



3D printing and injection molding of fused silica glass

Glassomer GmbH

79110 Freiburg im Breisgau, GERMANY

info@glassomer.com | www.glassomer.com



European Union's Horizon 2020 research and innovation programme

Patrick Risch

- ✓ Production Manager, Head of Manufacturing
- ✓ Scientific background: Chemical Engineer
- ✓ Different scientific papers on the technologies

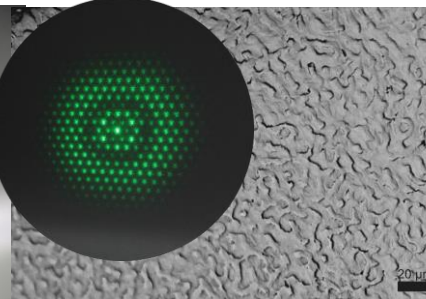
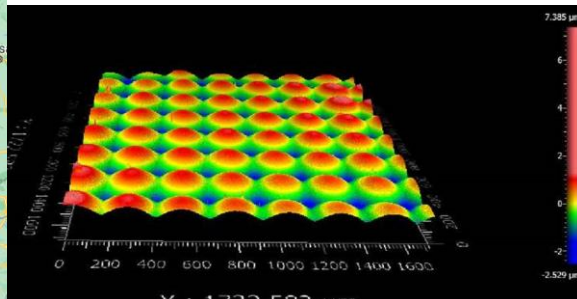
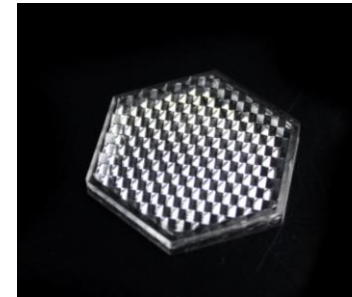
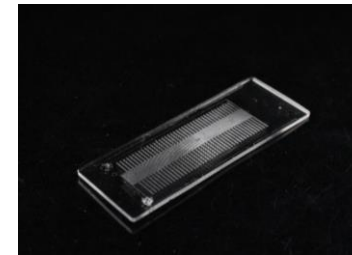


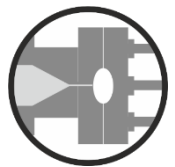
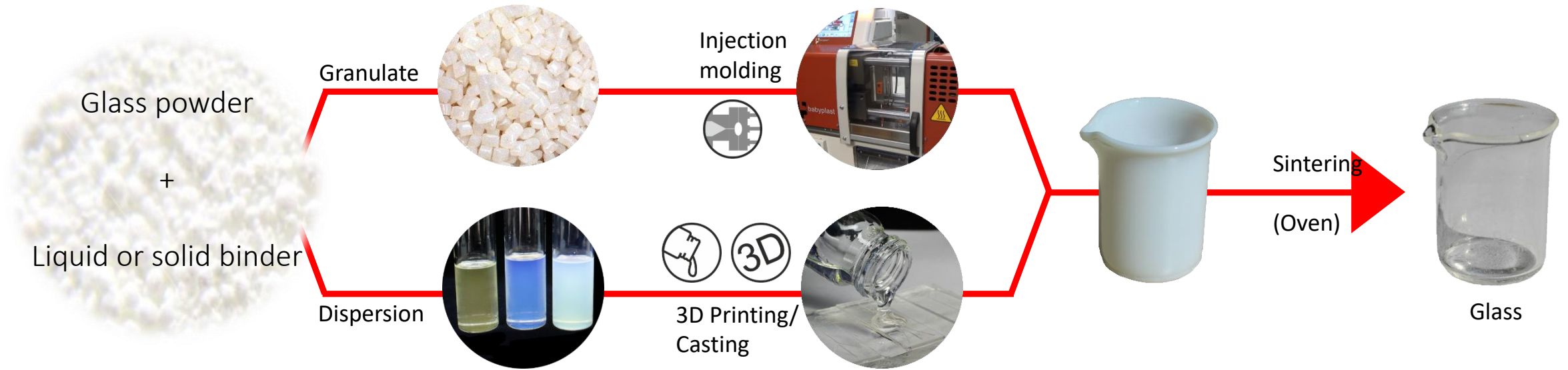
Glassomer GmbH – Precision glass parts from Freiburg



High purity fused silica components

- ✓ Optics
- ✓ Biochips
- ✓ Illumination
- ✓ Nano- & Micropatterning
- ✓ Arts & Decoration





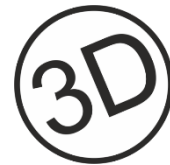
Injection Molding (IM)

- ✓ High-Performance thermoplast S50-im
- ✓ Process with standard IM machines
- ✓ Structuring at ~130 °C



3D Printing and Casting

- ✓ High-Performance liquid composite
- ✓ Structuring under UV light or thermally



