

We at Elmarco create value for our customers
by providing the best industrial nanofiber production
equipment and solutions



Elmarco - Grantové projekty EU

Jana Baráková

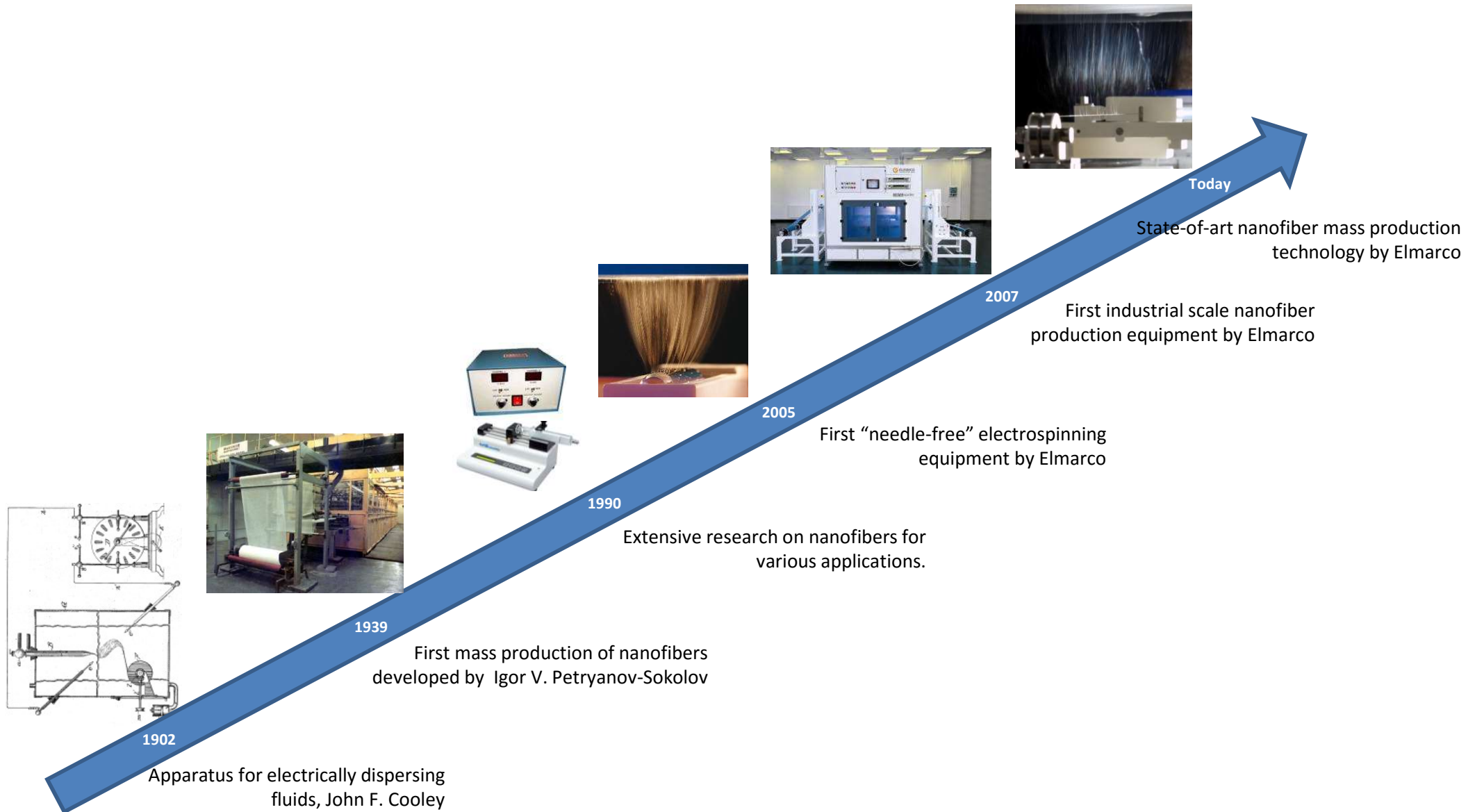
Praha

26.11.2019

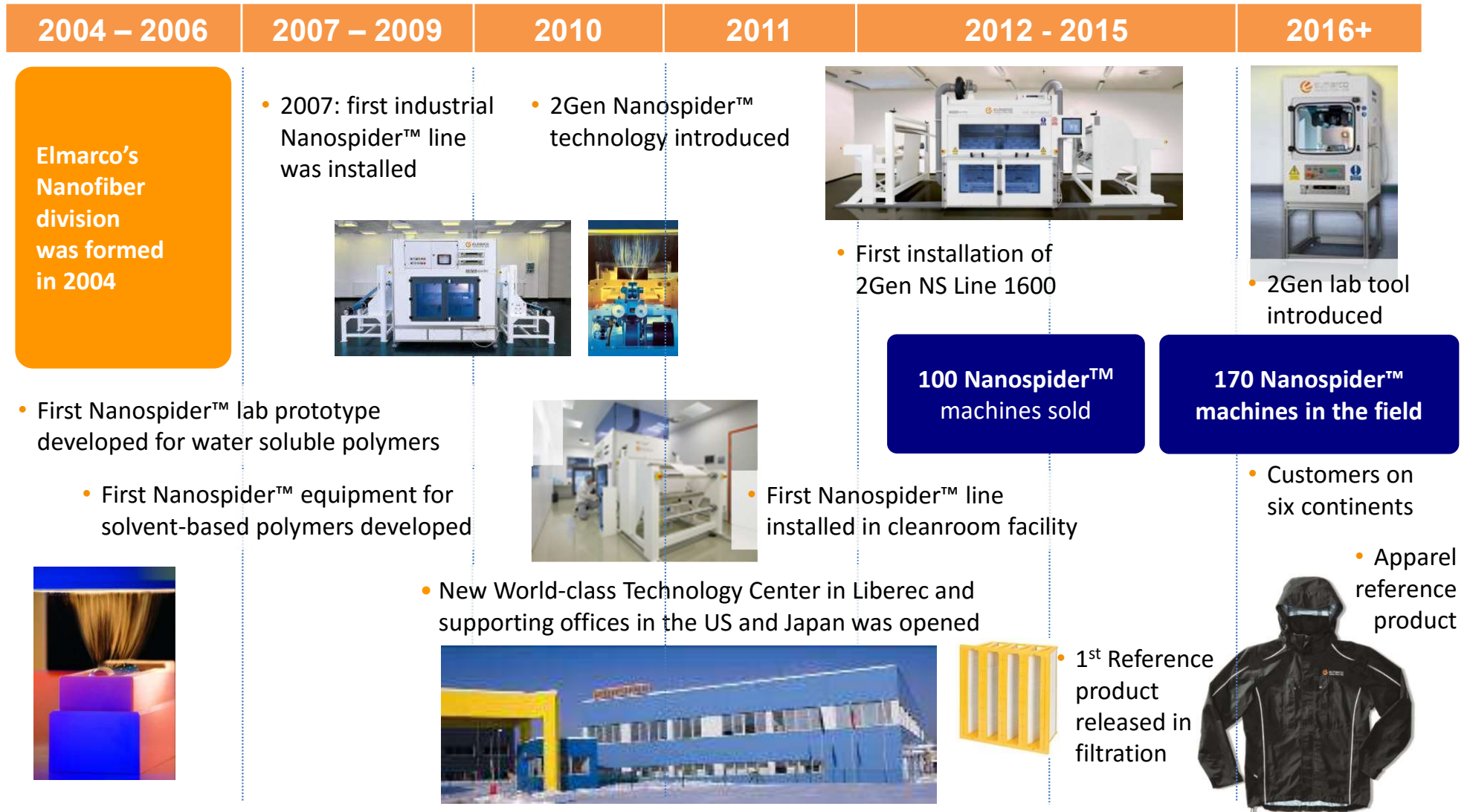
Agenda

- **Představení firmy Elmarco**
- **Projekt BioComb4Nanofibers**
- **Projekt GAIA**

