Willkommen
Welcome
Bienvenue

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Materials Science and Technology

Lab-on-Fiber: Fluorescence and Colorimetric Sensors for the Monitoring of Wounds and Other Diseases

Prof. Dr. René M. Rossi
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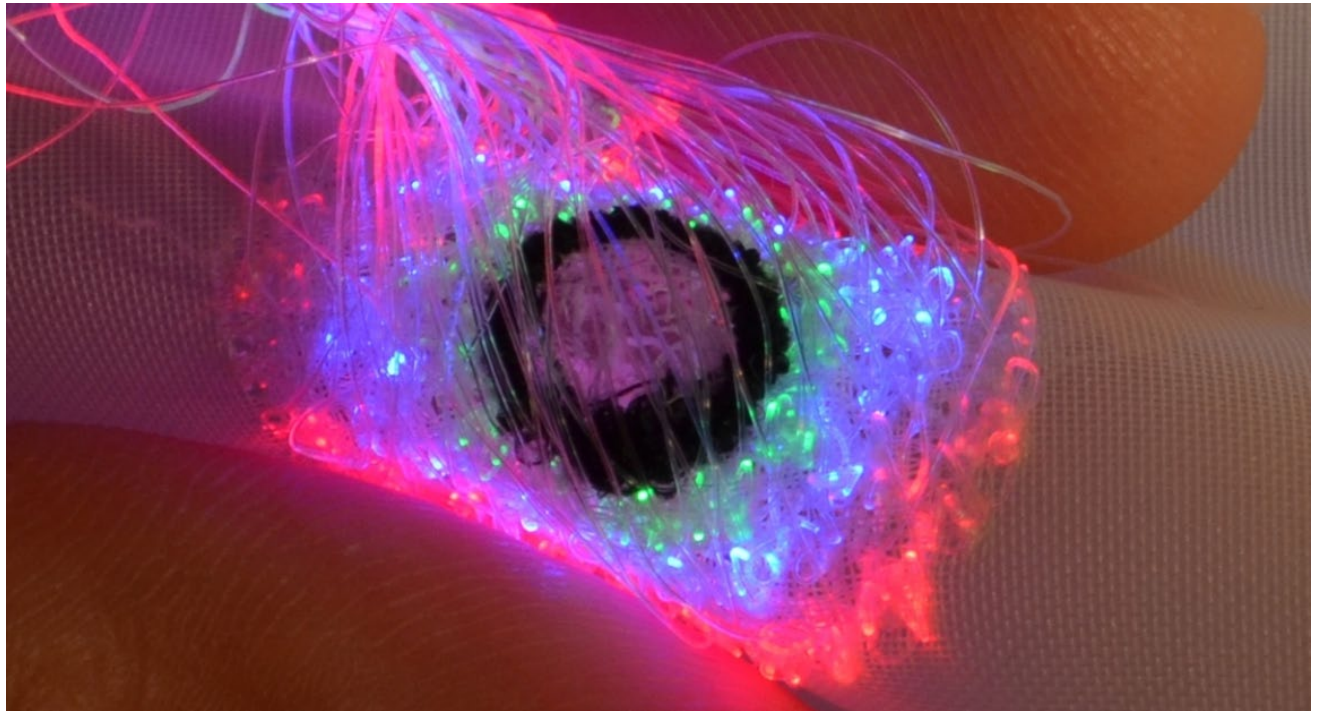
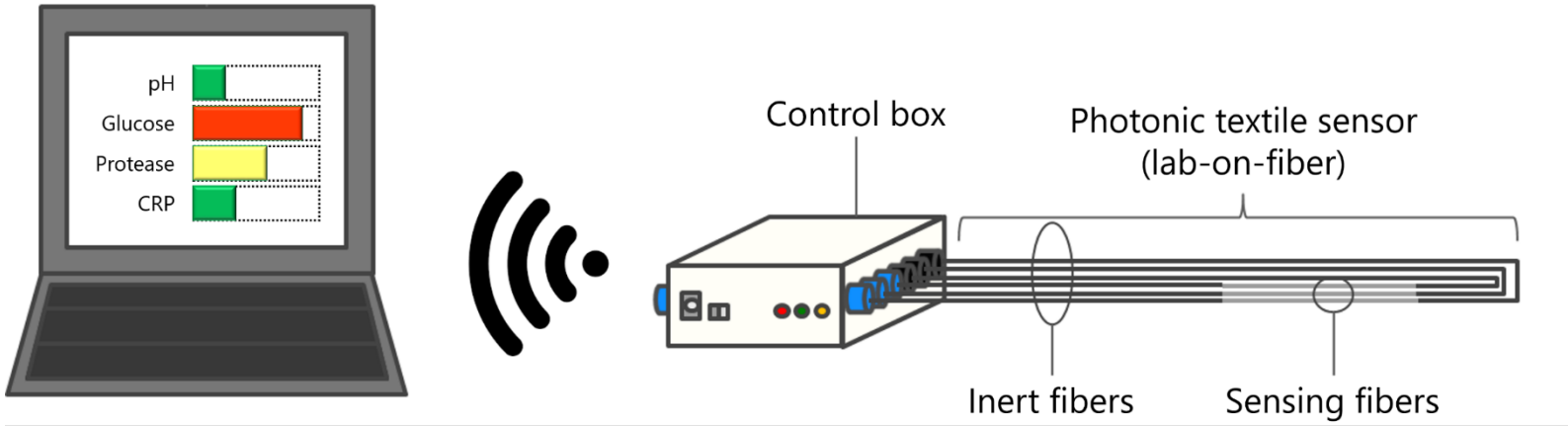