Production Process

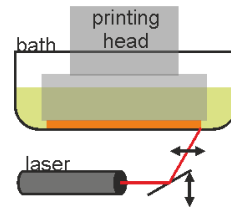
3D Printing Glass

3D Printing Glass with Glassomer

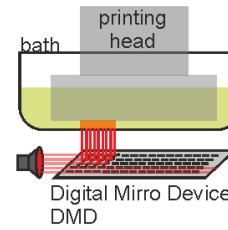
- ✓ 3D shaping
- ✓ Micro and macroscale
- ✓ High freedom of design
- ✓ Rapid prototyping to small series

VAT Photopolymerization

SLA
Stereolithography

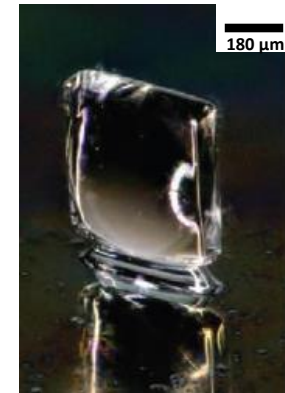
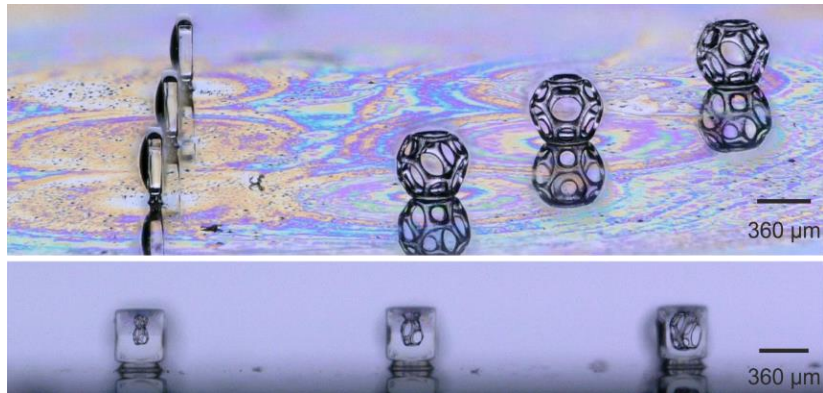
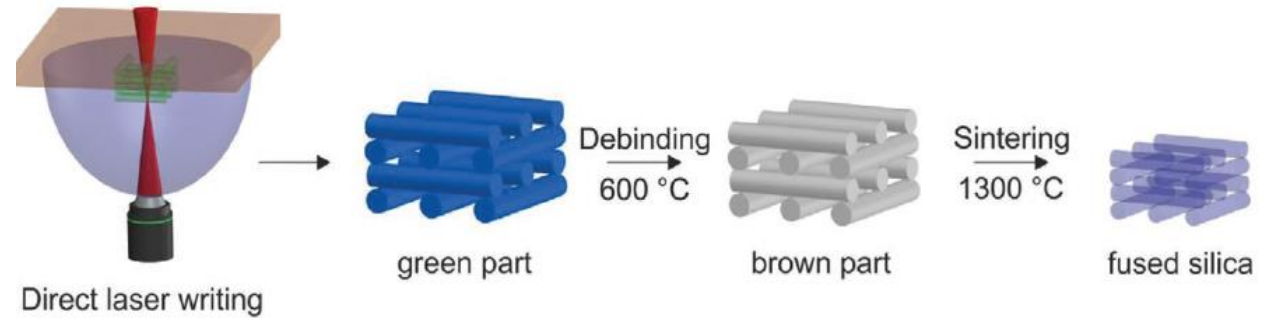


DLP
Digital Light
Processing



2PP Glass Printing with Glassomer & Nanoscribe

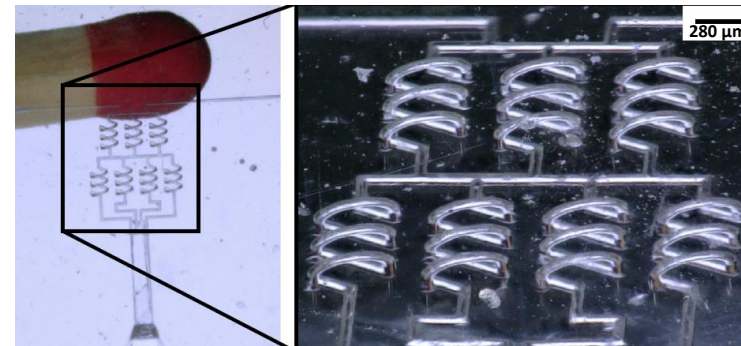
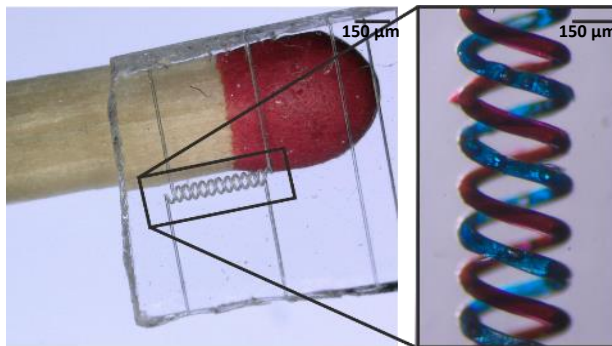
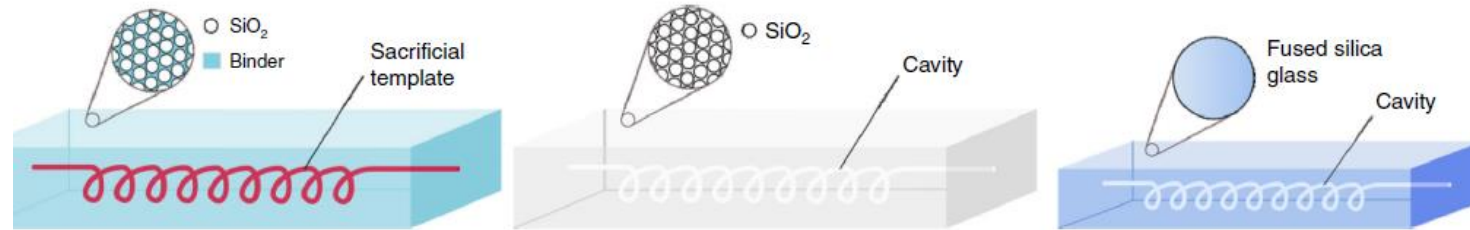
- ✓ Micro- and nanoscale
- ✓ High freedom of design
- ✓ High precision glass parts



