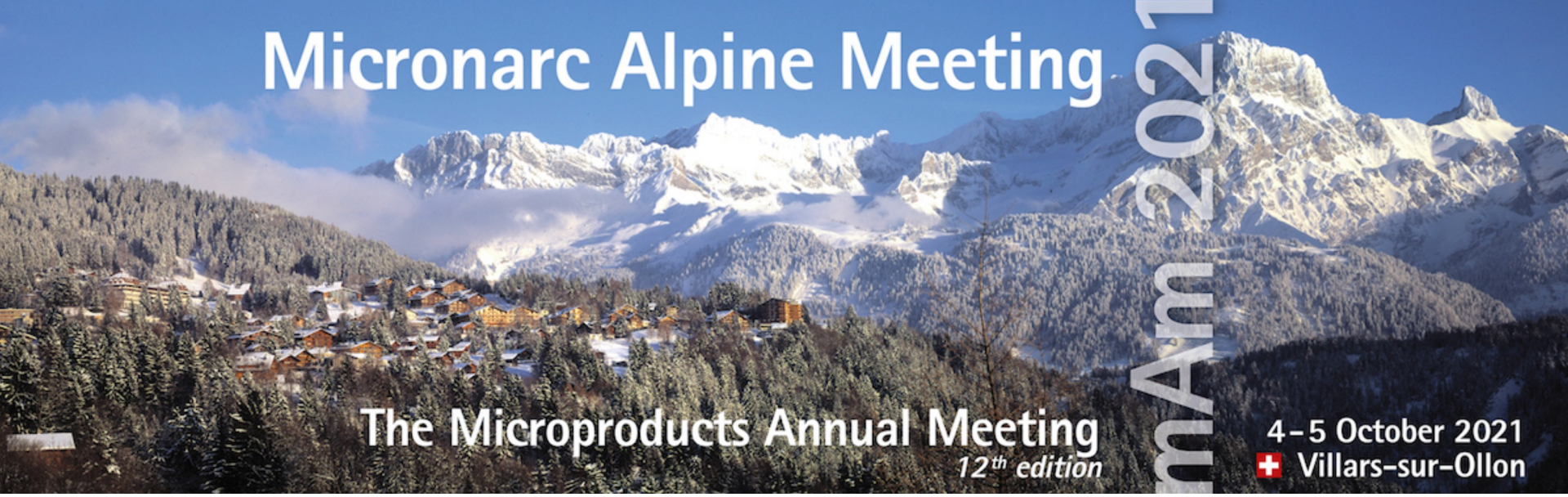


Final Remarks MAM 2021

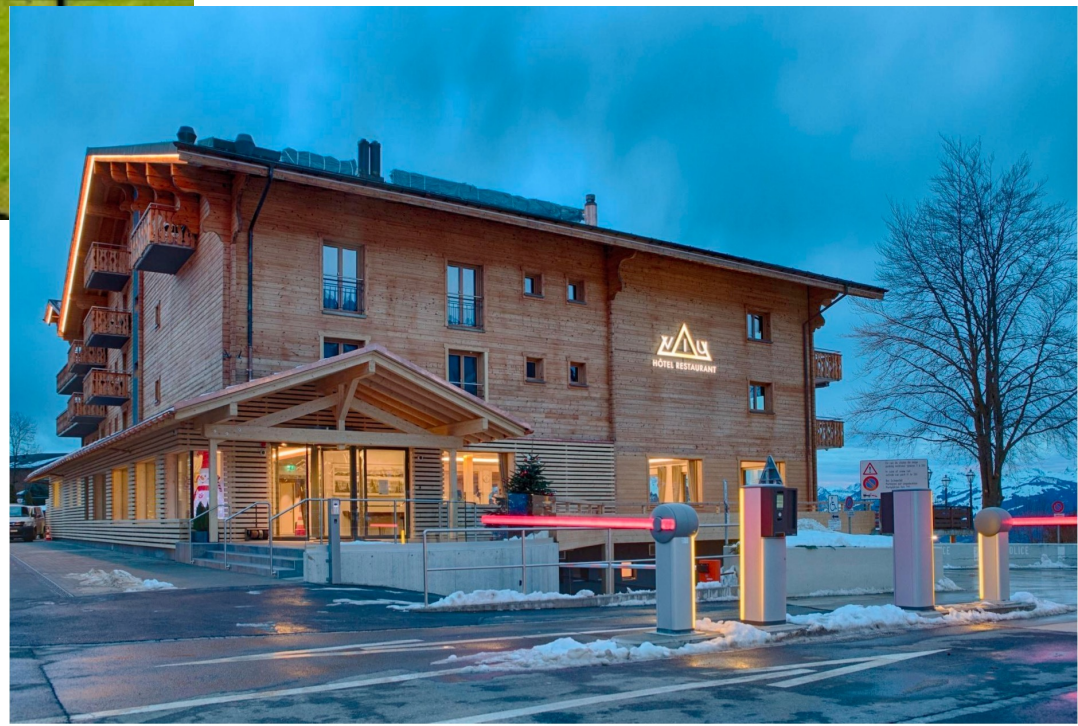
Volker Saile

October 05, 2021

mAm 2021, 12th Edition

Same Concept, New Venue, Same Quality

Change of Date, Season, Venue



The Program 2021

Monday 4 October 2021

09:00 - 09:30 **Welcome**

Edward Byrne, Micronarc / FSRM

Micronarc → Region, Mission, see also distributed Magazine
mAm 2021: what has changed - what has not changed
Type of conference: face to face
55 people this year

Prof. Volker Saile, Karlsruhe Institute of Technology

09:30 - 10:15

Invited Keynote on the Future of Micromanufacturing I

Chair: Volker Saile, Karlsruhe Institute of Technology

Prof. Dr.-Ing. Roland Zengerle
Hahn-Schickard& IMTEK (Germany)

Molecular Diagnostics at the Point-of-Need enabled by Centrifugal Microfluidics

Testing targets for SARS - CoV-2 Antigen Tests ← RT-PCR Test
Amplification 1 Billion
Centralized facilities for diagnostics vs Point-of-Need
1 hour vs days

Centrifugal Microfluidics : process chains and fluidic unit operations → 30 steps for PCR
Systems integration challenge.-
low cost platform, Simplicity

Many platforms are available

Centrifugal microfluidics - spinning frequency and temperature

Stick packs, transport, valves , mixing → start - stop spinning, detecting: lower limit 1 molecule

Hahn-Schickard pilot line