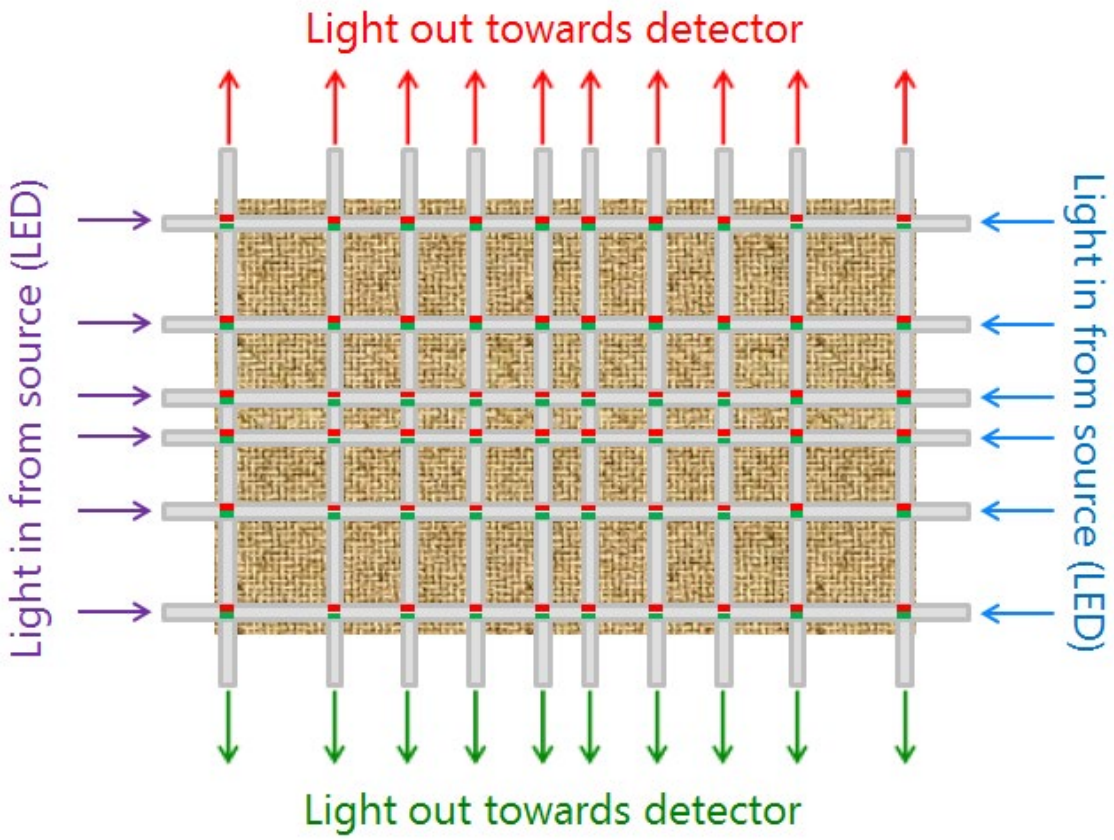
Project Aim



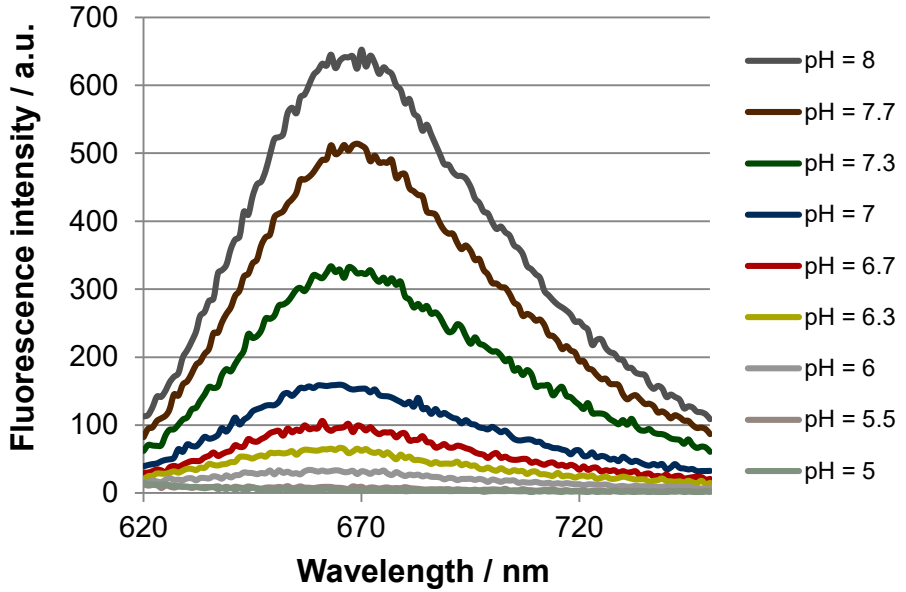
Development of a **multi-sensor platform** to allow a time and spatial resolved **detection of relevant metabolites for wound healing**

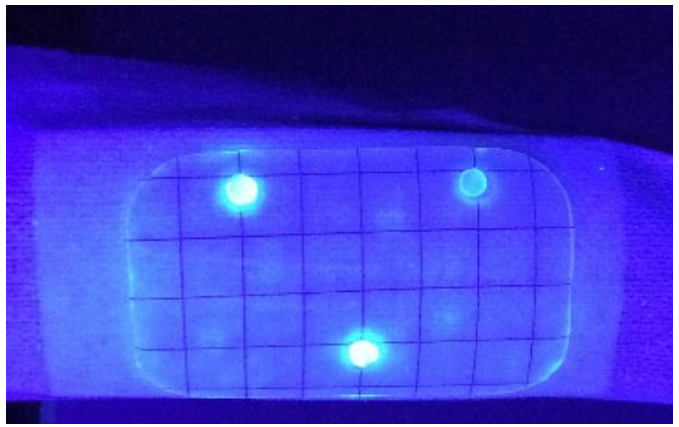
Strategic Focus Area
Personalized Health
and Related Technologies

