



JOANNEUM
RESEARCH
MATERIALS



JOANNEUM RESEARCH Research Units

3

DIGITAL

ROBOTICS

HEALTH

POLICIES

MATERIALS

COREMED

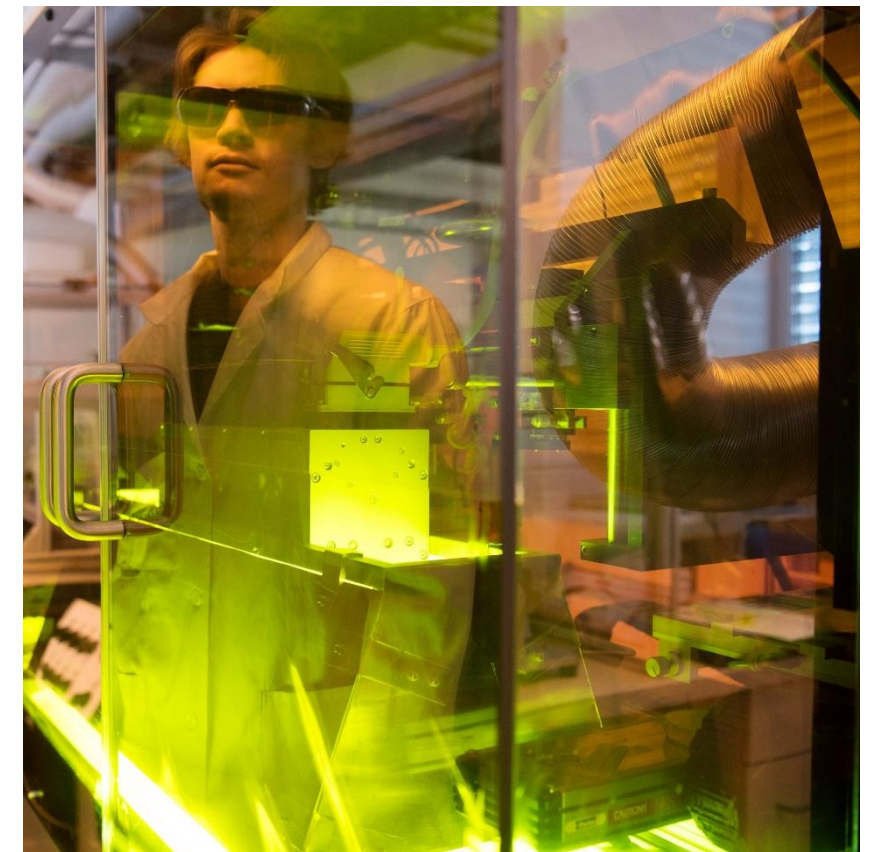
LIFE

JOANNEUM RESEARCH THE INNOVATION COMPANY

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JOANNEUM RESEARCH develops solutions and technologies for a broad range of industries and public agencies and is engaged in top applied research at an international level.

Optimally embedded in the national and international innovation network our staff develops innovations in the three thematic areas of information and production technologies, human technology and medicine, society and sustainability.



~ 500
Employees

State of Styria (80.75 %)
BABEG – Carinthian Agency for
Investment Promotion and
Public Shareholding (14.25 %)
Landesholding
Burgenland GmbH (5 %)

3 Owners

6
Locations
Graz
Klagenfurt
Niklasdorf
Pinkafeld
Weiz
Vienna

3
Thematic Areas

7
Research
Units

> 500 R&D-Projekts

19 Equity
Holdings (as of 2021)

~ 50 Mio. EUR
Research performance

~ 71 Mio. EUR
Total Assets

~ 4 Mio. EUR Investments

~ 170 Refereed Publications

~ 140 Scientific Lectures

> 70 Thesis
(Bachelor, Master, Dissertation)

6 National und
International Awards

22 Patents
(9 granted, 13 pending)

MATERIALS

Organization, Structure of Research Groups

7

- Director:

