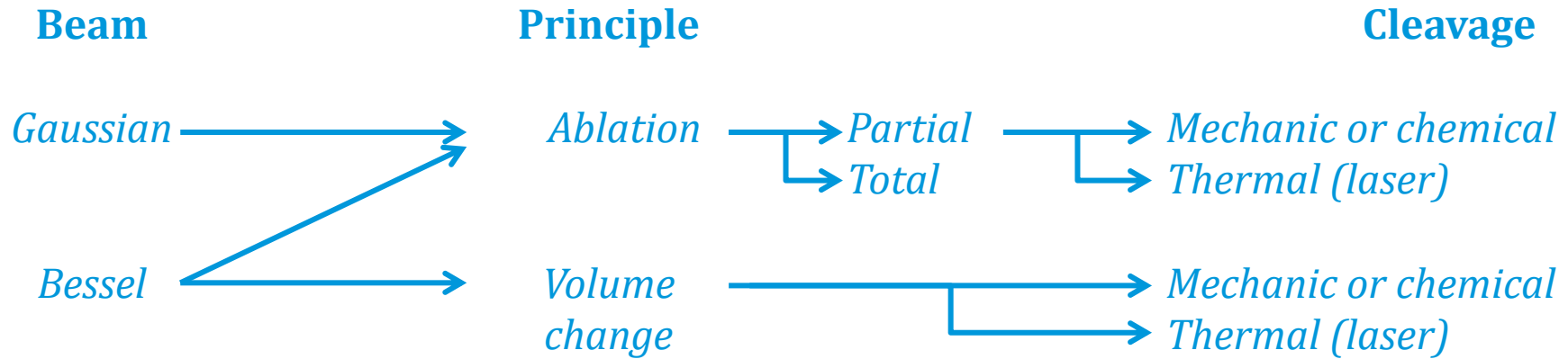


Credit: Femtoprint

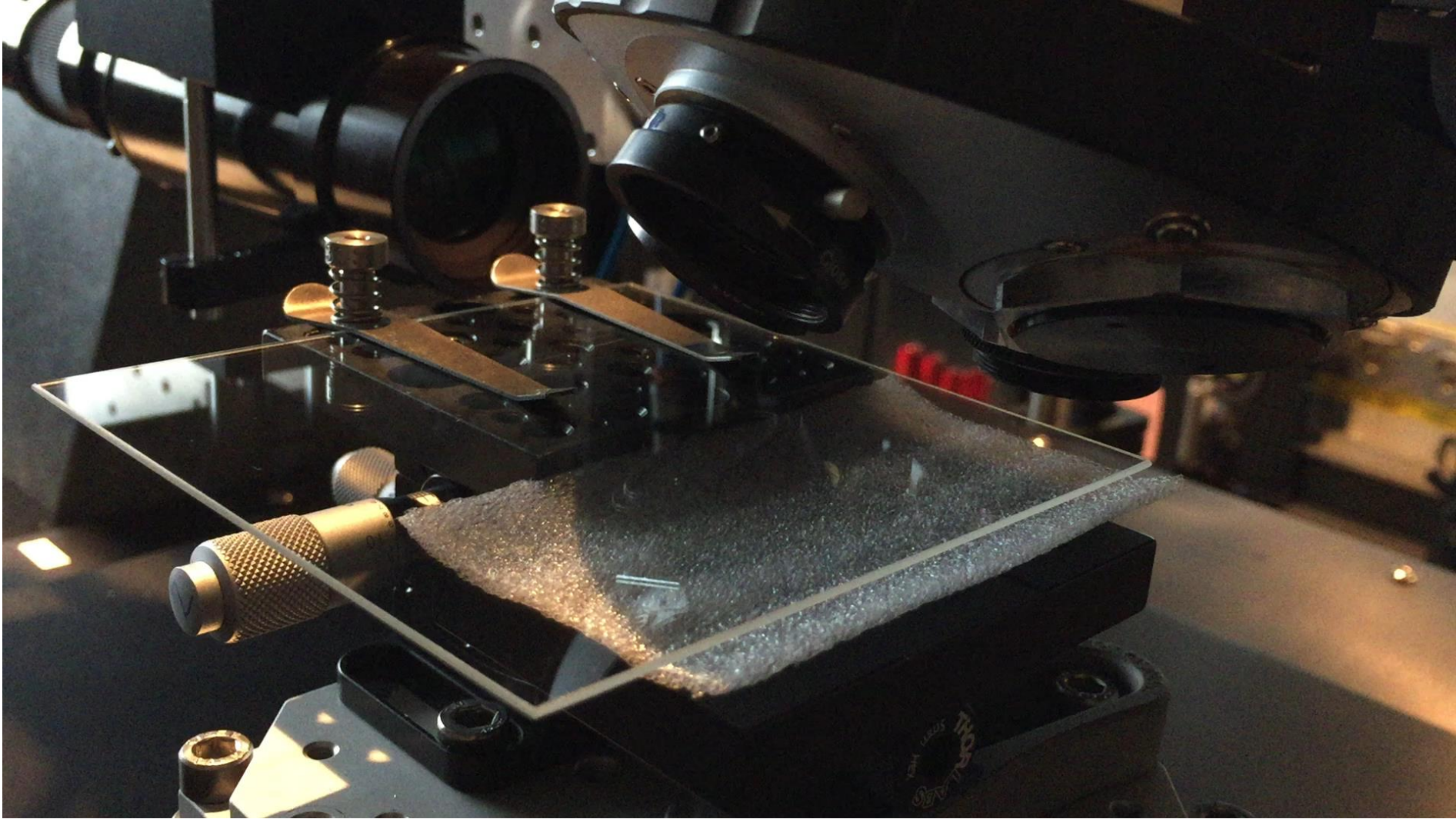


Surface functionalization:  
Fs-Laser AR coating  
