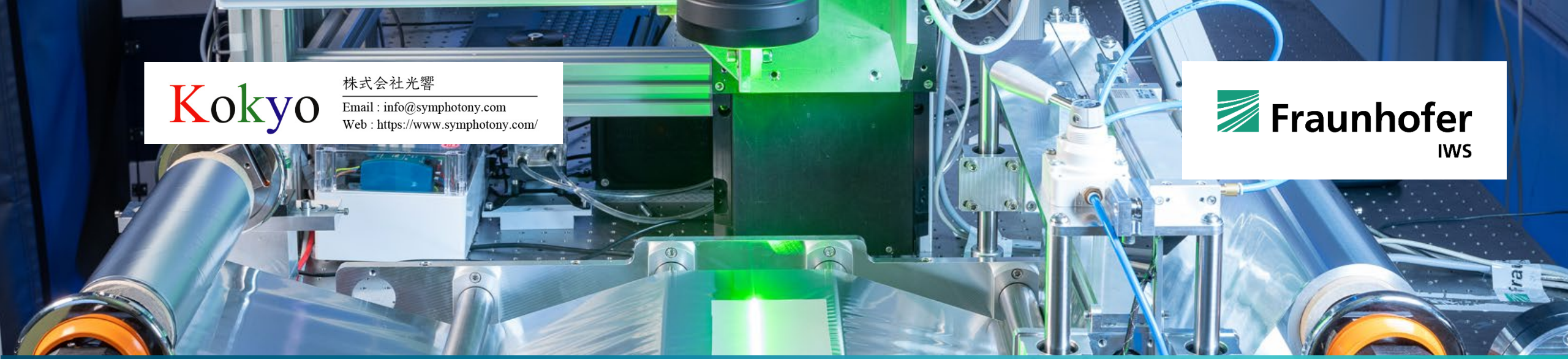


Fraunhofer IWS

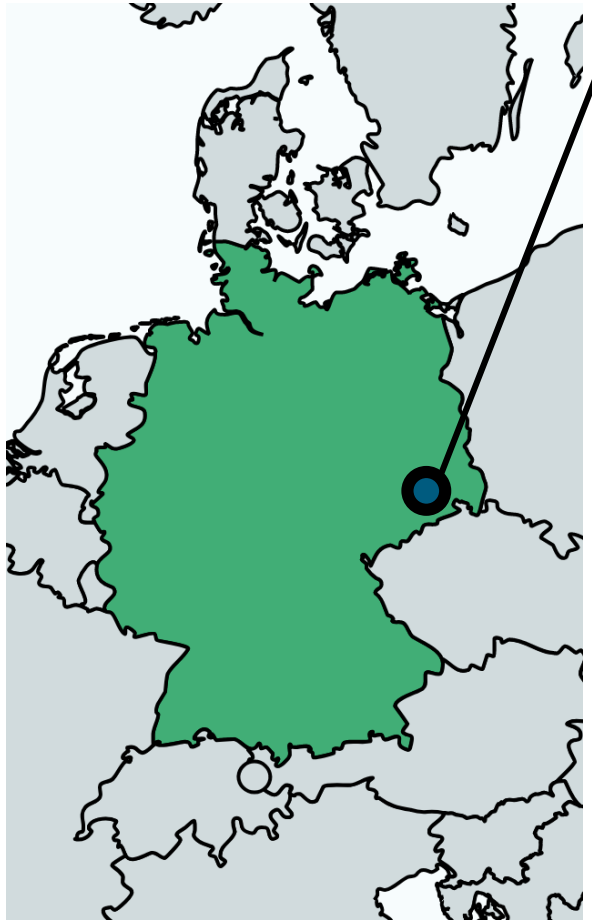
Bigger, faster, …smaller?! Development of system technology for direct laser interference patterning at the forefront of industrial needs

C. Zwahr[1], N. Serey[1], F. Schell[1], L. Nitschke[1] and T. Steege[1]

[1]Fraunhofer Institute for Material and Beam Technology Dresden, Winterbergstr. 28, 01277 Dresden, Germany

LPM2023
The 24th International Symposium on Laser Precision Microfabrication
June 13-16, 2023 Hirosaki, Aomori, Japan