Electrospinning – History



Introduction: Elmarco - Milestones



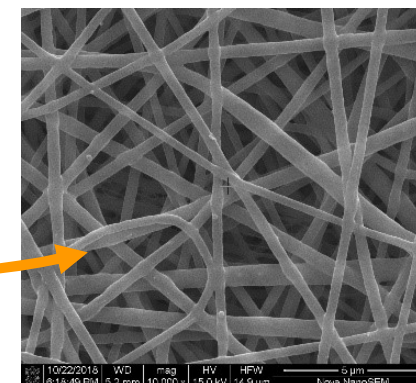
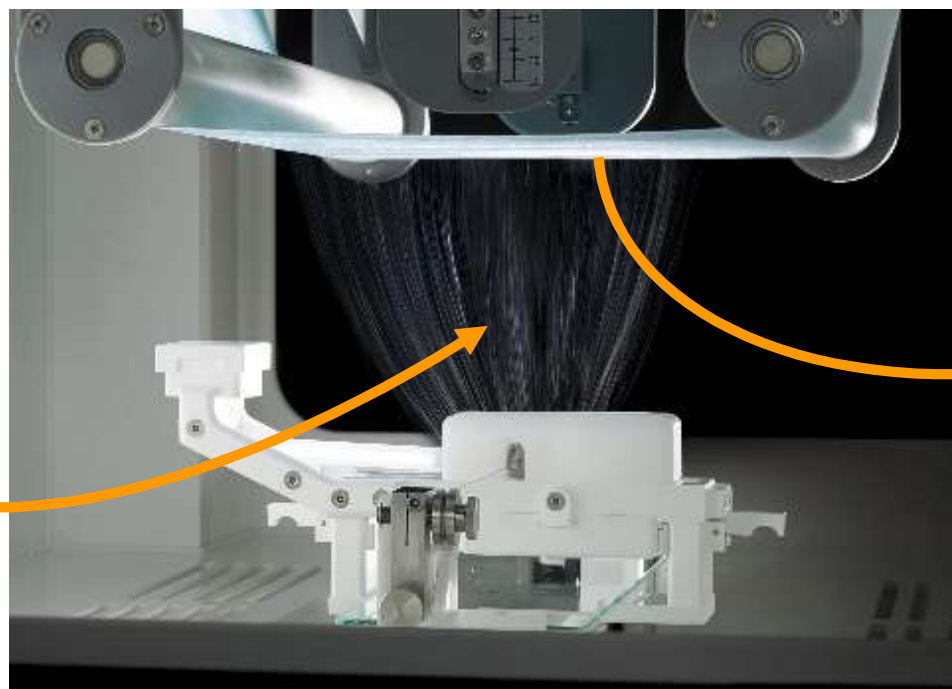
Nanospider™ – Technology



- Standard Industrial line is 1.6 meters wide and 8 electrodes
- Elmarco provides TURNKEY solutions: peripherals including air conditioning, adhesion module, dryers, mixing & cleaning stations, waste air treatment
- Elmarco serves the industrial market and academic sector with Lab electrospinning equipment