(high LIDT)

# Thin glass cutting



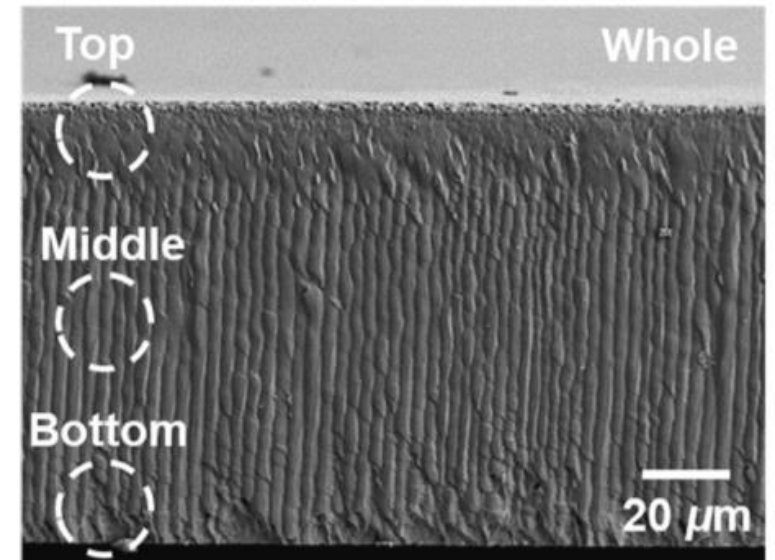
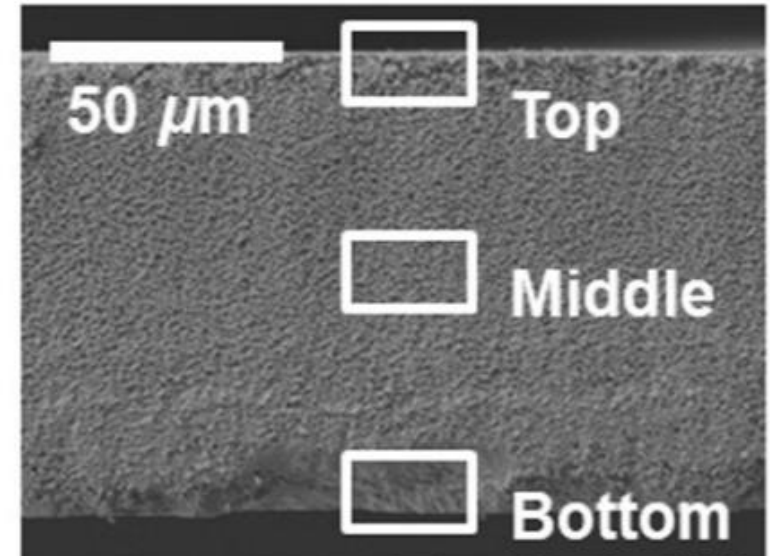
# Thin glass cutting