2PP Glass Printing with Glassomer & Nanoscribe

✓ Sacrificial Template Replication:

Manufacturing of microfluidic 3D channels in fused silica glass



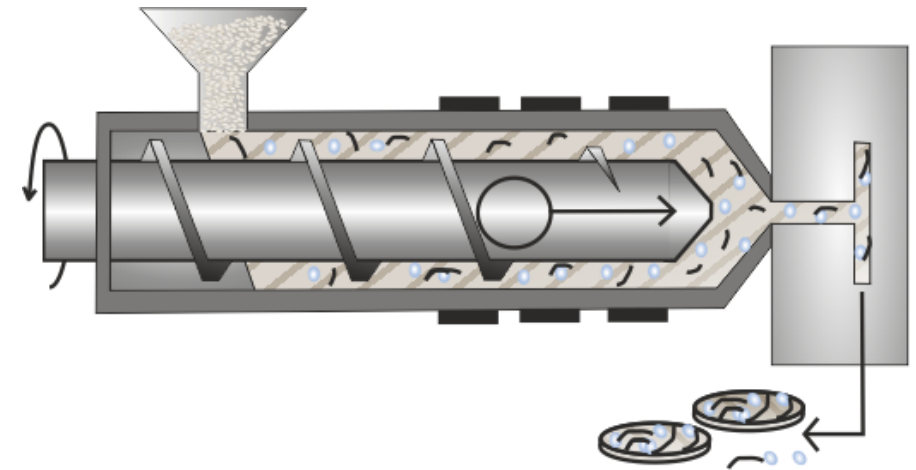
Production Process

Injection Molding

Glassomer Glass Injection Molding



- ✓ Thermoplastic binder
- ✓ High-throughput
- ✓ Cycle times: 20 s
- ✓ Industrial scale
- ✓ Standard Machines



Compounding



Injection
Molding



Heating
1300 °C



Injection Molding Showcases

Complex shapes



High-throughput, fully automated injection molding



~5 s per piece



~8 s per piece

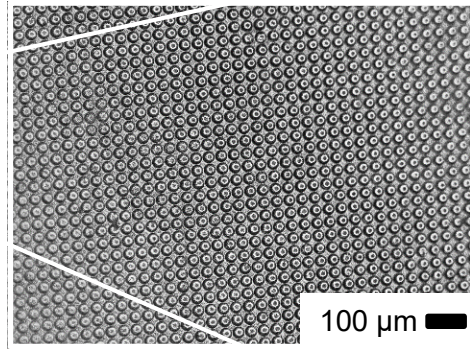
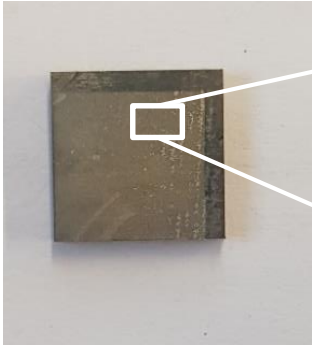