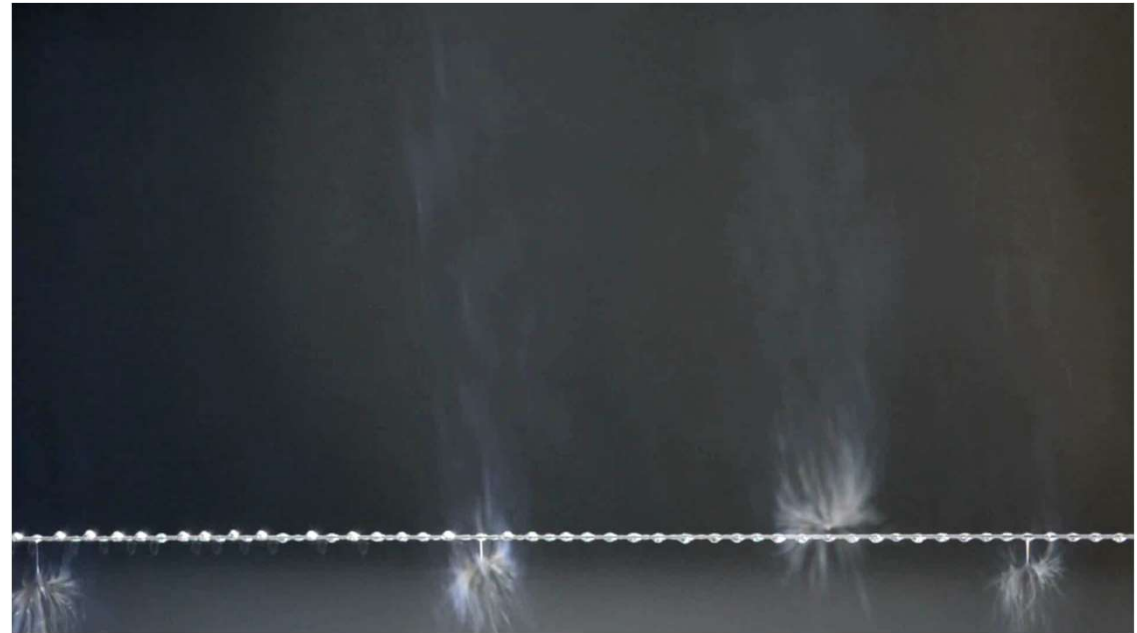
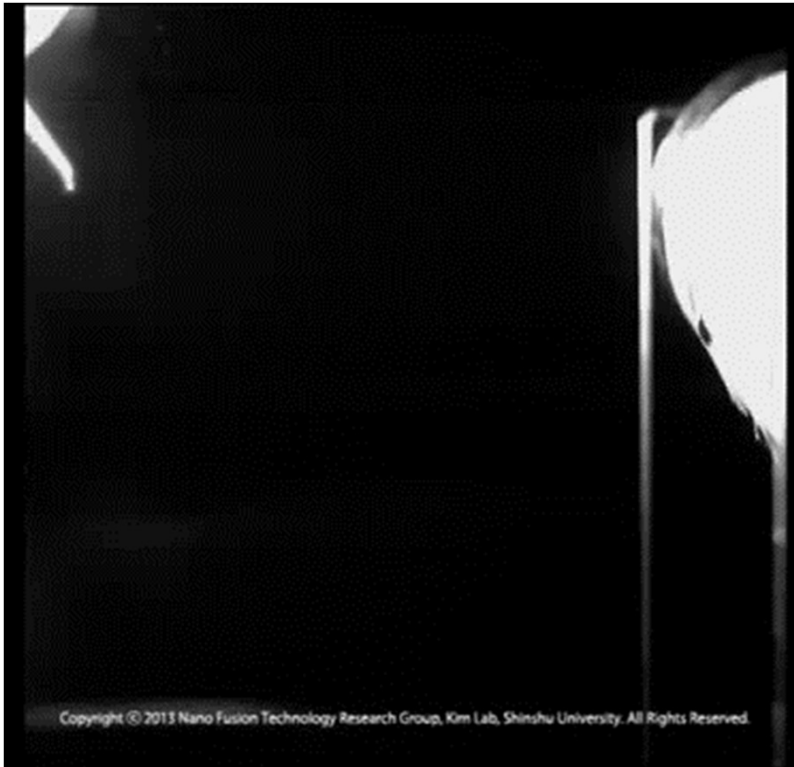
Process of fiber web preparation



Nanofiber Mass Production

“Needle” vs. “Needle-free”

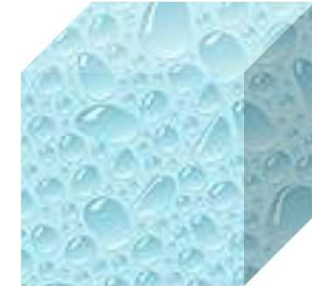
- Needle free technology
- Needle technology