# Thin glass cutting

	Ablation (gaussian)	Volume change (Bessel)
Kerf (cut line width)	~30 $\mu\text{m}$	1-5 $\mu\text{m}$
Defaults	Chipping (10 – 30 $\mu\text{m}$ ) « Heat Affected Zone » <30 $\mu\text{m}$	Chipping (~ $\mu\text{m}$ ) Line shape <3 $\mu\text{m}$
Cutting speed	10-500 $\text{mm.s}^{-1}$ Strong dependence on thickness	200-1000 $\text{mm.s}^{-1}$ Very low dependence on thickness
Wall roughness	High	Low
Dust	Lots = cleaning	A few chips = no cleaning
Material strength after cutting	160 MPa*	350 MPa*

\*edge strength, back side, credit: POSTECH



# Abrisa Technologies: One-stop-shop provider for display solutions



Semi-Transparent Mirrors for Hidden Displays



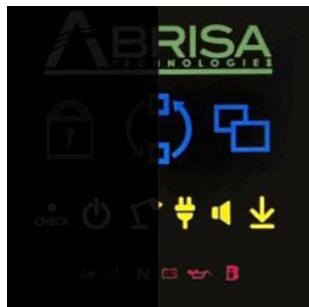
Total Solutions for Ready-to-Install Enhancement Glass



Large 84" Diagonal HI-OD™ Screen Printed Display Glass Solutions



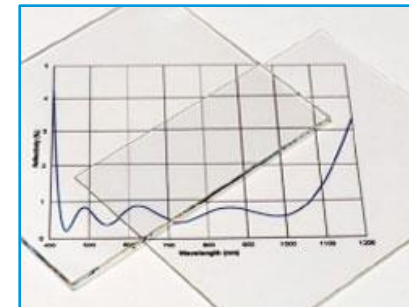
CleanVue™ Pro Oleophobic & Hydrophobic Coating Solutions



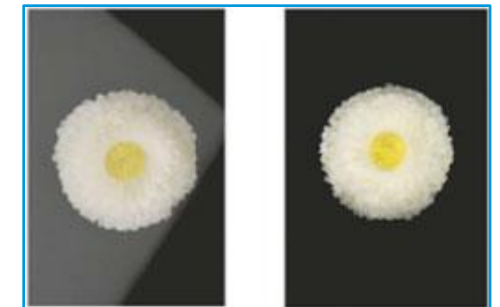
Dead Front Panels for Backlit User Interfaces



Vehicular Information Display & Interface Applications



Sensor & Scanner window Solutions



Low Reflection & Non-Glare Glass Solutions



# More application notes on our website !

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Your Total Solution Partner

## AGC Dragontrail™ Chemically Strengthened Glass

**Cover Glasses • Displays • Sensors • Scanners**

AGC Dragontrail™ Chemically Strengthened Glass (CSG) is an innovative high ion-exchange (HIG) soda-lime glass with superior strength, scratch resistance and a beautiful surface finish that is made by applying a proprietary chemical strengthening and tempering process to the right size and flatness.

Dragontrail™ supports low profile and reduced weight portable flat and industrial devices with a lightweight, flat display area that is environmentally friendly and is processed without the use of heat, stress, and airflows.

Dragontrail™ is an excellent choice of a transparent and durable monolithic window or display enhancement glass that helps to enhance the usable lifetime of flat-panel touch displays, flat and industrial touch sensors, document scanners and on-board vehicle and marine displays.