CAMP - Center for Advanced Micro-Photonics



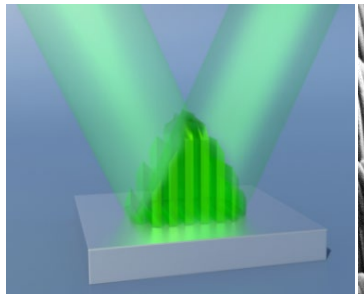
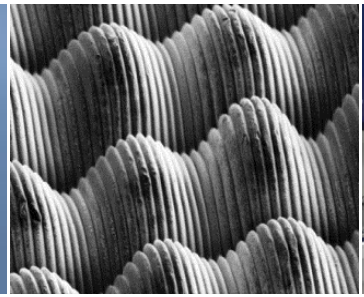
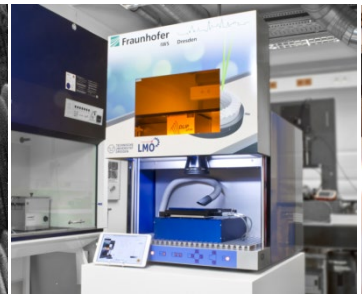
Dresden

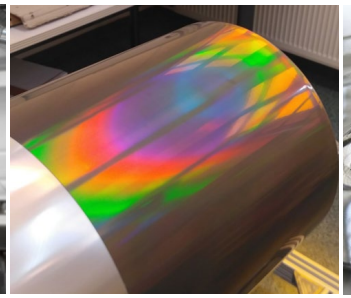
CAMP
CENTER FOR ADVANCED MICRO–PHOTONICS