- FoV – 21 mm

ES Process Variables – area of optimization

Overview



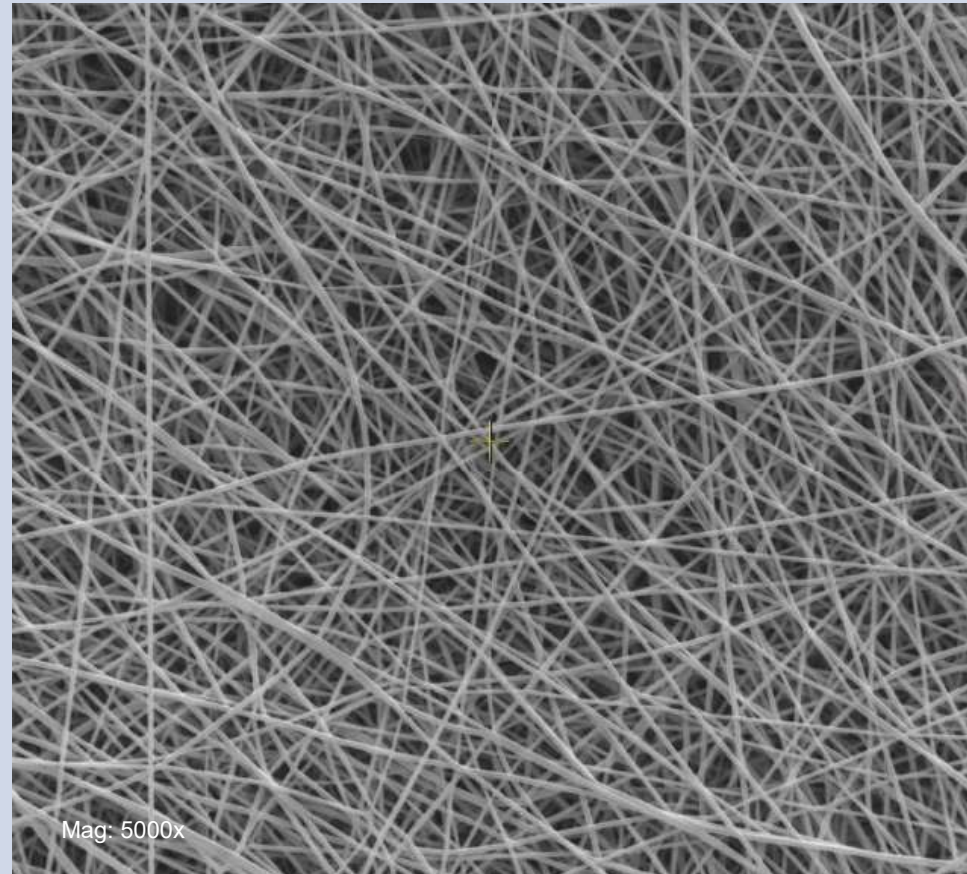
Spinning solution	Carrier material	Equipment settings	Ambient parameters
Polymer type Solvent type Viscosity Concentration Surface Tension Conductivity Volatility Additives	Composition Thickness Geometry Conductivity Resistivity Additional treatments (Absence of substrate)	Carriage speed Distance of electrodes Voltage (Electrical field intensity) Substrate speed	Temperature Relative humidity Air flow rate Atm. Pressure Presence of particles

NOTE: development hints in Lab scale optimization

Nanospider™ - Material flexibility

Polymers

PA6, PA 6.6 (Polyamide 6 and 6.6)
PVDF (Polyvinylidene fluoride)
PVDF-HFP (PVDF-co-hexafluoropropylene)
PES (Polyethersulfone)
PUR (Polyurethanes)
PVA (Polyvinyl alcohol)
PAN (Polyacrylonitrile)
PVP (Polyvinylpyrrolidone)
PS (Polystyrene)
PMMA (Polymethylmethacrylate)
PBI (Polybenzimidazole)
ACC (Cellulose acetate)
PLA (Polylactic acid)
PCL (Polycaprolactone)
Chitosan
Gelatine