**Applications:**

- Display cover glass
- Camera windows
- MAR (Marine) display
- Scanner beds
- Industrial machine cases
- Electronic enclosures

**Benefits:**

- Is stronger than soda-lime float glass
- Victor's trademark (V)™
- 500 MPa strength
- 3.0 x Depth of Layer (DOL) = 8µm
- Heat Size
- 4F x 2F (1219.2mm x 762.0mm) standard
- 4F x 4F (1016mm x 1016mm) standard
- Thickness
- Shard Resistant Inside (SRI) and (SRI)™
- Other thicknesses of 2 to 5 mm

**Dragontrail™**

Albrisa Technologies • 288 South Harbor Drive, Santa Paula, CA 93060 • (877) 622-7472  
www.abrisatechnologies.com • info@abrisatechnologies.com

## AGC Dragontrail™ Chemically

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Your Total Solution Partner

## Corning® Gorilla® Glass

**Design's Best Gorilla® Glass with Better Damage Resistance™ is an Alkali Aluminosilicate float glass that is better able to sustain the stresses of the most demanding cover glass design. With its low compressive, low glass residual stress, low thermal and expansion by heating to prevent the deep chips and scratches that damage float glass.**

**Product Information**

**Benefits:**

- Low weight and reduced volume design
- Optimum strength after use
- High mechanical strength and low thermal expansion
- Optimum clarity

**Applications:**

- Industrial and consumer displays
- Medical and dental equipment covers
- Automotive displays
- Industrial machines
- High speed glass articles

**Chemical Durability**

Corning Gorilla® Glass is chemically strengthened glass that is better able to sustain the stresses of the most demanding cover glass design. With its low compressive, low glass residual stress, low thermal and expansion by heating to prevent the deep chips and scratches that damage float glass.

**Electrical**

Corning Gorilla® Glass is chemically strengthened glass that is better able to sustain the stresses of the most demanding cover glass design. With its low compressive, low glass residual stress, low thermal and expansion by heating to prevent the deep chips and scratches that damage float glass.

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## Corning® Gorilla® Glass

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Your Total Solution Partner

## SCHOTT AS 87 eco Ultra-Thin

**Touch Displays • Biometric & Image Sensors • Cover Glass**

SCHOTT AS 87 eco is an ultra-thin aluminosilicate glass with extremely high levels of bending and impact strength and superior scratch resistance. It is an excellent choice for use as cover or enhancement glass on flat-panel devices, touch sensors and other applications where thickness and weight are critical. SCHOTT AS 87 eco is chemically strengthened by the release of sodium ions (Na+) chemical strengthening to even higher levels of stress and is also a low thermal expansion, low glass residual stress, low thermal and expansion by heating to prevent the deep chips and scratches that damage float glass. Solutions are available.

**Benefits:**

- Ultra-Thin for Low Profile Designs
- Optimal IOP (Thermal Expansion)
- High Impact Damage Resistant
- Excellent Clear Visual Quality
- Shard Resistant (SRI) and (SRI)™
- HEAT and HIG (High Ion Exchange)

**Blank Size:**

- 19.687" x 15.747" (500 mm x 400 mm)

**Blank Thicknesses:** (thickness in millimeters)

- 2.102 mm (0.0834")
- 2.147 mm (0.0845")
- 2.217 mm (0.0873")
- 2.287 mm (0.0901")

**Applications:**

- Cover Glass for Displays & Touch Panels
- System Protection for Mobile Devices
- Flagship Design
- Ultra-Thin Glass Applications
- Medical & Bio-Medical
- Automotive Displays
- Camera Imaging

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## SCHOTT AS 87 eco Ultra-Thin

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HEF GROUPE  
Your Total Solution Partner

## SCHOTT Xensation™ Aluminosilicate Cover Glass

SCHOTT Xensation™ Cover Glass is a high ion-exchange (HIG)™ Aluminosilicate glass for capacitive touch keyboards. Xensation™ Cover is a high quality Aluminosilicate glass with outstanding resistance to breakage and scratches for superior touch performance.

**Key Benefits of SCHOTT Xensation™ Cover:**

- SCHOTT's unique mechanical manufacturing process gives the Xensation™ Cover aluminosilicate glass its superior clear quality.
- One of the most recently high compression (HIG) (HIG) and high ion-exchange (HIG) Cover offers outstanding strength.
- The clear nature of Xensation™ Cover results in very stable DOL and covered strength even under varying chemical strengthening conditions. This makes a great process window.
- Xensation™ Cover maintains high strength even when process applications call for shorter ion-exchange. Xensation™ Cover is available in a wide range of thicknesses with tight tolerances.

**Thermal Properties:**

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## SCHOTT Xensation®

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Your Total Solution Partner

## Anti-Glare (AG) Etched Soda-Lime Glass

Anti-glare (AG) glass provides an excellent light reflecting surface, allowing the user to focus on the display screen without reflections. (Anti-reflective (AR) coating is an additional feature, and glass with AR coating does not reduce light reflection as much as AG.)