Fraunhofer IWS

TECHNISCHE UNIVERSITÄT DRESDEN

From basic research to industrial applications




TECHNISCHE UNIVERSITÄT DRESDEN
CAMP CENTER FOR ADVANCED MICRO–PHOTONICS
Fraunhofer IWS

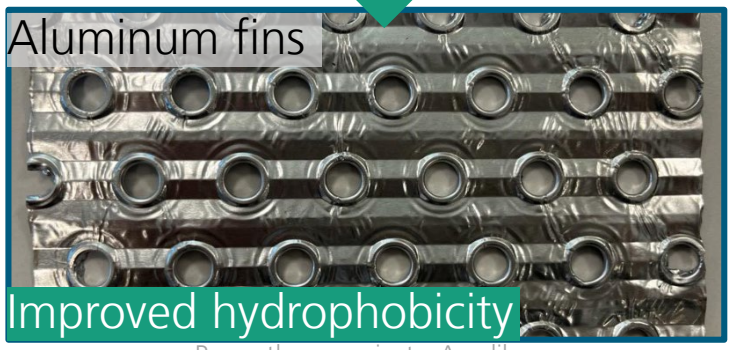
Application-driven process development

Improving surfaces of daily goods

Tumble Dryers

Better heat transfer

Aluminum fins



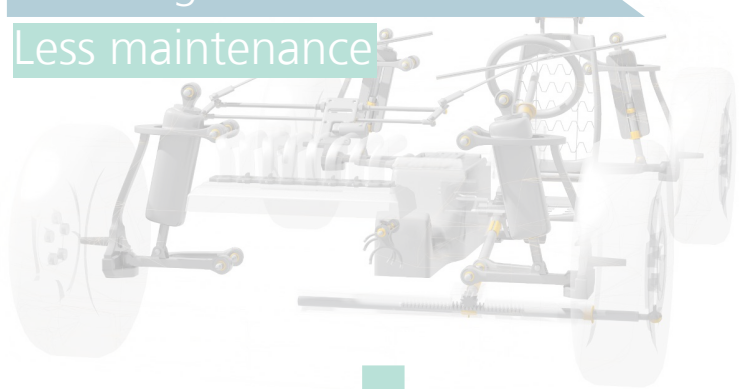
Improved hydrophobicity

Prometheus project - Arcelik

- **non-planar sheet metals**
- **high manufacturing speed**

Moving elements in cars

Less maintenance



https://blog.igus.de/wo-werden-gleitlager-eingesetzt/

Hard/Soft metal bearings

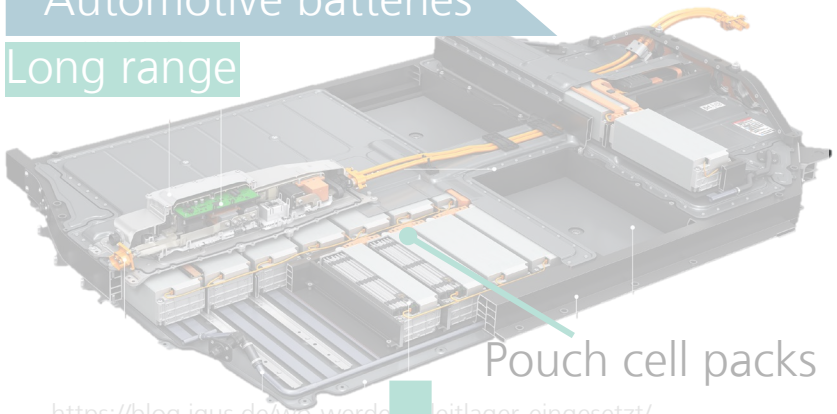
Improved friction

GRAPHITE COVA GMBH

- **small inner diameters**

Automotive batteries

Long range



Pouch cell packs

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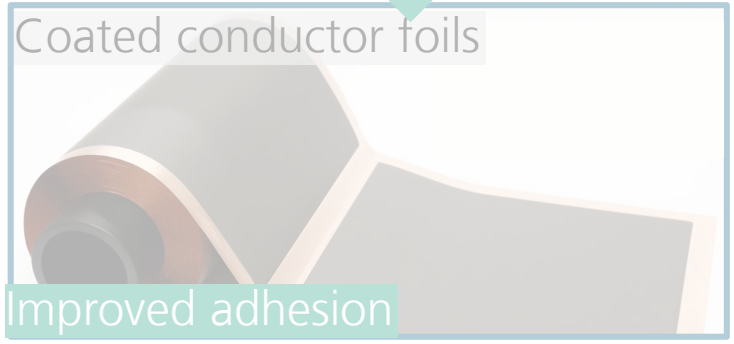
Coated conductor foils



Improved adhesion

https://www.youtube.com/watch?v=RJ8IlPaqL_k

- **very thin, wide foils**
- **high coating throughput**

PROMETHEUS RAPID ULTRA-SHORT PULSE LASER SURFACE TEXTURING TECHNOLOGY

CAMP CENTER FOR ADVANCED MICRO-PHOTONICS

Fraunhofer IWS

Motivation

Improving surfaces of daily goods

Tumble Dryers

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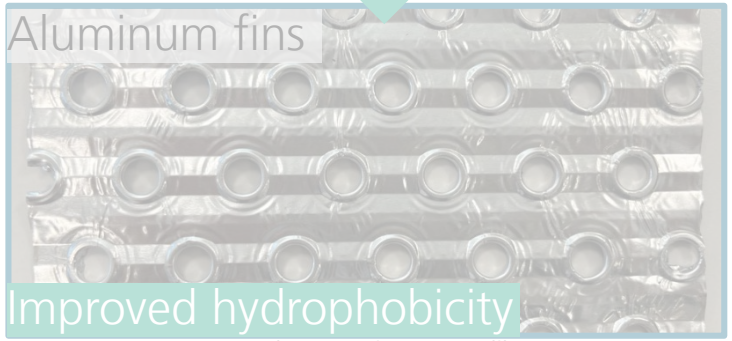
Aluminum fins



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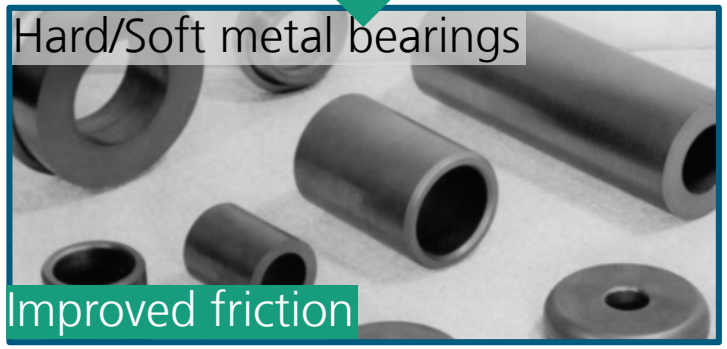