- Paul Hartmann

- 5 Research Groups

- ~ 100 Employees

- 2 Locations in Styria / Austria

- Weiz

- Niklasdorf

- 1 Location in Burgenland

- Pinkafeld



Hybrid Electronics
and Patterning
Barbara Stadlober

Light and Optical
Technologies
Christian Sommer

Laser and Plasma
Processing
Wolfgang Waldhauser

Sensors and
Functional Printing
Jan Hesse

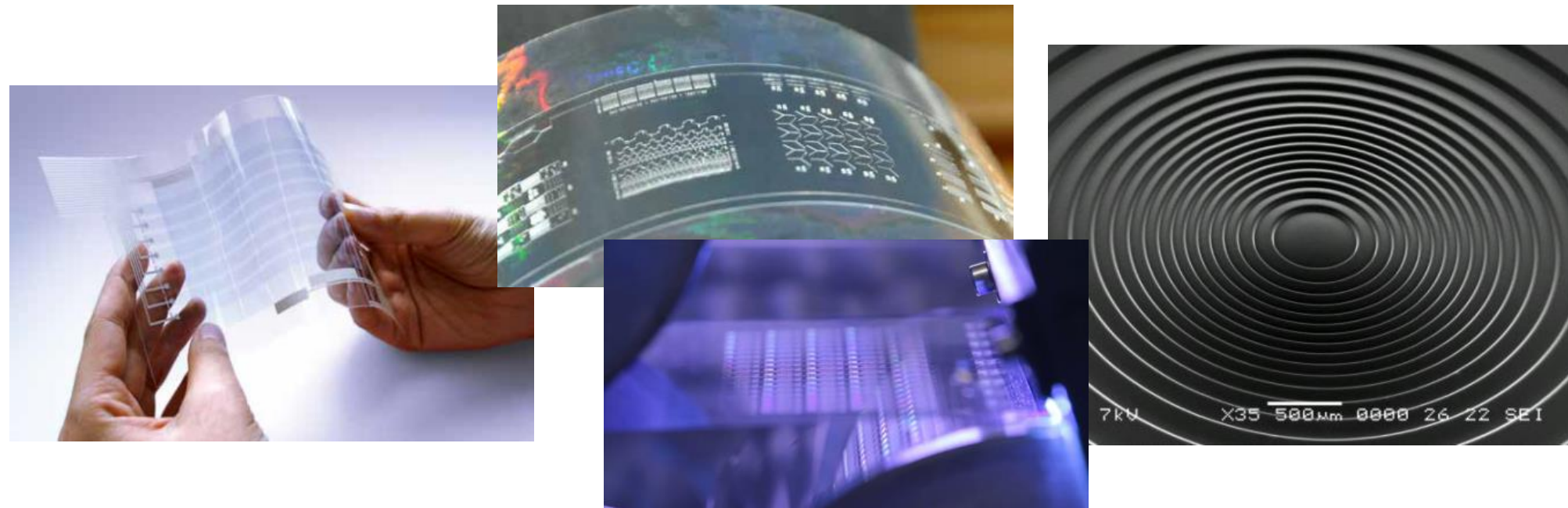
Smart Connected Lighting
Andreas Weiss

Vision

8

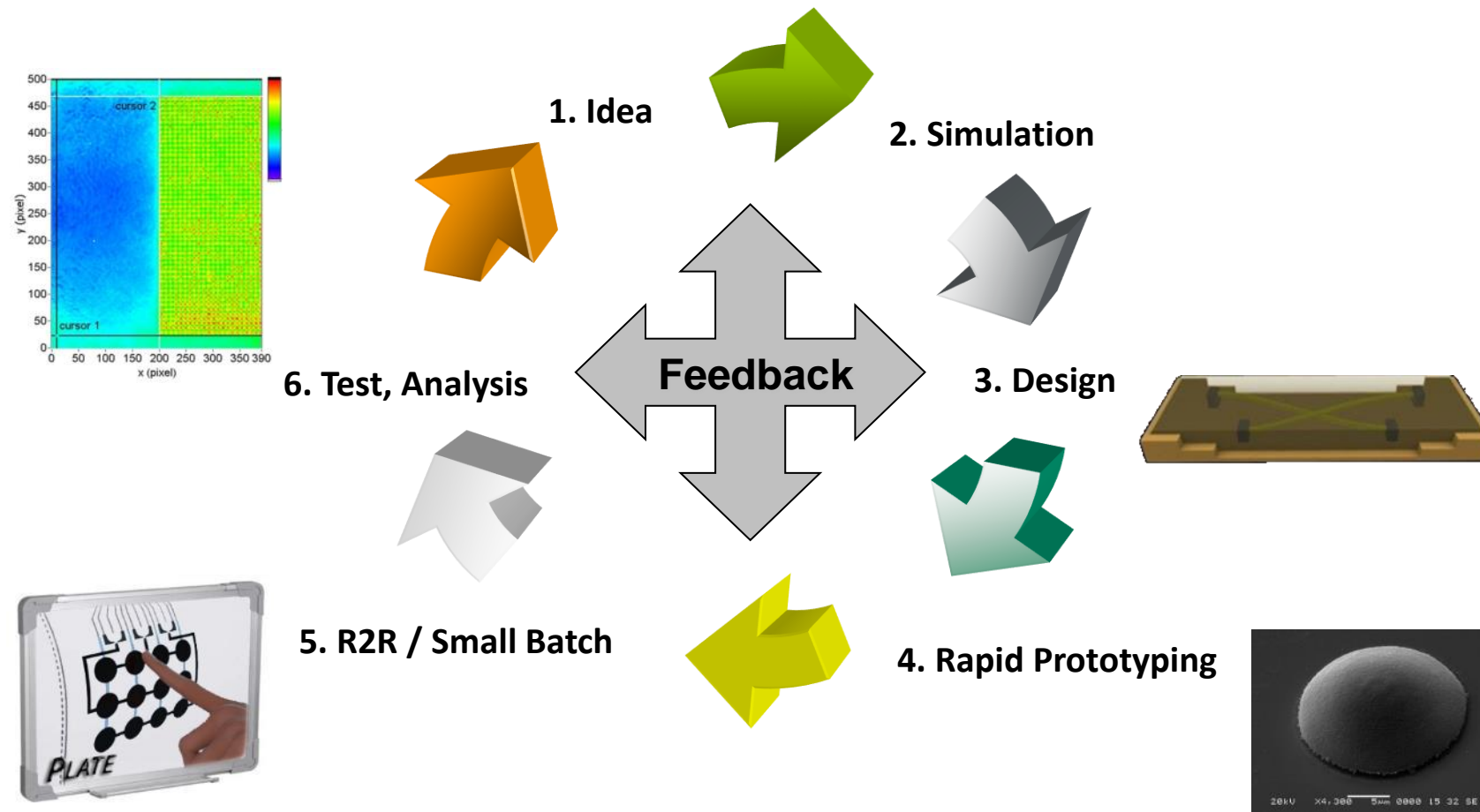
Smart MATERIALS for a sustainable future

MATERIALS – the leading research center for advanced materials and manufacturing solutions is your research and development partner for innovative processes and products



Pilot Line Concept offers Solutions to our Customer

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Infrastructure (excerpt)

10

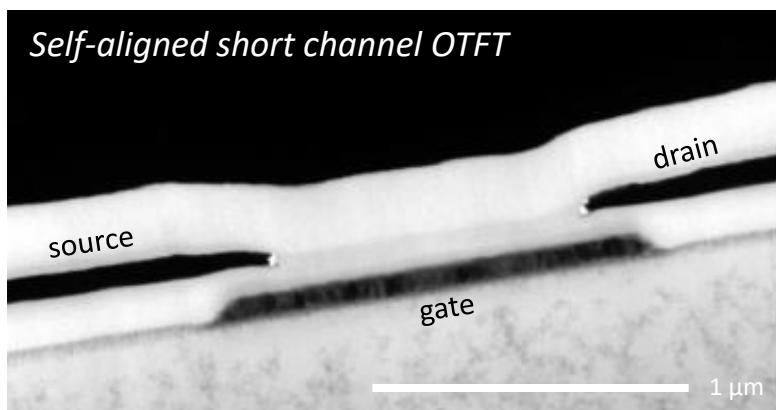
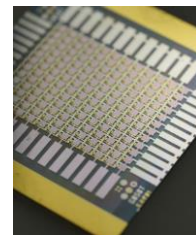
- Class 6 clean room certified according to ISO 14644
- Lithography and mastering
 - Roll-to-roll plant with hot embossing and UV Nano imprint lithography
 - High-resolution 3D structuring by two-photon absorption
 - Maskless grey-scale lithography
- Optical simulation
 - Ray Tracing, wave optic methods, combination
 - Freeform optics
- Vacuum deposition methods
 - Industrial thin film deposition facilities
 - Low temperature sputtering system (max 50° C substrate temperature)
- Additive printing and coating methods
 - Roll-to-roll facility for gravure printing
 - Screen printing with automatic screen alignment
 - Inkjet printing and processes
 - Aerosol jet printing
 - Atmospheric Pressure Plasma Jet
- Industry standard lasers and NC-controlled machining systems
- Surface, film and material characterisation methods
 - Laser Scanning Microscope
 - High-performance barrier or O₂ permeation
 - X-ray photoelectron spectroscopy (XPS/ESCA)
 - Spectroscopic ellipsometry
 - Scanning electron microscopy (SEM/EDX) or atomic force microscopy (AFM)
 - Photogoniometry