~15 s per piece

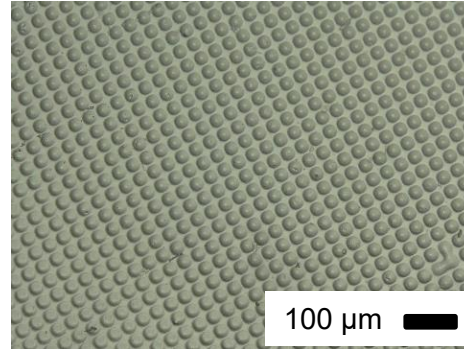
Optics



Micro structured metal mold inset



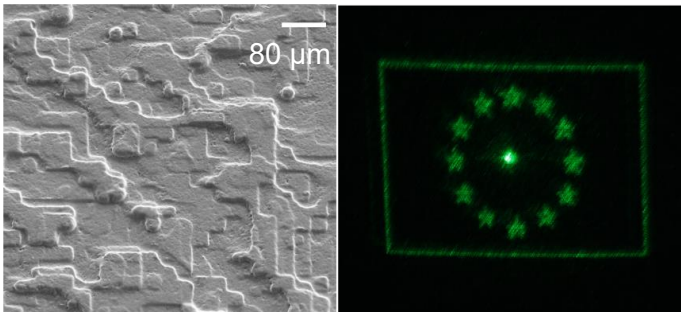
Fused silica glass



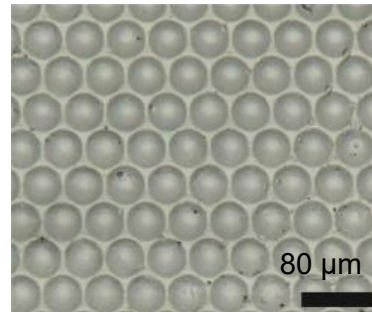
Examples

- UV lenses
- IR lenses
- Microlenses
- Illumination

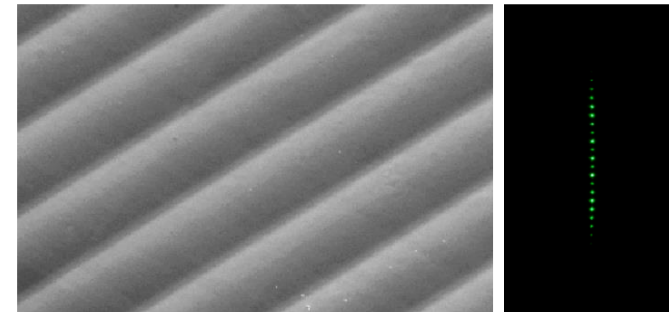
Diffractive optics

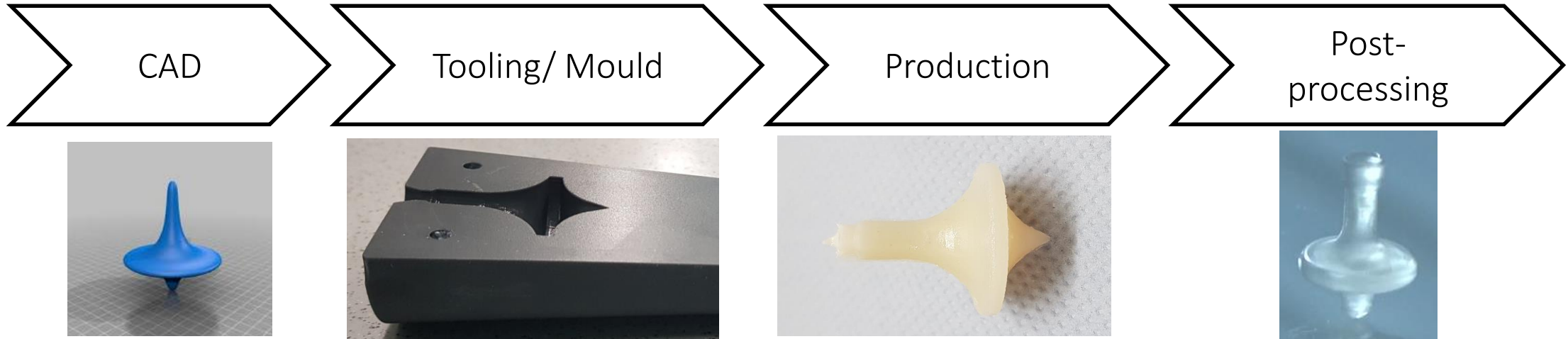


Microlens array



Cylindrical lens array





Glassomer injection molding

- Open now: small to mid-scale production
- Large scale production starting 2023/24

Sent CAD/scheme to info@glassomer.com



Glassomer Future Prospects for Glass



Optics

MedTec & LOC

Automotive

Solar Tec

Industry Trends

Materials with increased performance

Miniaturization:
High Throughput Screening and minimally invasive treatments

Design: Lighting Concepts
Safety: Sensors and 3D recognition
Information: Displays

Efficiency increase
Solar glazing

Why glass?