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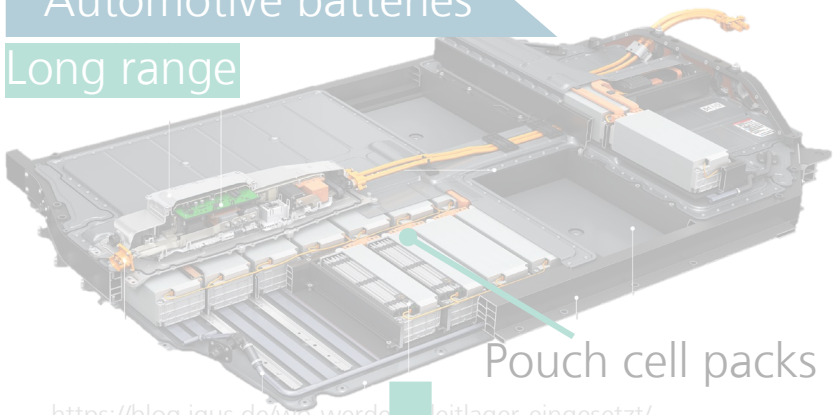

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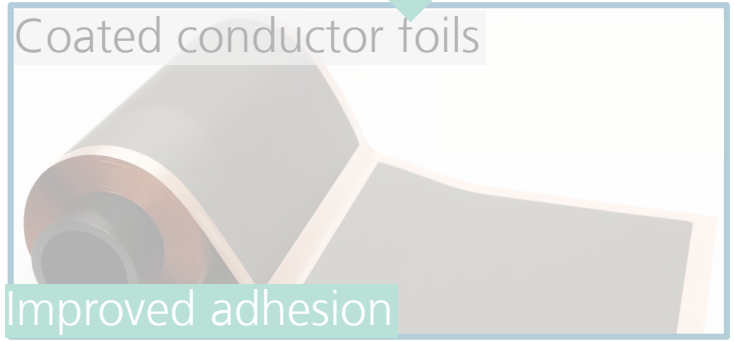

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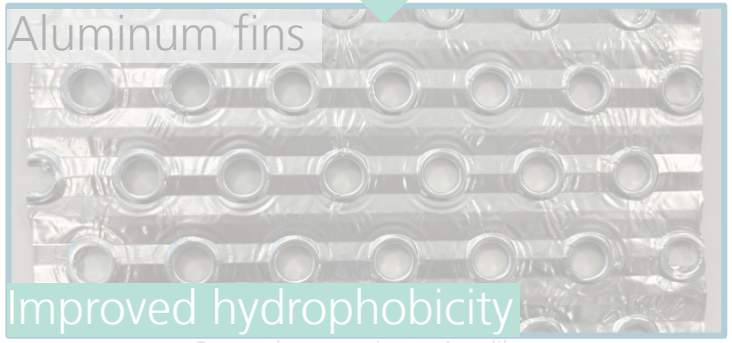

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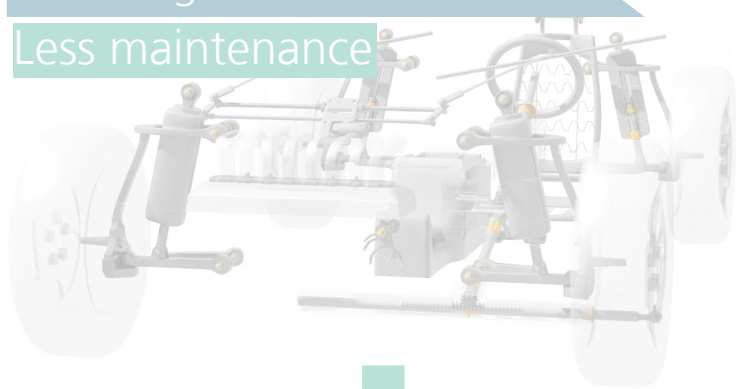

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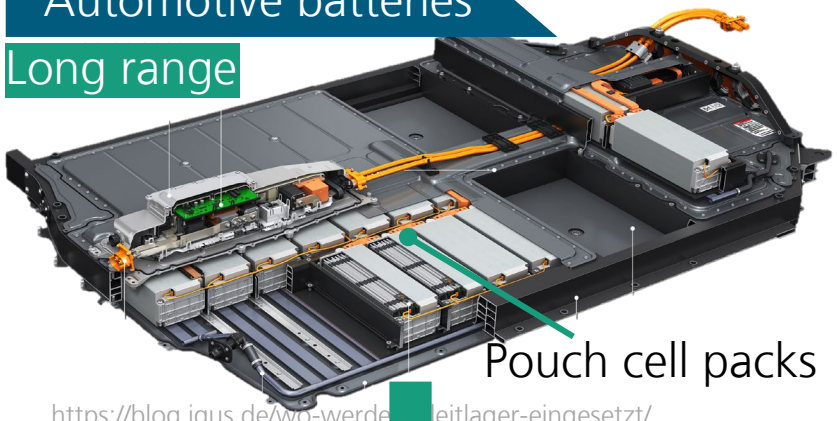