Hybrid Electronics & Patterning

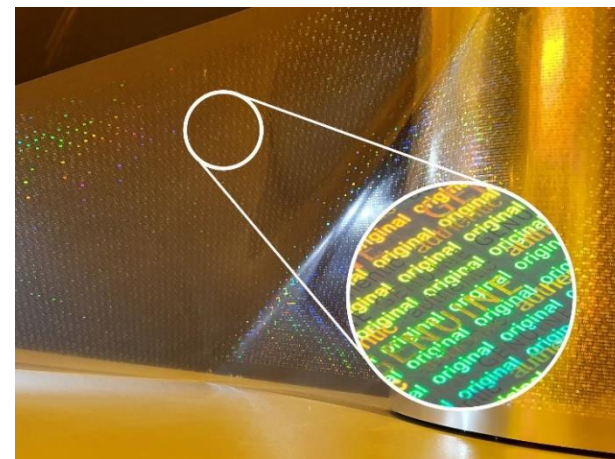
Thin Film Transistors

- **Printed electronics:** OECTs, resistors, capacitors, circuits
- **OTFTs:** Self-aligned, miniaturized
- Photopatternable **dielectrics**
- Dipole-modified **SAMs**
- **Flexible backplane** for active matrix sensors



R2R-Micro/Nanopatterning

- **Mastering:** Lithography (laser, photo)
- **Micro/Nanopatterning:** UV-Nanoimprinting, Step & Repeat
- **NILcure[®]:** robust & multifunctional imprint resins
- **Functional films:** bionics, μ -fluidics & μ -optics, transparent electrodes



PyzoFlex[®] - Sensors

- Printed flexible / stretchable **ferroelectric sensors**
- Enhanced **user interfaces** in 2D & 3D
- **Proximity sensors** for robotics
- **Sensor systems** for condition monitoring, industrial, consumer & smart home
- **Energy harvesting solutions**