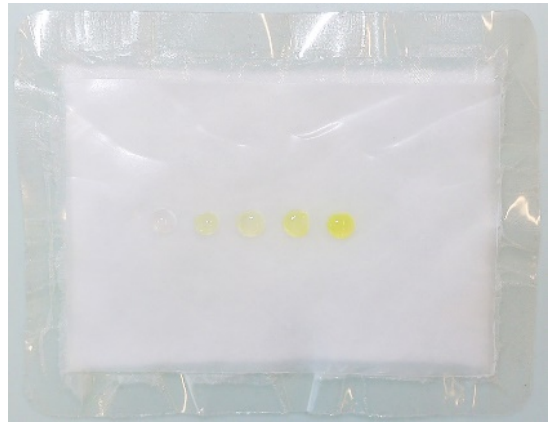
Continuous monitoring of wounds



pH detection







Glucose detection

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and Related Technologies

Hype cycle for emerging technologies

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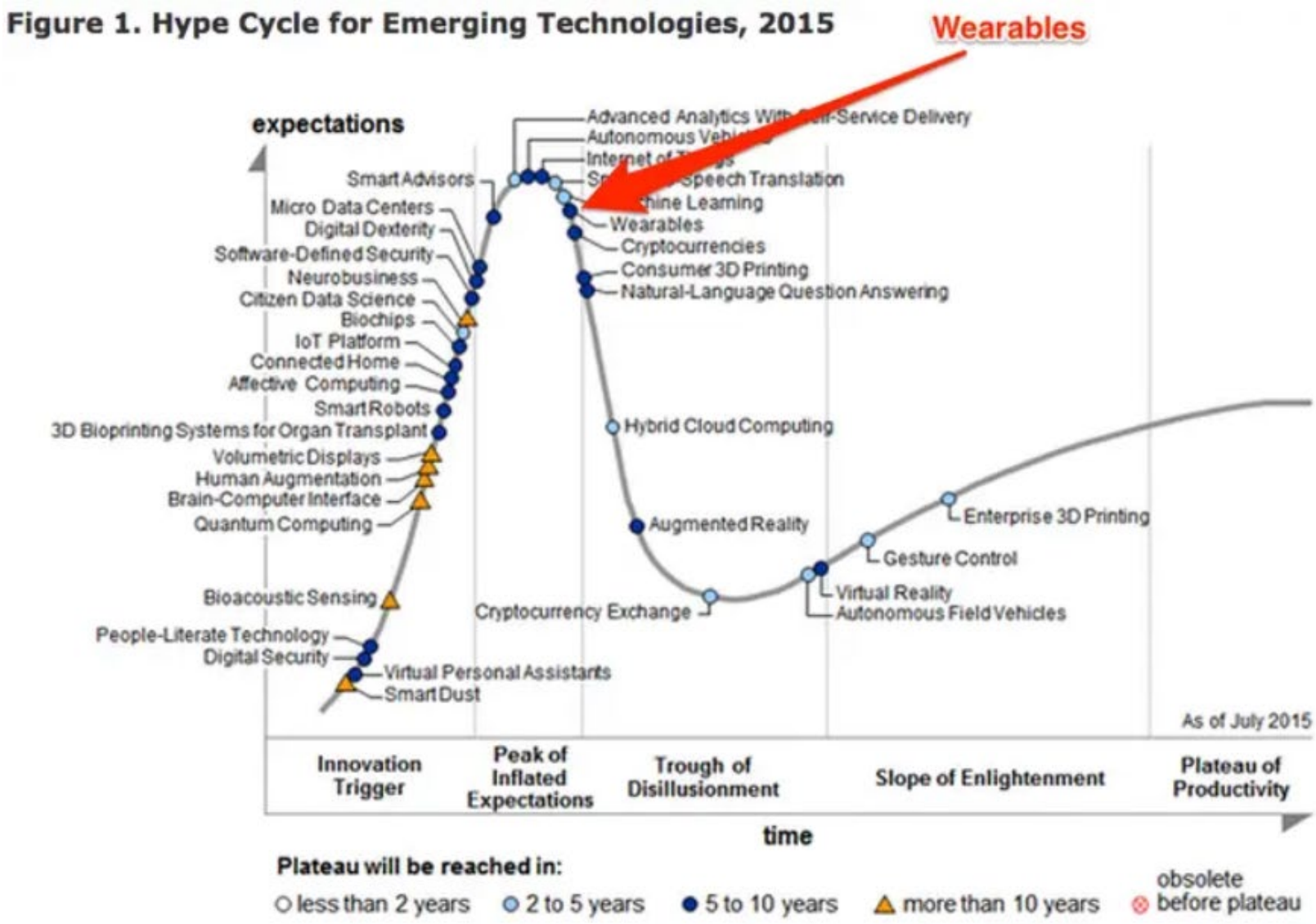
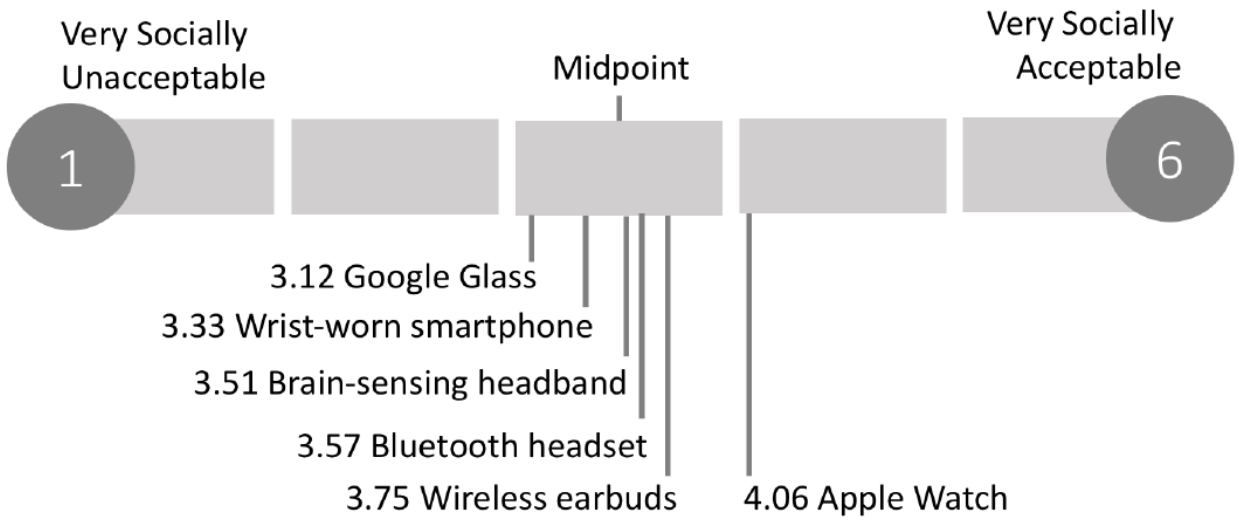


- Precision
- Reliability
- Relevance
- Acceptance

https://www.businessinsider.com/wearables-arent-as-exciting-anymore-2015-8?r=US&IR=T

Wearables acceptance



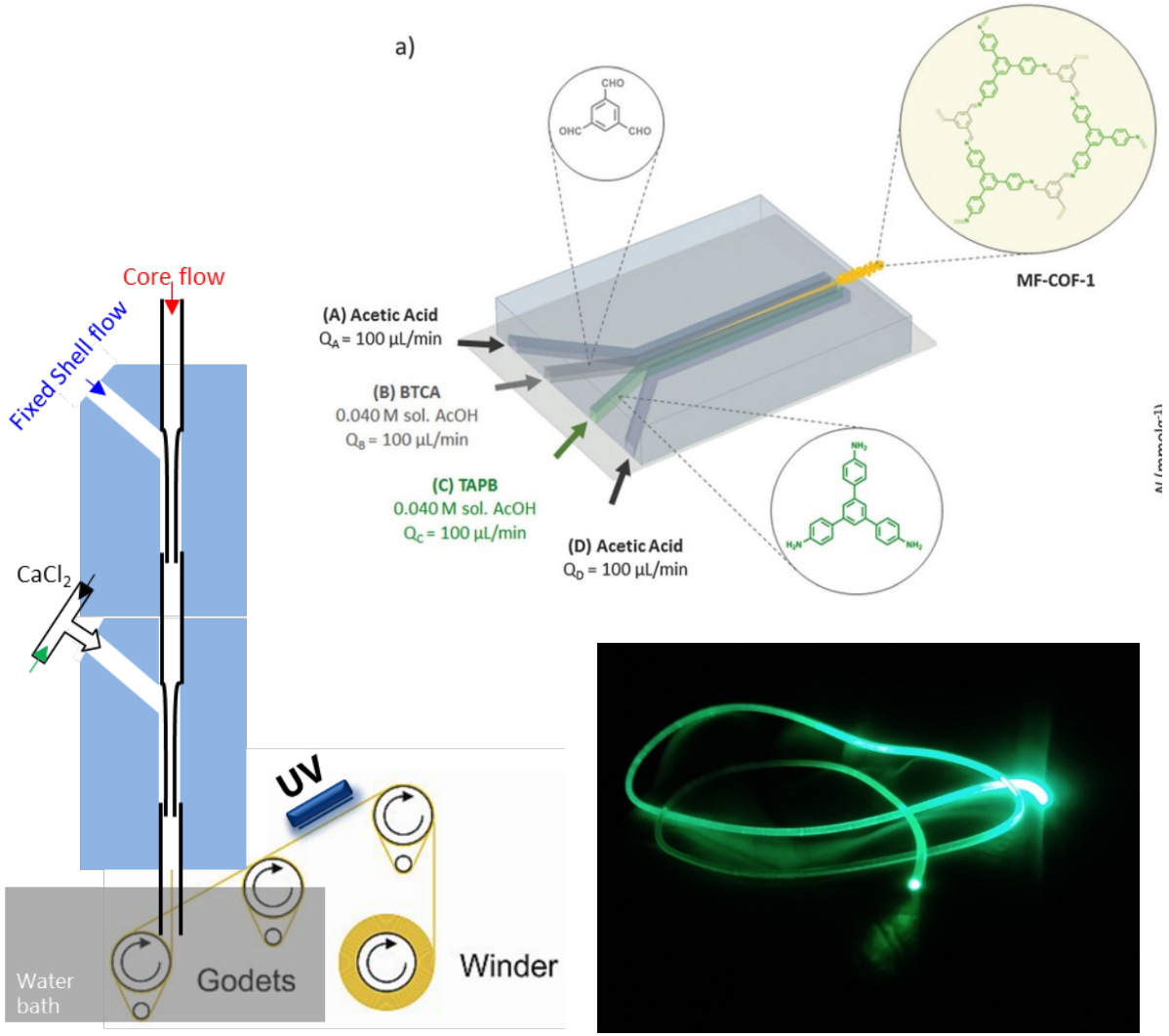
→ Ease of use
→ Perceived usefulness

→ Wearables: from low burden to «no burden»
→ «Disappearing Electronics» - Disappearables