Application examples: Bacterial endotoxins, (with Suez Waters USA)

Second example: Spindiag SARS-CoV-2, 50 Minutes

Spindiag Rhonda, 2 discs per run, only 5 components

Collaborative robots for pilot line

Challenges and learning":

Regulatory affairs, complexity-keep cartridge simple, valididation, ramp-up , testing, you need 4 manufacturing lines, multiplexing, acceleration of results

10.45 – 12:00

Micromanufacturing Applications I Watchmaking

Chair: Roland Hirschi, Micronarc

Sylvain Dolla, CEO and
Nicolas Clerc, Vice President Product Development,
Tissot SA(Switzerland)

Tissot T-Touch Connect Solar: powered by nature – crafted for you

Swiss made with CSEM: smart watches, connecting watches.Solar, long lasting watch, independent 0S

Collaboration with CSEM important, 35 Patents
Power of Switzerland and Region. History of converted watches:

Requirements:
noble materials , connectivity, resistant, autonomous functions - connected functions, autonomy and independence

Pierre-François Louvigné, Sales and Marketing Director,
Silmach (France)

Introducing the so-called "hybrid MEMS" micromotors for connected watches

Silmach: 31 people, MEMS, combination with classical micro mechanics,

Si → foundry, assembly of components .
Power- MEMS (motors), Chrono-MEMS (sensors, detectors)
My - MEMS (customer needs)