Increased performance in optics and photonics

Biocompatibility & Stability
No leaching & air-tight packaging

Durability, haptics, high transparency, low thermal expansion

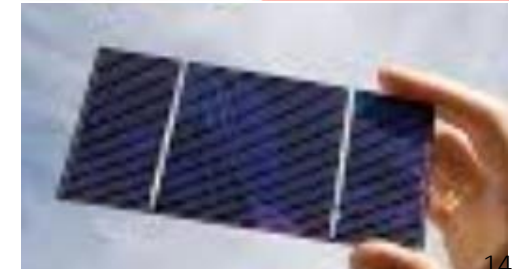
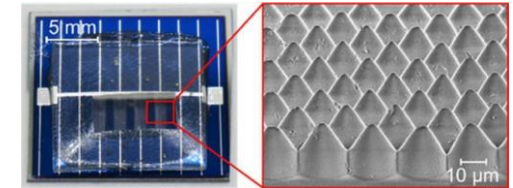
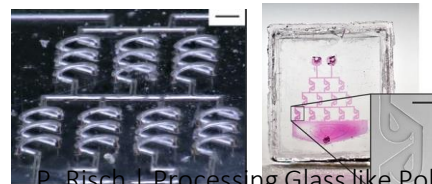
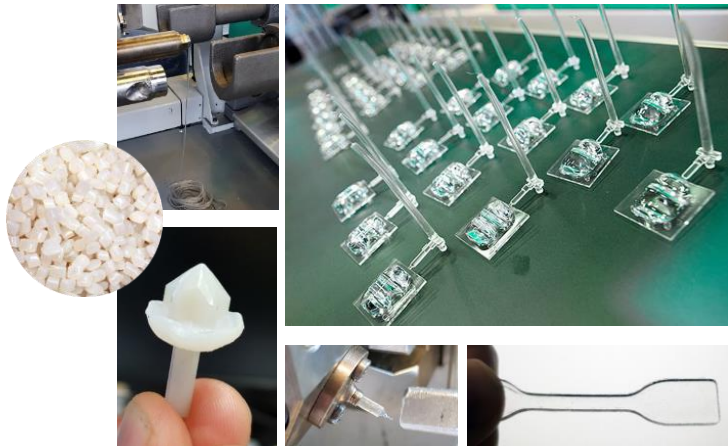
Heat resistance, mechanical resistance, high transparency

Glass injection molding for precision optics, fiber connectors and Compact Camera Modules

Microfluidic devices
Efficient optics for endoscopes
Special packaging

Miniaturized optics for lighting, high purity, low thermal expansion glass for 3D recognition (structured light illumination, SLI)

Microstructures for increased efficiency, made from glass for higher thermal resistance





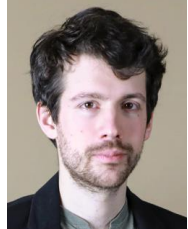
CEO
Dr. Dorothea Helmer
Strategic Planning & Management
Science Communication Expert



CSO
Dr. Frederik H. Kotz
Process Innovation & Sales
MIT European Innovator 2019



CTO
Dr. Bastian E. Rapp
IP, IT, Legal Management
Raised €12 M in public funding



Head of Manufacturing & R&D
M.Sc. Patrick Risch
Manufacturing & CAD
Expert in Process Optimization

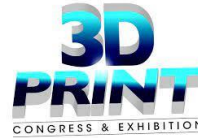


Sales Manager
Thomas Fujimoto
Sales and Business development



Awarded the EIC Accelerator 2021

This project has received funding from the European Union's Horizon 2020 research and innovation programme.