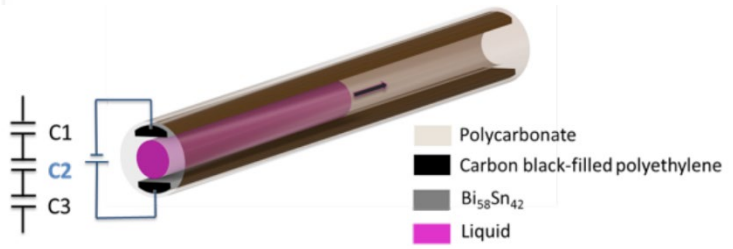
Kelly and Gilbert, 2018, The Wearer, the Device, and Its Use: Advances in Understanding the Social Acceptability of Wearables, Proceedings of the Human Factors and Ergonomics Society
Kvedar et al., Nature Biotechnology, 34, 239-246, (2016)

Hybrid and multimaterial fibers

Microfluidic wet spinning

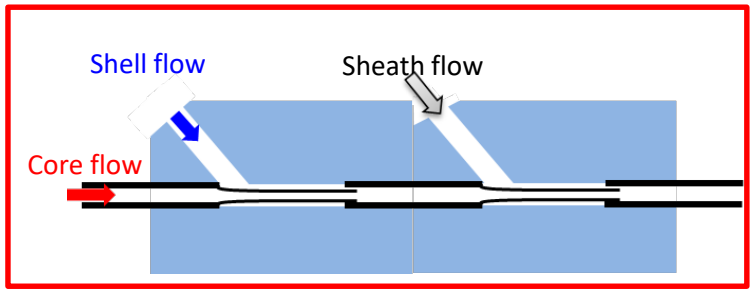


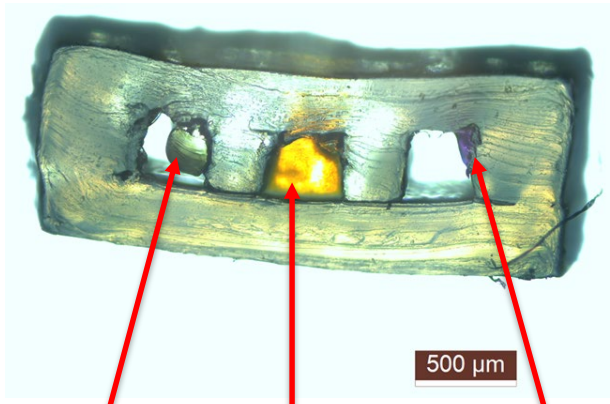
Thermal drawing

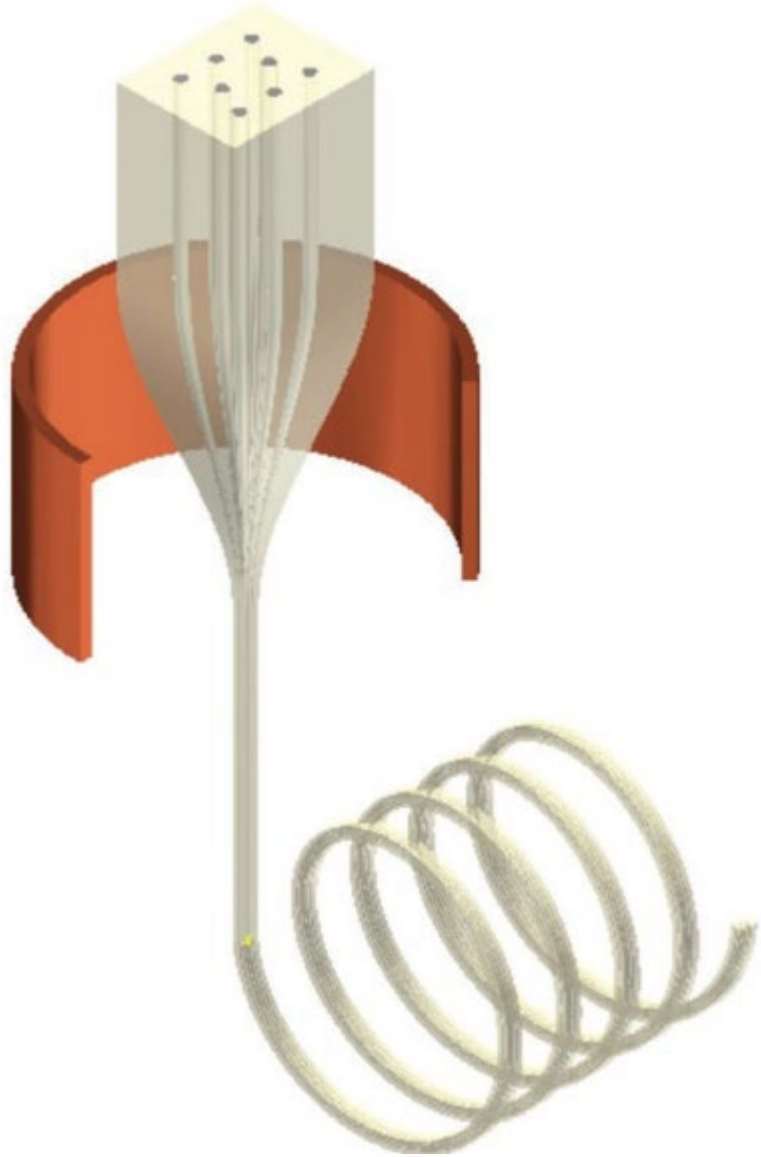


Dong, Sorin et. al., 2019, Adv. Mat. Tech. 1900417.
Qu, Rossi, Sorin, et al., 2018, Adv. Mat. , 30 (27), 1707251