Power-MEMS: watch making industry
Joint company with TIMEX Group (→ classic part): TIMACH
Assembly facilities in Besancon: Investment
PowerMEMS Boxes

Giulia Bottarini, Business Developer,
FEMTOprint (Switzerland)

New horizons in micro mechanical devices manufacturing

Glass and transparent materials since 2014
Subtractive 3D printing: laser exposure and chemical etching
No masks, no cleanrooms, wafer-level

Micromechanical devices: Optomechanical Sensors, 3D Watch components
Microfluidic applications
Optics and photonics
Replication by molding

Laser ablation of thin films

Exhibitor elevator pitch (3 min) - **Lyncée Tec**
4 D: Time resolved 3D measurements, Large Surfaces, Integration in production line

Exhibitor elevator pitch (3 min) - **HYBRID**
Microelectronics assembly, wire bonding, die bonding, screen printing, SMD

13:30 - 15:00

Micromanufacturing Applications II Medtech

Chair: Pierre-André Grandchamp, FSRM

Dr. Samantha Paoletti, Research and Business Development Mgr., CSEM, (Switzerland)

Microtechnologies behind organ-on-chips and organoids

Technology Transfer to Industry

In vitro models: Cells, Organoids +body fluids → Chip → Treatment

Start-ups: SUNBIOSCIENCE supported by CSEM
Automation: YOU-ON-CHIP
Biology
Picking and sorting
Regenerative medicine: CUTIS → Personalized skin graft
Non invasive heath monitoring: e. g. , urine analysis

Partnership for innovation.

Dr. Bernd Vogel,
Endosmart (Germany)

Nitinol – A Material with unusual Properties

Thermal and mechanical shape memory effect.
Biomechanical compatibility
Nitinol history, breakthrough: stents
Consumer products

Nitinol processing: expensive material

Endosmart manufacturing
Products: Implants
Endo smart: 60 workers, > 400 000 PCS → cleanroom

"Memory instruments“
Endourology
Flexible robotic surgery
Stents
Bone implants

Max Boysset, CEO
ICOSAMED (Switzerland)

Wearable ultrasound devices for cancer monitoring

Cancer : monitor, early detection

Bra wearable by using 3D array of ultrasound and AI
Product EZ ROSE: breast cancer: follow growth of cells

Data: Ownership

Medical board and tech partners
Technical aspects: Testing- simulations and phantoms
Select doctor
Data collection

Dr. Andreas Hogg, CEO, COAT-X and
Dr. Arkadiusz Kuczaj, Manager Aerosol Innovation and Dosimetry,
Philip Morris International R&D (Switzerland)

Biocompatible hydrophobic coating on high-performance filters for reusable community masks

Material: Filtration Properties - why a reusable mask?

ProMask.CH Partners
Build a dynamic inventory of fabrics, performance of 300 + fabrics
Aerosols: particle density, size, size distribution, deposition and filtration
Measurement: Test capabilities developed within Consortium
Filtration → Breathability

Conclusion: layering of fabrics, value propositions of product
Hydrophobic coatings , washing at 60°C, thin , different surfaces

Exhibitor elevator pitch (3 min) - **Amplitude Laser**

Why ultrafast lasers?
Fiber lasers, hybrid lasers

Markets: Science, Industry, Medical

15:30 - 17:15

Sensors

Chair: Philippe Fischer, FSRM

Andrea Onetti, Analog, MEMS and Sensors Group Vice President, MEMS Sensors Division General Manager, STMicroelectronics (Switzerland/Italy)

Changing everyday life with intelligent micromachined sensors

Easier and healthier life: **offline era, online era , onlife era**

On line era: performance improvement and technology fusion,

(sensor mprovements: power, cost, performance)

Onlife era: unique devices able to observe, think and act. Fusion of technology and life

Fragmented - connected-trained. Sustainable technology

ST vision: Sensors with machine learning Core

Smart glasses and LIDAR - key onlife enabler

MEMS mirror: electrostatic to electromagnetic to piezoelectric

Challenges: accuracy, miniaturization, scalability

IC-technology, embedded AI

Are we ready: Yes!