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PROMETHEUS RAPID ULTRA-SHORT PULSE LASER SURFACE TEXTURING TECHNOLOGY

CAMP CENTER FOR ADVANCED MICRO-PHOTONICS

Fraunhofer IWS

Laser texturing using Direct Laser Interference Patterning

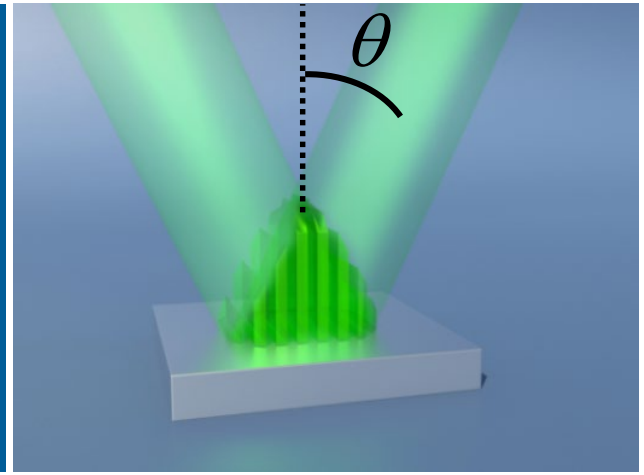
Industrial-scalable technology for large-area surface functionalization!

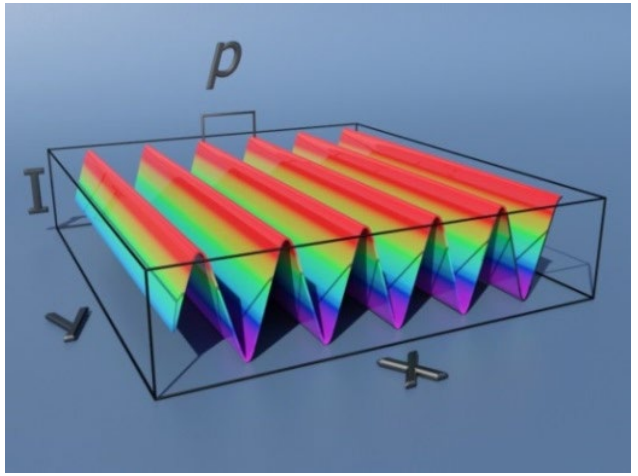
Hardware & pattern development

DLIP Technology

- Interference effects / patterns
- Facilitate pulsed laser sources:
  1064 nm – 266 nm
- One-step process
- One laser pulse generates up to several millions of surface features
- Process speeds: up to ~ 1 m²/min