Multicompartment fibers

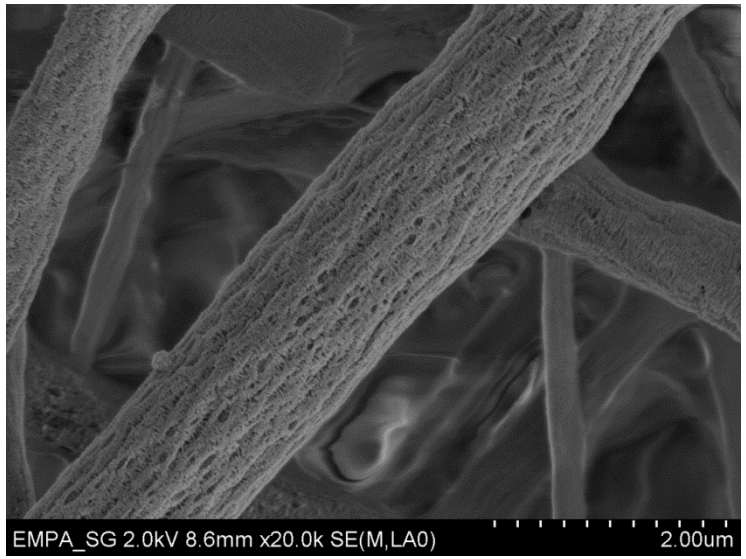


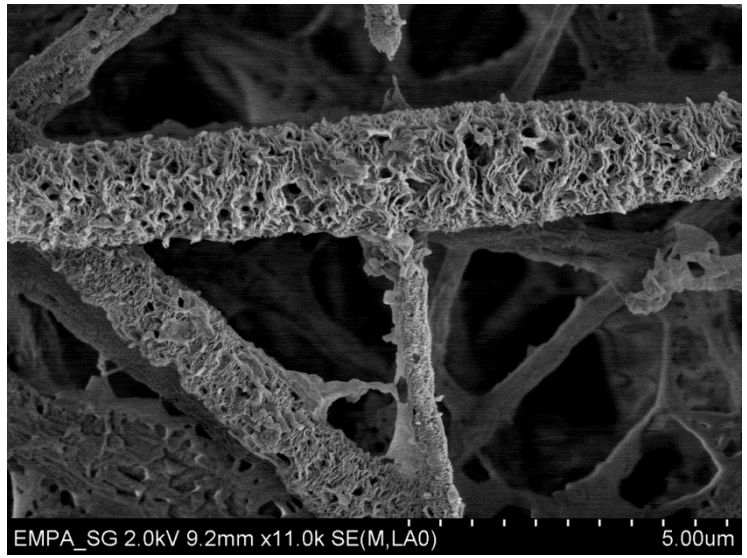


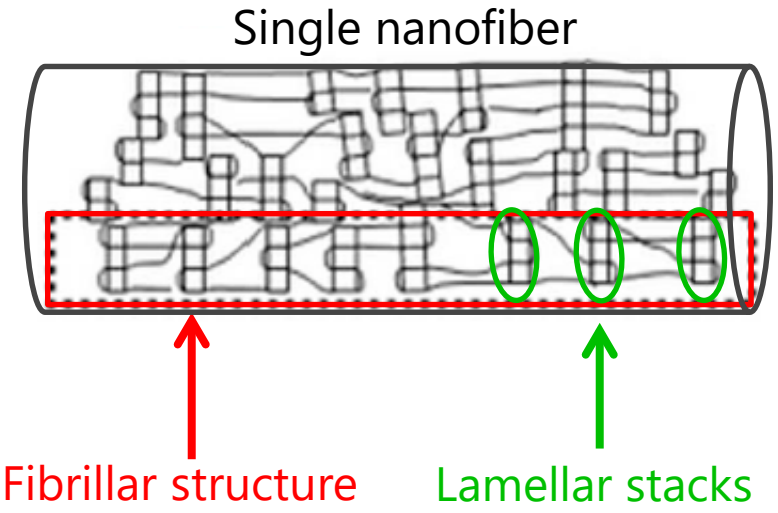


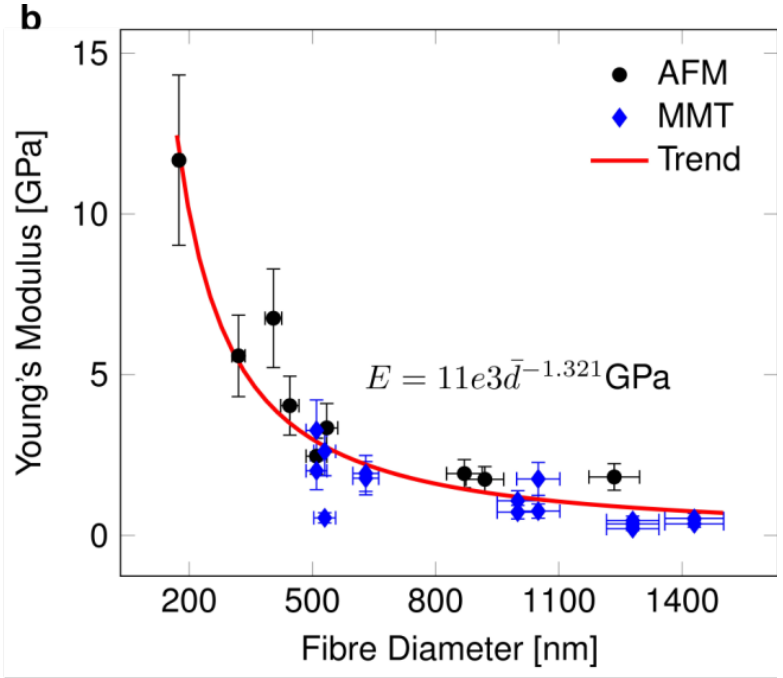
Strategic Focus Area
Personalized Health and Related Technologies