Dr. Nicole Ruiter,
Karlsruhe Institute of Technology (Germany)

Breast imaging with Ultrasound Computer Tomography

Breast cancer every 10th woman in western world
KIT 3D USCT
Reflected and transmitted US

Challenges: many sensors, data rates, signals are weak
Studies: inflammatory carcinoma
Multi center study with more than 1000

New improved system
Transducers and front electronics
Commissioning of 3D USCT-III

Next steps: Multi center study, reconstruction, transducers

Dr. Stefan Kimmerle, Director Engineering,
Bosch Sensortec GmbH(Germany)

Hidden high-tech in consumer sensors

Si-Markets: US, China
But Si-sensors: Europe: Hidden high-tech in consumer sensors
Limits: people

Gas Sensors: reduction in power consumption
Application: wildfires → sensor node
Sensor: 1W→ 0.5mW by low thermal mass for hotplate

Magnetic sensors: → TMR sensors: power consumption
TMR stacks: 10 atomic layers

Smart sensors - automatically tracking activity : AI
Pressure sensors: resolution of 10cm - how many stair steps!

MEMS sensors: Europe is world leader!

Dr. Dominik Rabus, RABUS.TECH (Germany)

MEMS Spectrometers, Cloud Computing and High Volume Production: A perfect match?

Spectral Engines (VTT spin-out)
unispectral (MEMS mirror) spectrometer

Data analysis
Plug into smart phone - image analysis
The magic and the cloud: commercial software available
Training with data - cloud
Machine learning, many sensors

Customers: Cannabis, Drugs, Plant Health, Anti-Counterfeiting (fake medicine)

Exhibitor elevator pitch (3 min) - **Radar Swiss**

Powder coating technology, Manual powder coating equipment
Materials - wide applications
Ways for cooperation


Conference Dinner

Tuesday 5 October 2021

09:00 - 09:45

Invited Keynote on the Future of Micromanufacturing II

Chair: Prof. Volker Saile, Karlsruhe Institute of Technology

Prof. Rüdiger Dillmann,
KIT/FZI Karlsruhe (Germany)

Building Brains for Robots: Neuromorphic SNN-based Controls for Robot Visuomotor Tasks

Human brain project.
Building robots, learning from nature, different generations
Robust biomorphic systems: hazardous field applications
Snake or worm like robot: pipelines, narrow environments
Full autonomous robots.: 1988-2021
Humanoids: artifical skin, stereo head, fingernails, kognitive capabilities

How to program such a robot: many motors, sensors
Artificial neural nets: subsymbolic reasoning
Communication between robots

Subsymbolic programming
SNN Spiking Neural Networks

Building Brain-like Controls for Robots - assumptions for Brain Models
Human Brain Project

Spiking Artificial Neurons: only spikes
Very low energy consumption
Pattern recognition, drones, event cameras

Approach for Robot Brain Models
Data Set - Training - Robot

10:30 - 12:15

Novel Manufacturing

Chair: To be confirmed

Prof Dr-Ing Andrea Iris Schäfer, Director
Institute for Advanced Membrane Technology (IAMT),
Karlsruhe Institute of Technology (Germany)

Nanomembranes for water treatment

Water challenges, Nanomembranes, Clean water

Pollutants: viruses and bacteria – small and large
Desalination, humic substances removal

Today: micropollutants → enormous health cost
Nanomembrane: semipermeable layer
Pressure driven processes , nanofiltration <1 nm
Nanomembrane: morphology
Novel materials: Challenges

Adsorption, Photocatalysis, Toolbox Approach
Examples: morphology ← > performance
Hormones, breakthrough
Photocatalytic reactions
Reactive membranes
Manufacturing challenges
Digital twins

Frederic Loizeau, Business & Technology Development Mgr..
CSEM

Augmented CMOS: how to add new functionalities to a mature technology?