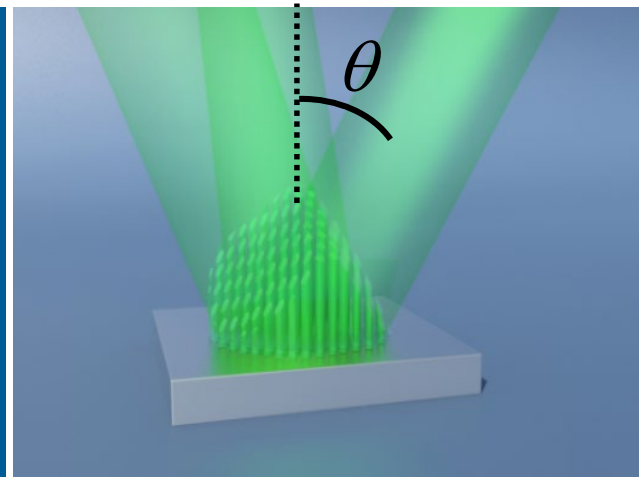
2-Beam Interference

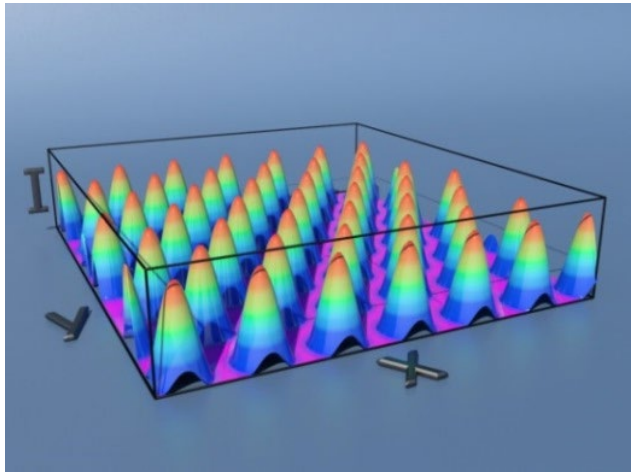




$$p = \frac{\lambda}{2\sin(\theta)}$$

3-Beam Interference





$$p = \frac{\lambda}{\sqrt{3}\sin(\theta)}$$

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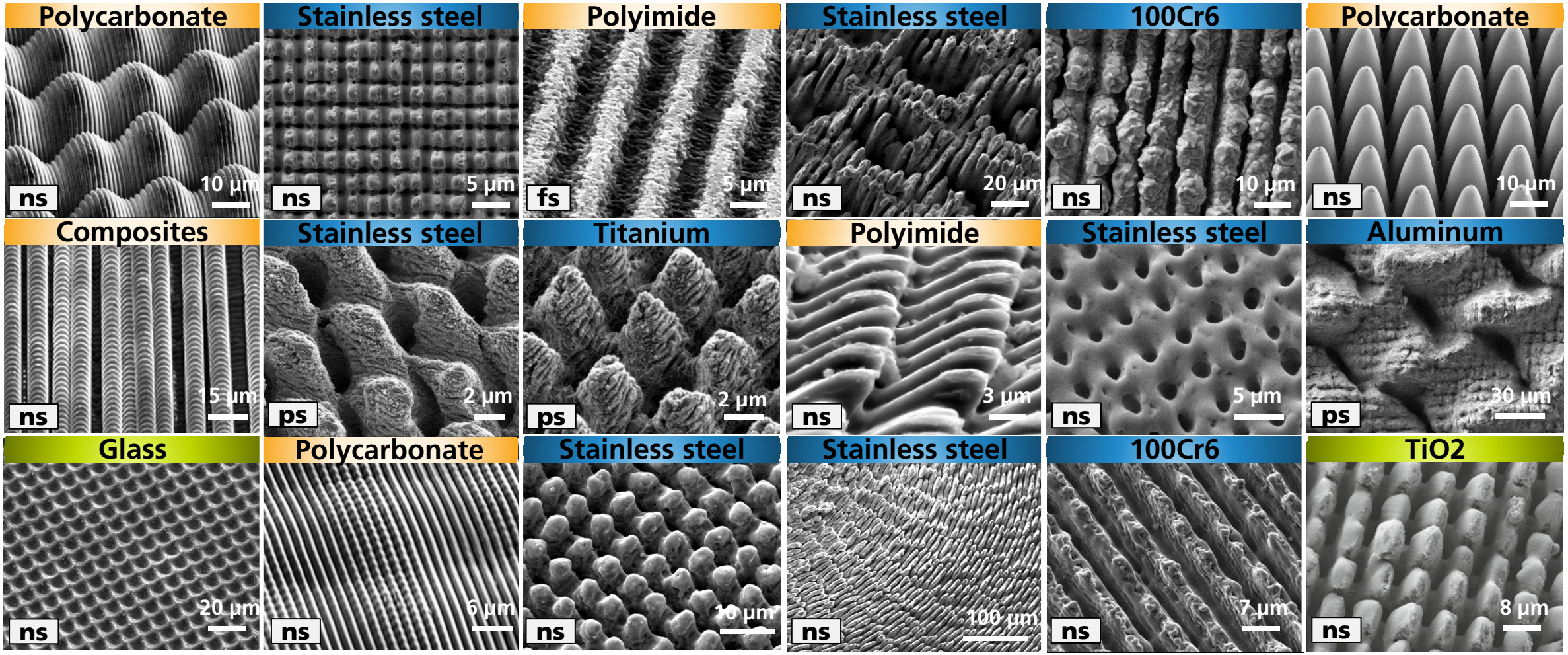
Laser texturing using Direct Laser Interference Patterning

A myriad of possibilities in surface microarchitecture design…



Fraunhofer IWS

Contact

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christoph.zwahr@iws.fraunhofer.de

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