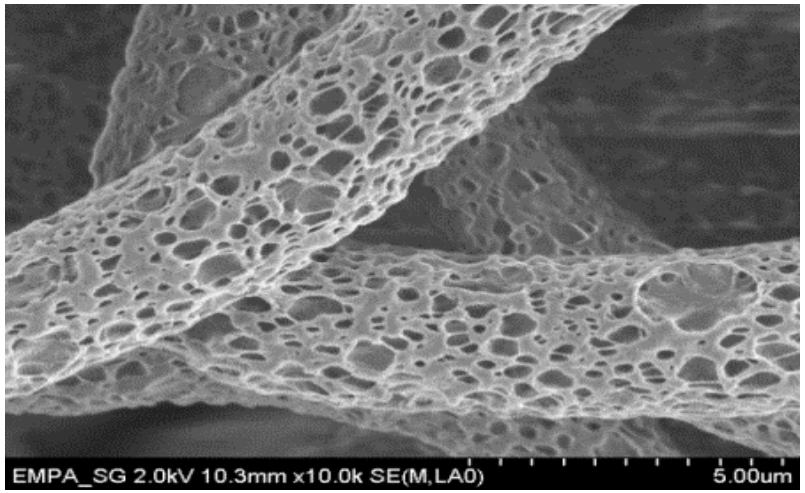
Fibers – tailoring the properties









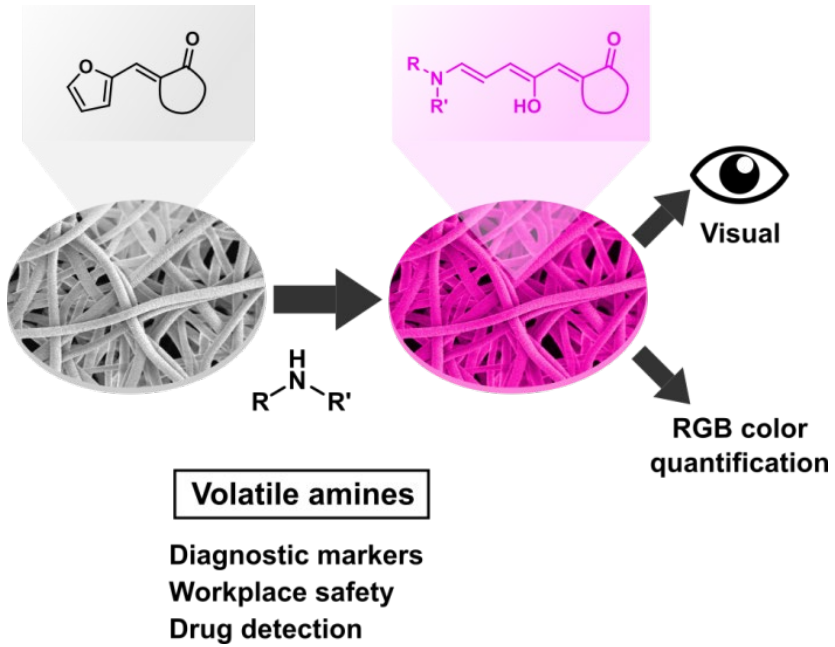


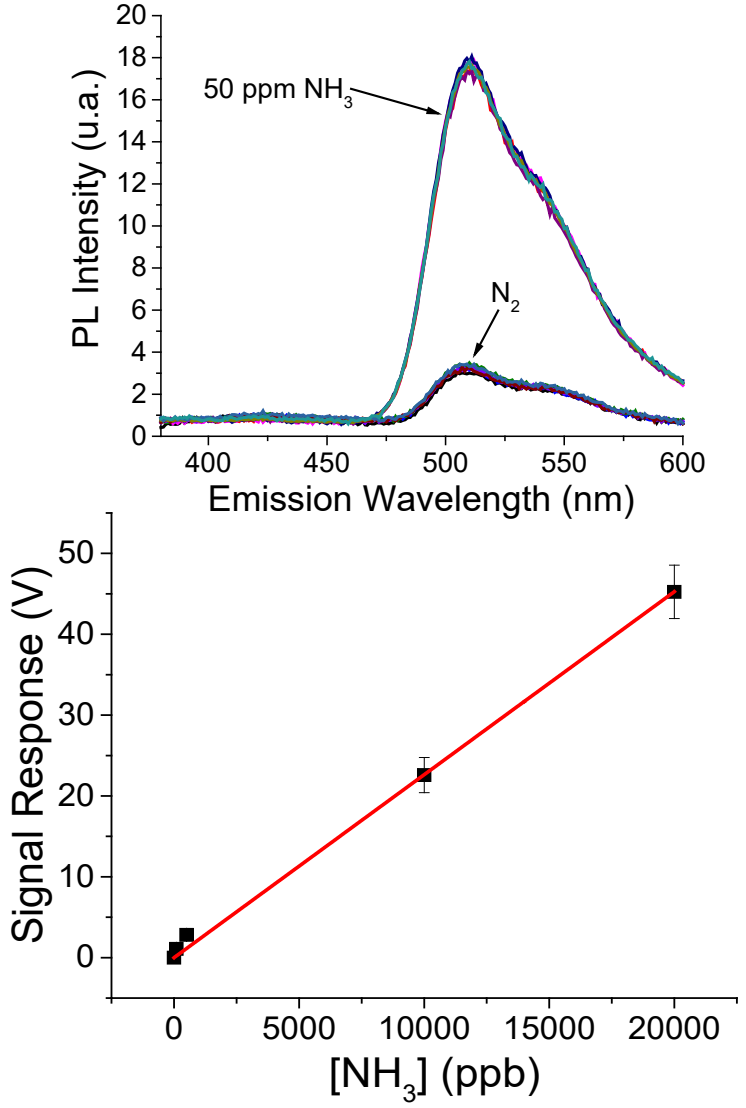
Maurya, Weidenbacher, Sadeghpour et al., 2019, Nanoscale. 11, 7176-7187

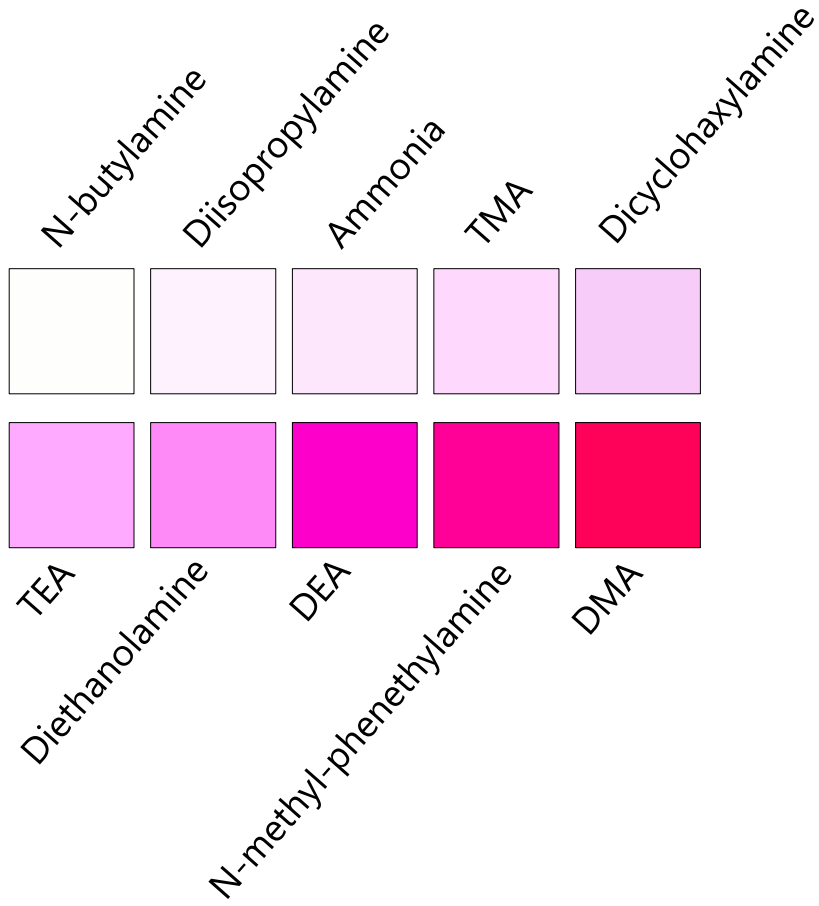
Morel, Rossi et al., 2019, Nanoscale, 11,16788–16800

Morel., Domaschke, Fortunato, et al., 2018,, Acta Biomater., 81, 169-183

Fibrous colorimetric sensors







Hsu Toncelli et al., Sensors&Actuators: B Chemical, 253, 2017, 714-722
Ulrich,Boesel, et al. *Sensors and Actuators B: Chemical* 322 (2020): 128570.

Polymer optical fibers as chemical sensors

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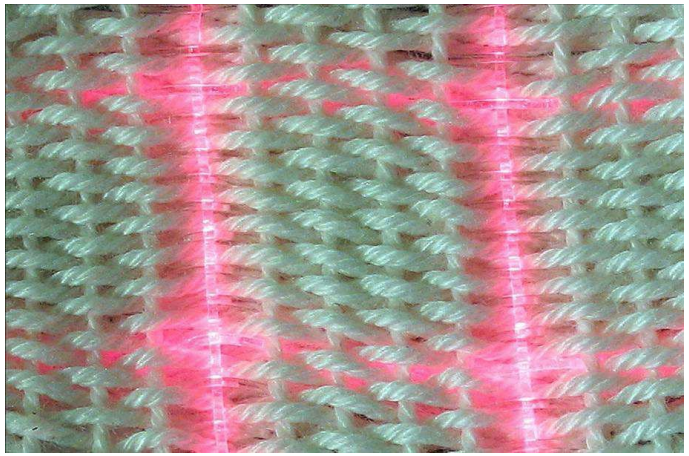
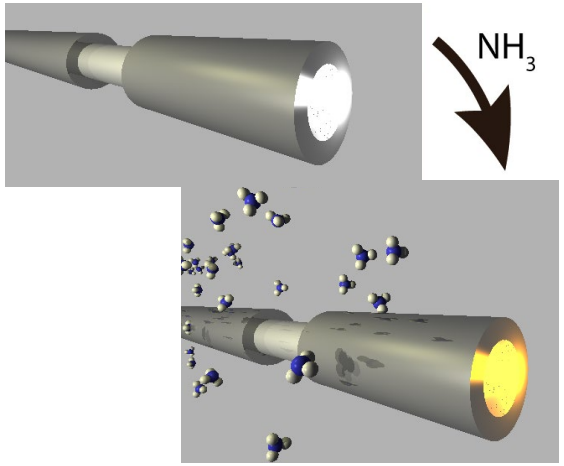
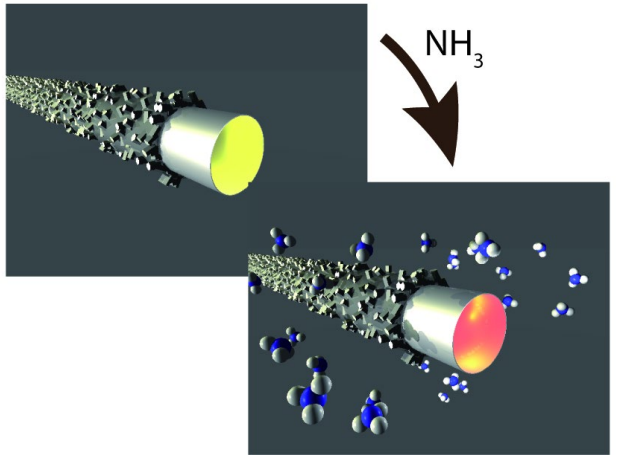
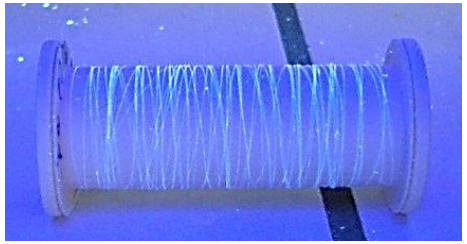