Silicon chip shortage
Million of useless cars
Silicon is getting more expensive
Santa might be late this year

CMOS is everywhere
Additive manufacturing brings new functionalities
Aerosol jet printing" focused beam <10 micrometer , 3- 5mm stand-off

Augmented CMOS:
Chemical sensor → pH sensor (with Bürkert), functionalization
Molecular imprinted polymers

Optical features on chips: minimum feature size 30 micrometers

3D electrode arrays: brain micro-tissues
non- flat surfaces: electro-deposited pillars

Prof. Dr. Jürgen Brandner, Scientific Director Karlsruhe Nano Micro Facility KNMFi, KIT (Germany)

The Karlsruhe Nano Micro Facility: Open Access User Facility for Machining, Characterization and Research Data Management in Nano and Micro Scale

Open innovation user facility for research in nano and micro scale

Open to industry and academia

Common publication or pay full cost

Nano micro-structuring, characterization , RDM

Examples: Submicron 3D printing, He-ion microscopy

Modelling, simulation, RDM

Typical process chains: correlative aspects

How to perform with KNMF

Long term perspective: KCOP, KNMR (2026 and 2028)

Dr. Björn Gojdka, Group Leader, Agglomerated Microsystems,
Fraunhofer-ISIT (Germany)

Novel PowderMEMS microfabrication technology for integrated 3D functional microstructures

MEMS world is flat: semiconductor processes - let's make it 3D

Fraunhofer Society: data, Itzehoe ISIT, R and D on industrial level
Business unit MEMS Applications, Group Agglomerated Microsystems

PowderMEMS: Si mold, dry filling, ALD solidification, surface conditioning

3D micromagnets, porous structures

Integration in MEMS devices: Energy harvesting, zero-power standby magnetic field sensor, porous structure for microfluidic applications, soft magnetic cores: microcoils

Organiser elevator pitch (3 min) - **FSRM**

Gala picture by Dali
FSRM-activities: Courses

14:00 - 14:45

Invited Keynote on the Future of Micromanufacturing III

Chair: Philippe Fischer, FSRM

Prof. Yves Bellouard,
GALATEA LAB, EPFL (Switzerland)

Non-ablative femtosecond laser processing: expanding the realm of 3D manufacturing by tailoring material properties.

Non-linear absorption - fs laser
Beyond diffraction limit, ultra-high aspect ratio, 3D

Glass -in-Glass : Process workflow - IR Glass into Silica
Tune material properties: Inner structure
Thermomechanical properties
Fused Silica weirdness

Measuring stress and strain : stress-nano gratings orientation dependence
Method for measuring CTE's variation

Resonant Cantilevers: again orientation of grating, polarization
Engineering the stiffness through laser writing
Applications: non- linear optomechanical resonator: change of dynamical behavior

Fine -positioning: Flexures + modifications (non-contact)
Laser to fibre coupling, optical bench on glass chip

Does glass flow?
long term stability? Static stress. Does not flow!

Laser-induced cavitation: TPa range, laser-induced high pressure

Self organization, depending on polarization of laser

In-situ monitoring: digital holography microscope

14:45 - 15:00

Final Remarks

Thanks

Speakers, Audience, Sponsors, Exhibitors, VAUD, Organizers

Supporters

VAUD

innovaud.ch

Gold Sponsors

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MICRONARC Western Switzerland Micro-nanotech Cluster

Organisers

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HYBRID SA


KNMF
Karlsruhe NANO
MICRO Facility


FEMTOPRINT
3D PRINTING FOR GLASS MICRODEVICES


RADAR

Booster

GMP
GENERAL
MICROTECHNOLOGY
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SEE YOU AT MAM 2022

VILLAR-SUR-OLLON

XXXXXX YY- ZZ, 2022