Prix Coup de Coeur 2022



Deutscher Studienpreis
für die wichtigsten
Dissertationen des Jahres

GMM Preis
des VDE/VDI
NEULAND
Transfer Award 2019

Prix Coup de Coeur 2022



Südwestmetall Förderpreis



INNOVATORS UNDER 35 EUROPE



STARTUP AWARD 2019



Gips-Schüle-
Nachwuchspreis
startup bw

ELEVATOR PITCH 2019



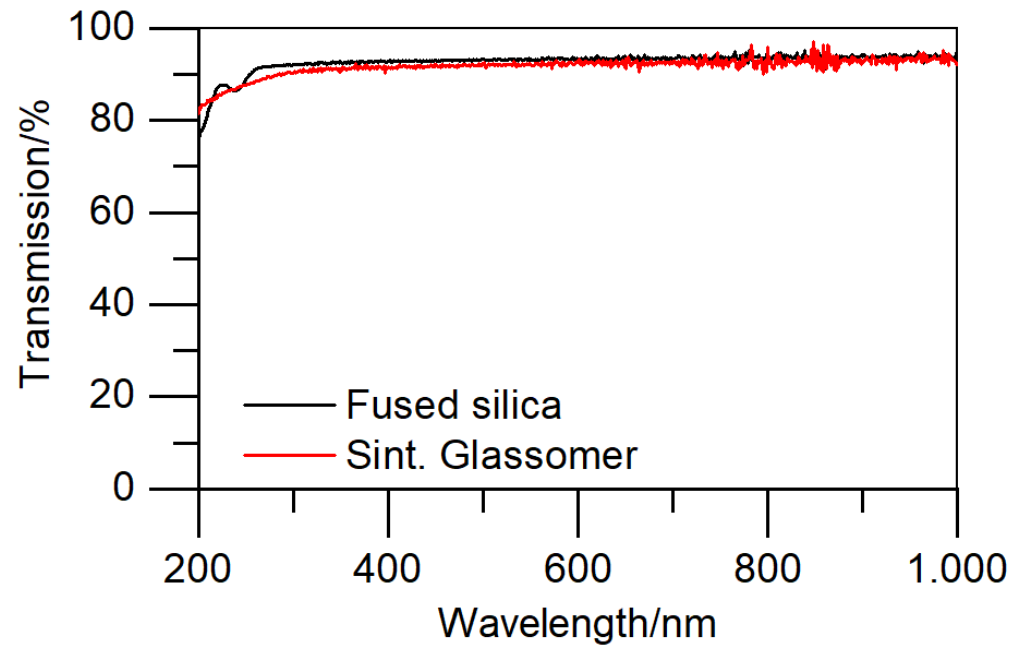
Q & A

Backup Slides

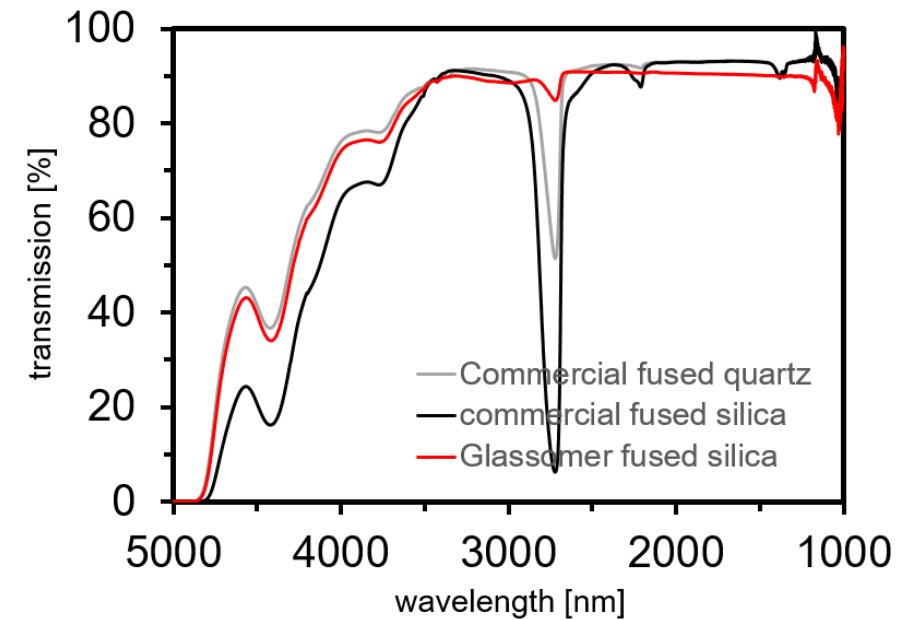
The Solution: Glassomer[®] High Purity Fused Silica