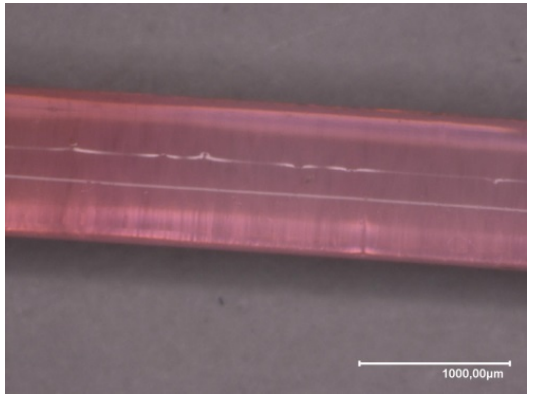


Sensing dyes immobilized in xerogel cladding material



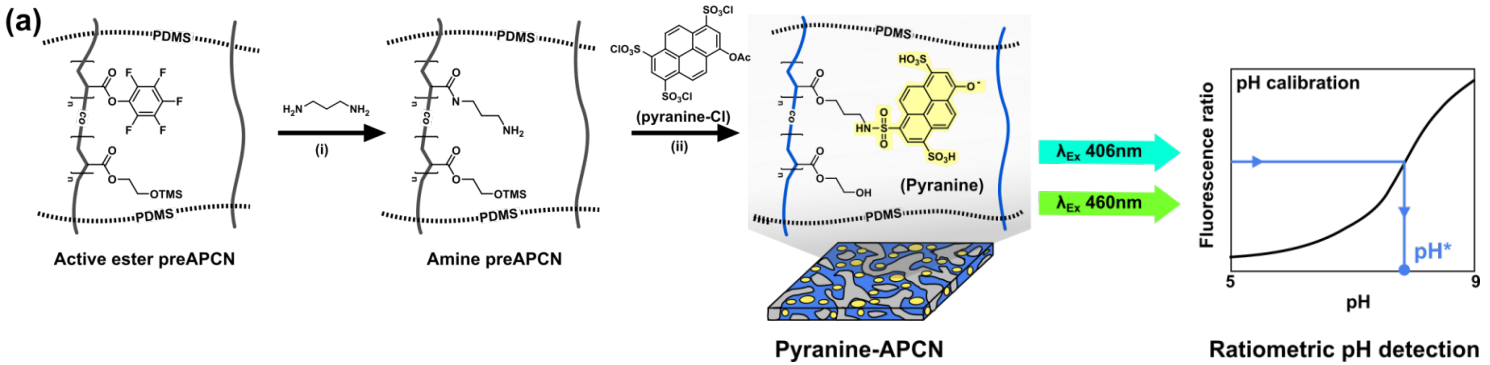
Sensing dyes immobilized in porous material **OR**
introduction of porous materials into the xerogel cladding for faster gas diffusion

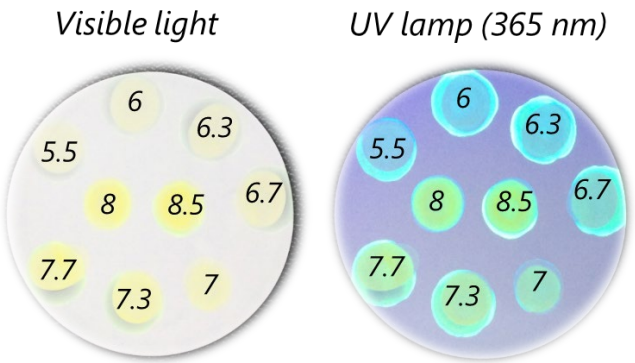


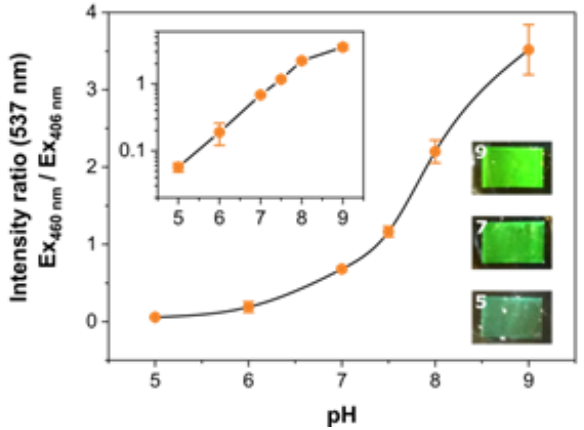


Strategic Focus Area
Personalized Health and Related Technologies

Ratiometric pH sensors







Strategic Focus Area
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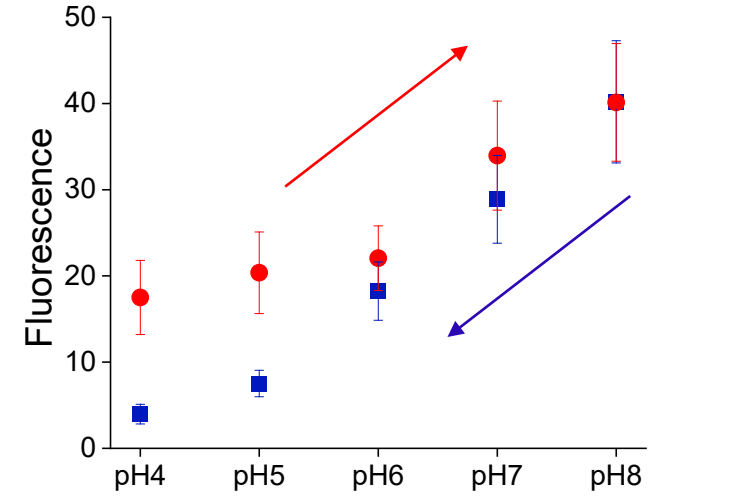
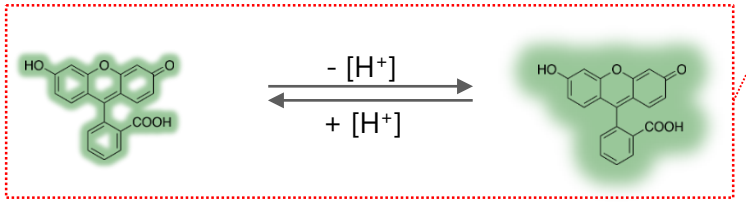
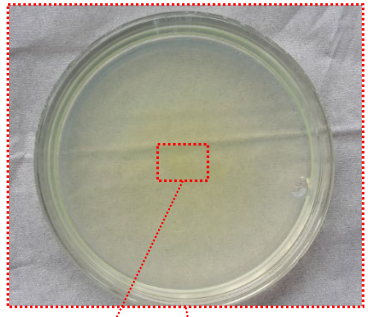
pH sensor: integration into the fiber