Albrisa Technologies anti-glare glass is manufactured by a controlled acid etch process, producing a diffused surface for antiglare, high resolution, wide viewing angle resolution.

Anti-glare glass can be laminated, tempered or glass, only strengthened. Glass, lamination and glass work as a single unit and can be easily changed to your specific application. Custom thickness, sizes and glass weight can be up to 100 mm available upon request.

Harding finish of diffusion provides a glass with different levels of diffusion. It is a better glass handling than a more diffusion panel. This more diffuse for panel solution, the more glass solution is possible. However, the more glass solution is possible, the more glass solution is possible between the degree of diffusion and the panel resolution.

**Features:**

- Clear Protection
- High Resolution
- Superior Clarity
- Anti-Scratch
- Shard Resistant
- Shard Resistant Inside (SRI) and (SRI)™
- Thickness: 2.0mm - 5.0mm
- Blank Size: Up to 4F x 2F (1016 mm x 1016 mm)

**Typical Applications:**

- Mobile Phone Cases (Cover Glass)
- Electronic Displays & Touch Panels
- Medical Instruments
- Vehicle Displays
- LED Displays
- Camera Electronic Modules & Systems

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## Etched Anti-Glare Soda-Lime Glass

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## Patterned Glass for Diffusion & Light Control

Soda-Lime Glass

Albrisa Technologies offers a variety of patterned glass products and tempering solutions for diffusion and light control. These products can be laminated with virtually any resin and can be AR coated, anti-static, screen printed, UV coated, silver coated, and treated by various thermal shock treatments and mechanical strength to meet your application requirements.

Light reflecting glass can be laminated, tempered or glass, only strengthened. Glass, lamination and glass work as a single unit and can be easily changed to your specific application. Custom thickness, sizes and glass weight can be up to 100 mm available upon request.

Harding finish of diffusion provides a glass with different levels of diffusion. It is a better glass handling than a more diffusion panel. This more diffuse for panel solution, the more glass solution is possible. However, the more glass solution is possible, the more glass solution is possible between the degree of diffusion and the panel resolution.

**Features:**

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## Patterned Glass for Light Control

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## Low Emissivity (Low-E) Glass

Low Emissivity (Low-E) glass provides excellent performance in situations where temperature separation is desired. Low-E is used to reduce energy efficiency requirements by blocking UV light and providing heat insulation. This is done with a special film on the inside or outside which prevents the passage of short wave solar energy and also prevents long wave energy produced by heating systems and lighting from escaping.

**Features:**

- Higher Window U-Value
- Increased Insulation Performance
- Energy Savings
- Dimensional Control on Intra-Temperature by Blocking UV Light

**Applications:**

- Automotive
- Display Glass (Navigation Displays)
- Cell Phone Displays

**Dimensions:**

- Thickness: 2.0mm - 5.0mm
- Size
- Up to 4F x 2F (1016 mm x 1016 mm)
- Up to 10F x 10F (3048 mm x 3048 mm)

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## Low Emissivity (Low E) Soda-Lime Glass

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## Heat Absorbing Soda-Lime Glass

Heat Absorbing Soda-Lime Glass (HAG) provides superior performance in situations where temperature separation is desired. HAG is used to reduce energy efficiency requirements by blocking UV light and providing heat insulation. This is done with a special film on the inside or outside which prevents the passage of short wave solar energy and also prevents long wave energy produced by heating systems and lighting from escaping.

**Features:**

- Higher Window U-Value
- Increased Insulation Performance
- Energy Savings
- Dimensional Control on Intra-Temperature by Blocking UV Light

**Applications:**

- Automotive
- Display Glass (Navigation Displays)
- Cell Phone Displays

**Dimensions:**

- Thickness: 2.0mm - 5.0mm
- Size
- Up to 4F x 2F (1016 mm x 1016 mm)
- Up to 10F x 10F (3048 mm x 3048 mm)

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## Heat Absorbing Float Glass

Thank you for your attention !



# THANK YOU FOR YOUR ATTENTION



Contact information :



azoubir@hef.group



<https://abrisatechnologies.com/>