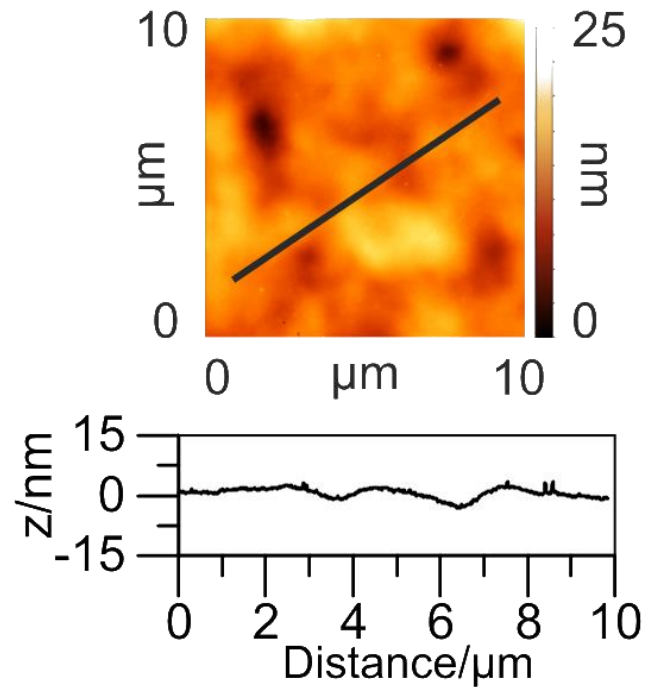
UV/VIS Transmission



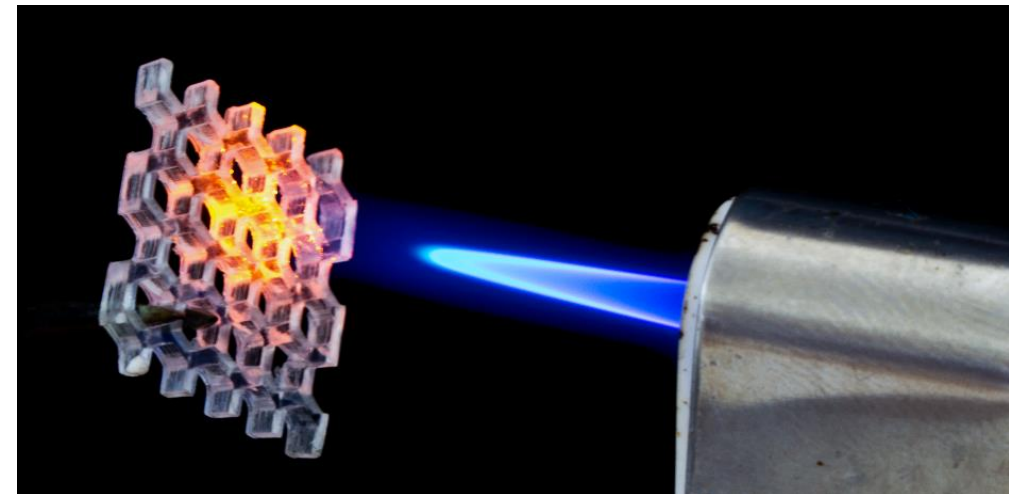
IR Transmission



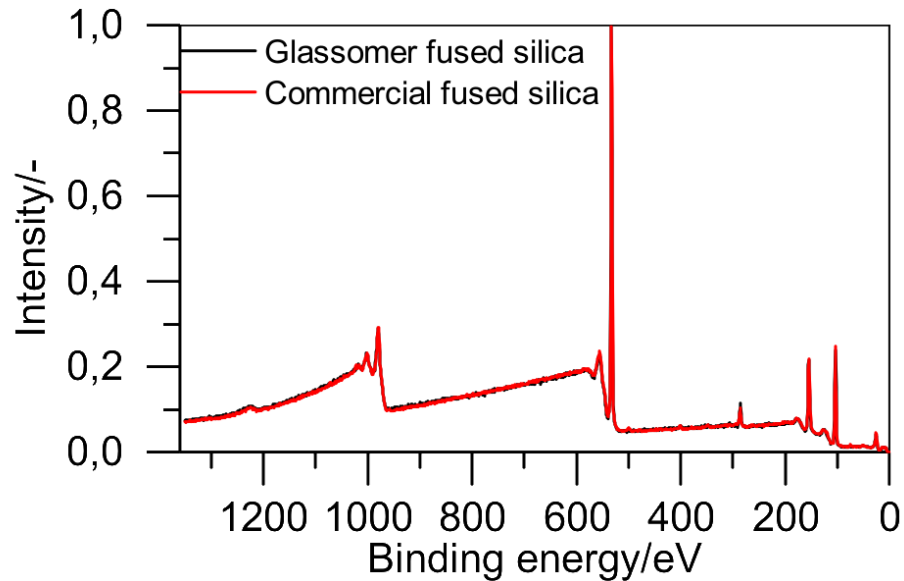
Surface Roughness



Thermal Resistance

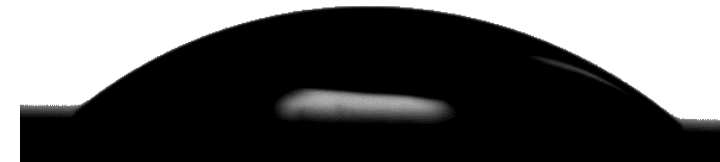


X-Ray Photoelectron Spectroscopy



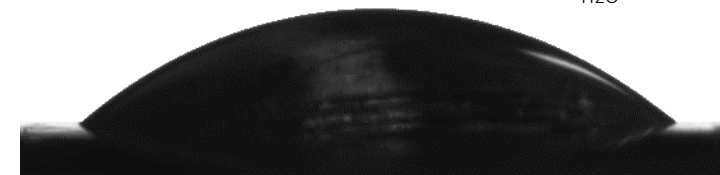
Wetting

$\gamma = 60.4 \pm 0,14 \text{ Jm}^{-2}$
 $\Theta_{\text{H}_2\text{O}} \sim 30^\circ$



Commercial fused silica

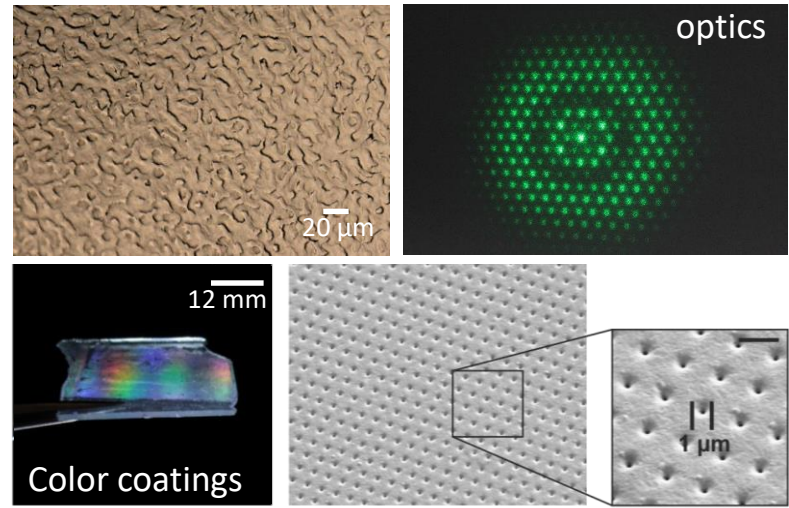
$\gamma = 59.4 \pm 0.52 \text{ Jm}^{-2}$
 $\Theta_{\text{H}_2\text{O}} \sim 30^\circ$