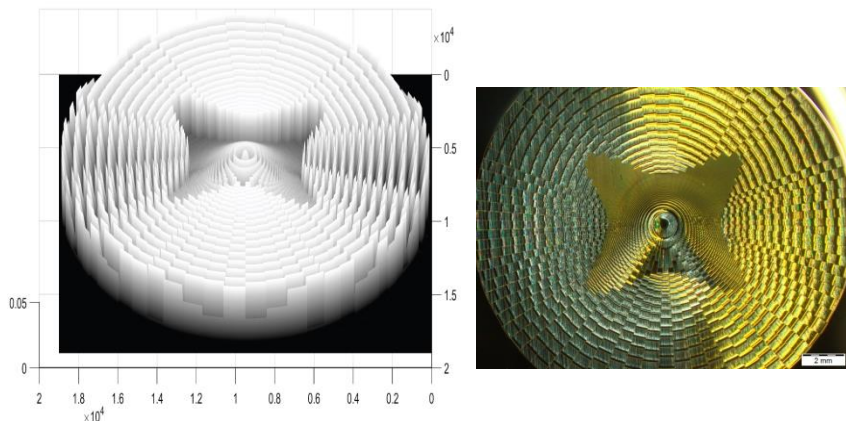


Light – for Function and as a Tool

Light & Optical Technologies

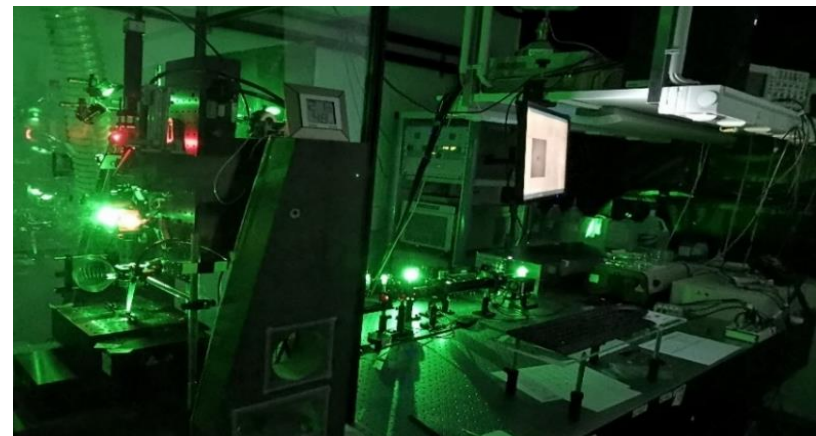
Optics

- **Optical simulation:** Ray-Tracing, Finite Difference Time Domain Method (FDTD), Multiscale Optical Simulations
- **Design, optimization of optical systems** for different applications (lighting, sensoric, photovoltaic)
- **Design of thin FF-optical elements for tailor made light management**



Laserprocessing

- **Laser ablation:** fabrication of ultraprecise mechanical and optical components, a.o.
- **Laser lithography:** two photon lithography, mastering of optical μ -structures
- **Laser sintering** of printed electrical contacts
- **Laser functionalization** of surfaces



PV & Optoelectronics

- **Common PV-Modules:** Innovative optical, photonic or plasmonic structures, Technologies for building integrated photovoltaics (BIPV)
- **Process and device development of next generation PV:** III-V semiconductors, OPV, Perovskites, CIGS, etc.
- **Development of methods:** for deposition and improving conductivity of printed electrical contacts
- **LED and LD technology** (phosphor conversion, lifetime models, reliability analyses, etc.)

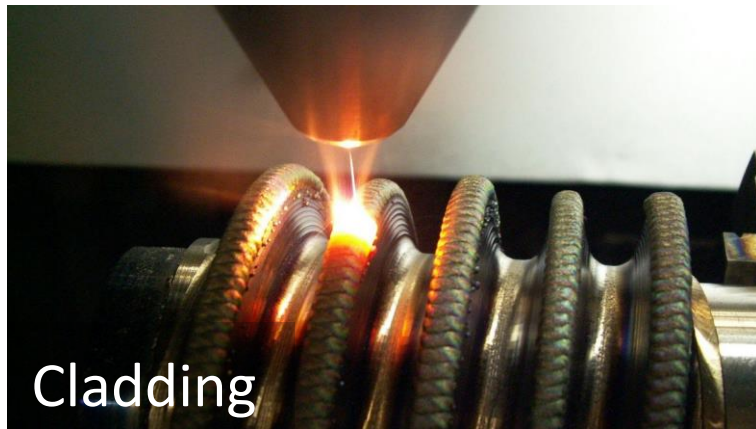
Innovative, precise and economical technologies for industry

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Laser & Plasma Processing

Joining & Thick Films

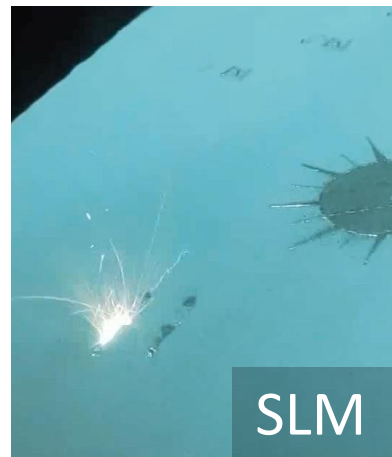
- **Laser Welding:** gear parts, tailored blanks, battery pack contacts, ...
- **Laser Cladding:** wear protection layers for tools, extruders, drill pipes for oil extraction, ...
- **Laser Alloying:** local wear protection for back-flow valves and bending tool, ...
- **Laser Beam Analysis**
- **Metallographic Characterization**



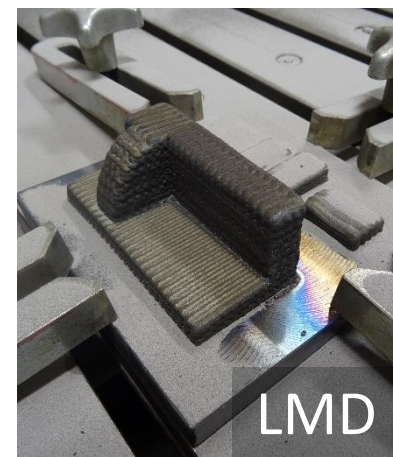
Cladding

Additive Manufacturing

- **Laser Metal Deposition (LMD or L-DED):** repair and prototyping of forging and casting tools, ...
- **Selective Laser Melting (SLM or LPBF):** personalized implants, aircraft components, ...
- **Hybrid Processes & New Materials**
- **Design and Simulation**