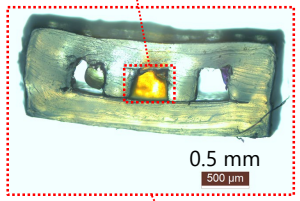


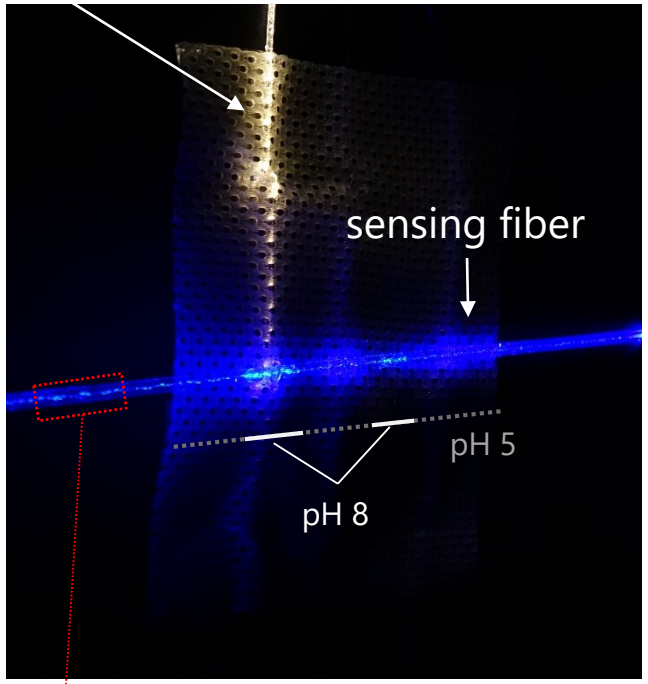


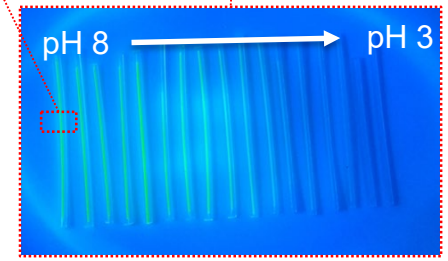
pH sensing molecule was covalently attached to a biopolymer to allow thermal drawing into pH sensing fibers

stitched inert fiber









Key success factors of fiber-based wearables

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- Precision → steering of materials properties
- Reliability → high time and spatial resolution
- Relevance → partnership with hospitals
- Acceptance → disappearables
  → immediate benefit (sensing of danger signals)

Fiber-based “disappearables” for health

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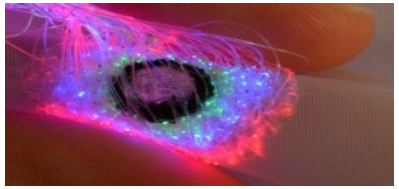
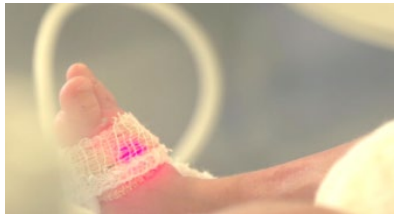
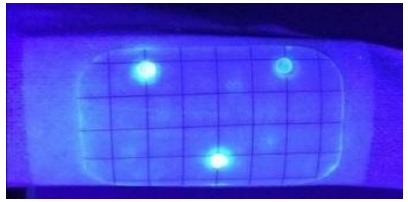
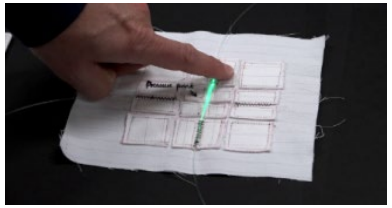
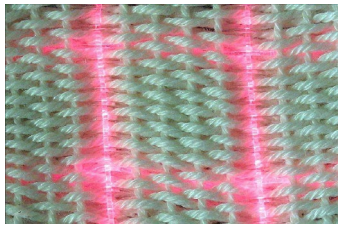
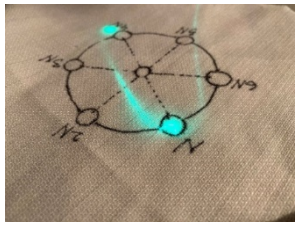












Oxygen saturation

Glucose

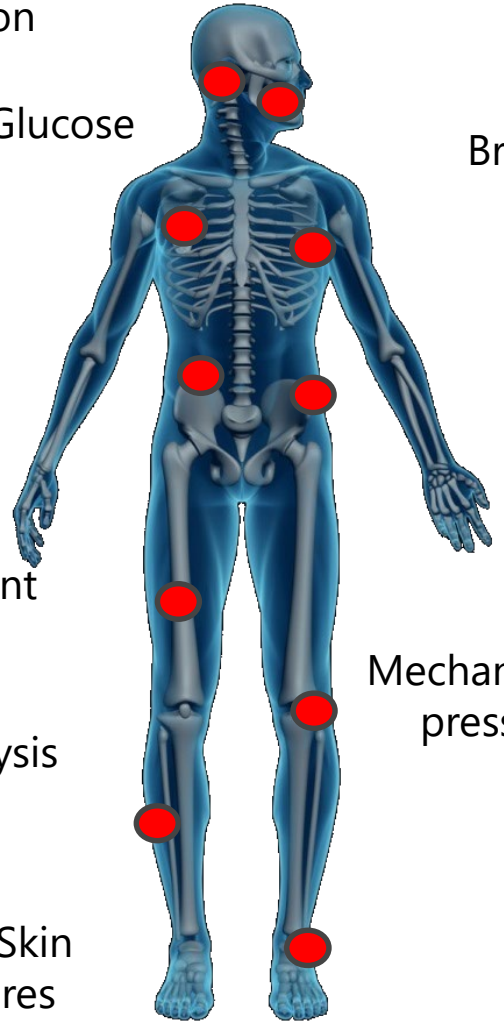
VOC

pH-value

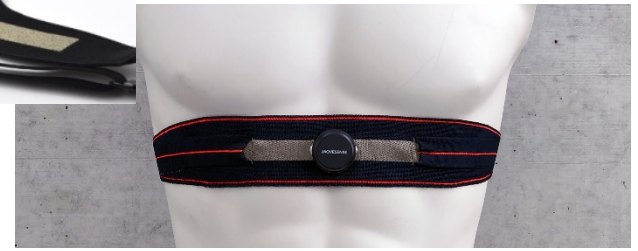
Movement

Hydration
Sweat analysis

Body and Skin
temperatures



Breathing



Pulse
ECG
Blood pressure

Mechanical
pressure

Thank you

HORIZON 2020

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World Food System Center

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NOVARTIS | The Novartis Foundation

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Strategic Focus Area
Personalized Health and Related Technologies

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