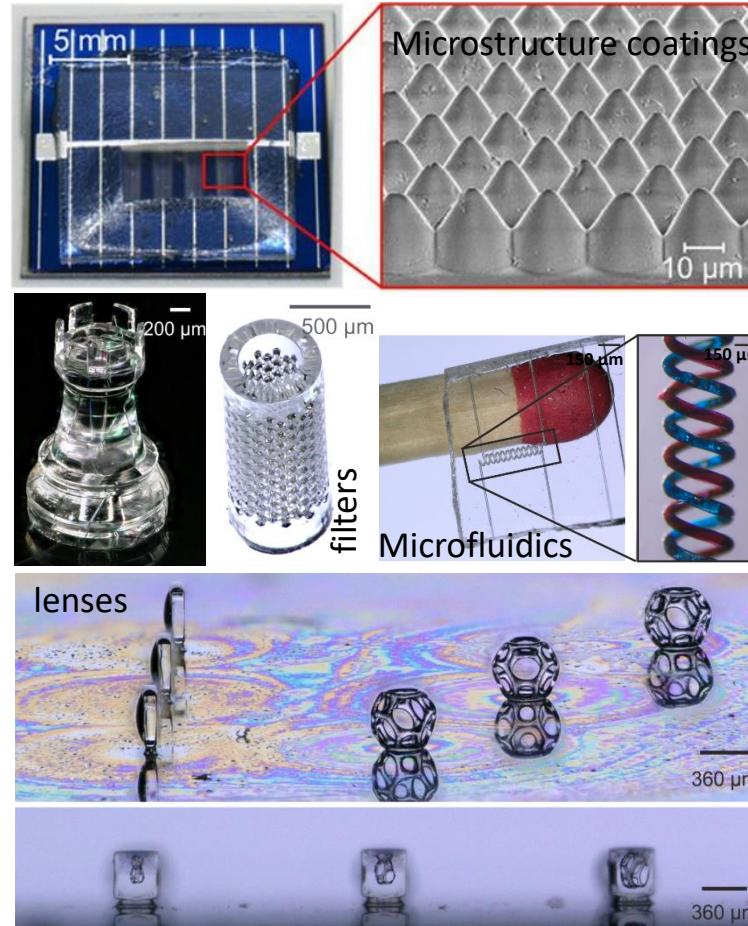
Glassomer® fused silica

Precision Glass Parts in all sizes – and in color!

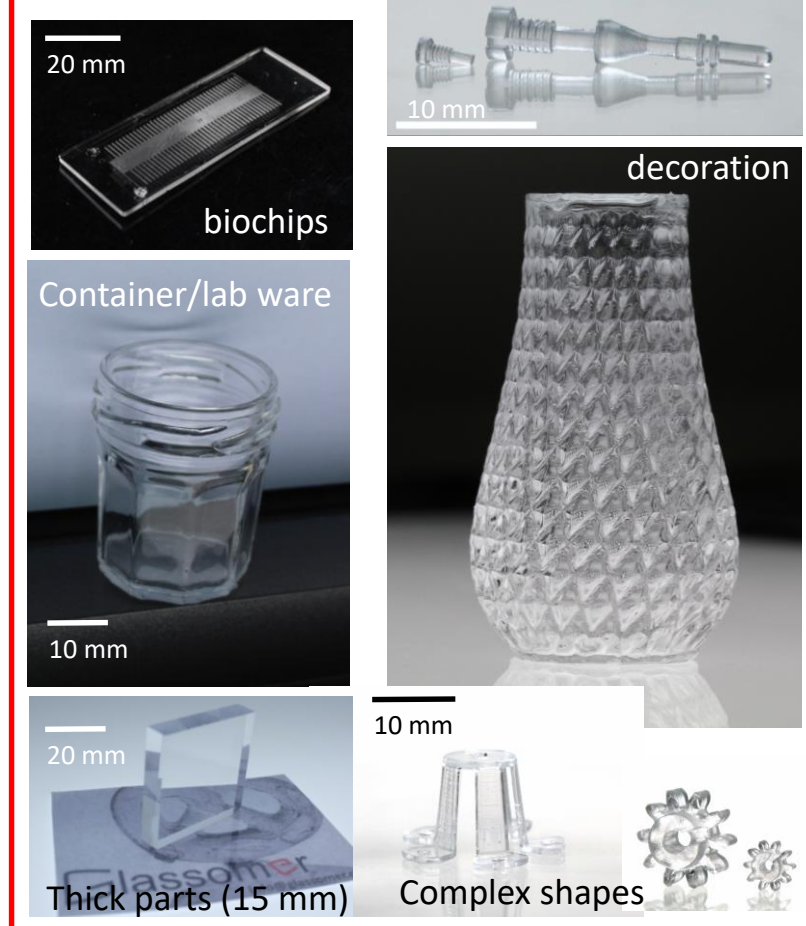
Nano



Micro



Macro



Coloured glass