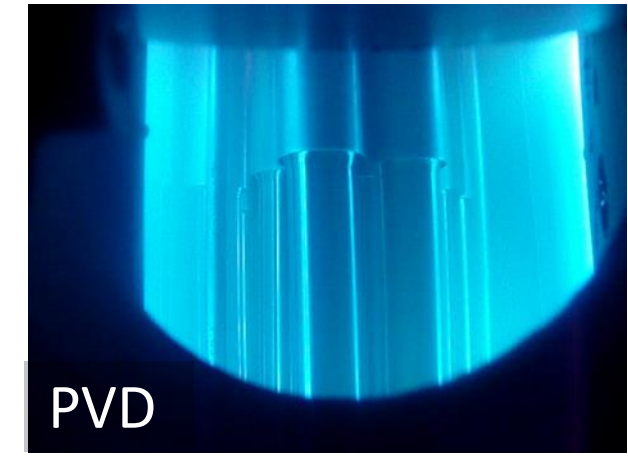
SLM



LMD

Plasma Surface Engineering

- **Physical Vapour Deposition (PVD)**
- **Plasma Enhanced Chemical Vapour Deposition (PECVD)**
- **Atmospheric Pressure Plasma Deposition (APPD)**
- **Functional thin films** for medical engineering, wear & corrosion protection, ...
- **Film Characterisation**



PVD

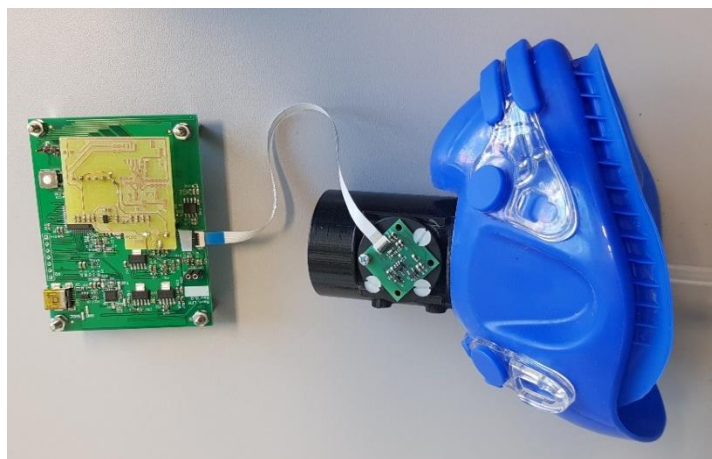
From concepts, materials and processes to prototypes and serial production

Printing makes Sense, ...
and Chips too!

Sensors & Functional Printing

Opto-chemical Sensors

- **Opto-chemical transducers:** chemo-sensitive chromo- and fluorophores
- **Matrices:** covalent coupling, physical embedding, nano-structuring, ...
- **Readout modules:** life-time, fibre-coupled, digital output, ...
- **Functional textiles - pH, sensing and diagnostic systems for – O₂, NH₃, ...**



Functional Printing

- **Ink development:** ionic self-curing inks, sensing inks, nano-particle inks
- **Digital printing:** Ink-Jet, Aerosol-Jet, Valve-Jet, Electro-static printing
- **Flexible printed circuitry, hybrid electronics for sensors, antennas, heaters ...**



Lab-on-Chip

- **Simulation based design:** fluidics & reaction kinetics, optics
- **Prototyping and upscaling technologies**
- **Surface chemistry:** covalent coupling, anti-fouling, R2R spotting
- Lab-on-Foil solutions for **medical diagnostics, food & environmental analysis ...**



From concepts to prototypes - application tailored process development and solution

Light, that connects

Smart Connected Lighting

Smart Electronic based Systems

- Analog/Digital Circuit Design
- Sensor Fusion
- Embedded Software
- Smart System Integration



Systems of Systems: Communication and Connectivity

- Wired and Wireless Connectivity
- (Backscattered) Visible Light Communication
- Visible Light Sensing
- Internet of Light



Integrative Lighting

- Non-visual Effects of Light
- Human Centric Lighting
- Horticultural Lighting
- Animal Lighting



Ready for the last mile of connectivity

Thank you very much

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