Selected examples only, numerous other polymer systems have been deployed

Nanofiber applications

Air filtration

- Industrial HVAC
- Engine air intake
- Cleanroom (HEPA, ULPA)
- Gas turbines
- Dust collectors

Acoustic materials

- Transportation
- Room acoustics
- Home appliances
- Industrial equipment

Medicine

- Wound care
- Tissue engineering
- Drug release
- Surgical drapes
- Face masks



Liquid filtration

- Drinking water preparation
- Fuel and oil filtration
- Processing filtration
- Waste water treatment
- Seawater treatment

Energy

- Battery separators
- Battery electrodes
- Fuel cells

Performance apparel

- Outdoor sportswear
- Protective clothing
- Footwear



EU Horizont 2020, Future and Emerging Technologies (FET)

Call FETOPEN-01-2018-2019-2020

Cut-off date: 24 January 2019

Research and Innovation Actions (RIA)



421 projects submitted to this call

182 projects positively evaluated

53 projects funded

BioCombs4Nanofibers ranked as number 29

Timing: 36 months (10/2019 – 09/2022)

Elmarco in BioCombs4Nanofibers



Partners:

- Johannes Kepler Universität Linz, Austria
- Rheinisch-Westfälische Technische Hochschule Aachen, Germany
- Institute of Electronic Structure and Laser, Greece
- Bundesanstalt für Materialforschung und -prüfung, Germany
- National Institute for Laser, Plasma & Radiation Physics, Romania
- Elmarco, Czech Republic

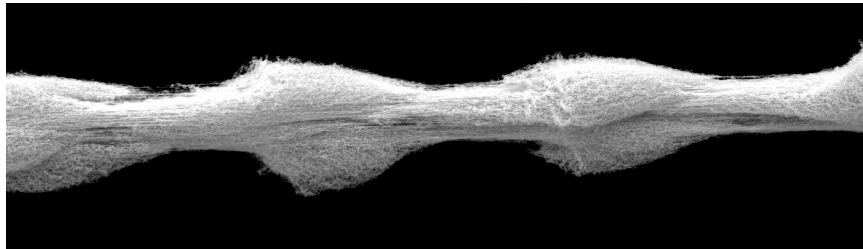
Finance:

- 80% of personal costs

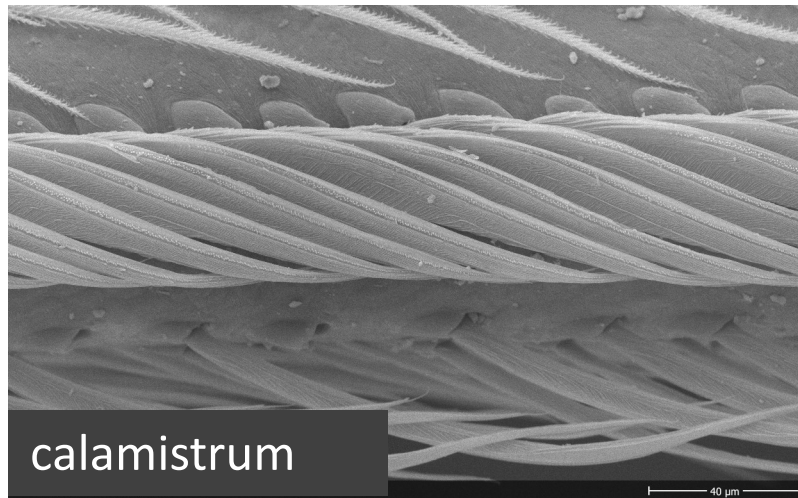
N.	Proposer name	Country	%
1	JKU	AT	19,9
2	RWTH	DE	23,2
3	FORTH	EL	16,9
4	BAM	DE	16,0
5	INFLPR	RO	13,8
6	Elmarco	CZ	10,2
	Total:		100,0



- **inspiration from cribellate spiders**
 - 10 – 30 nm thick fibers



Cribellate capture threads



Images: Anna-Christin Joel, RWTH Aachen

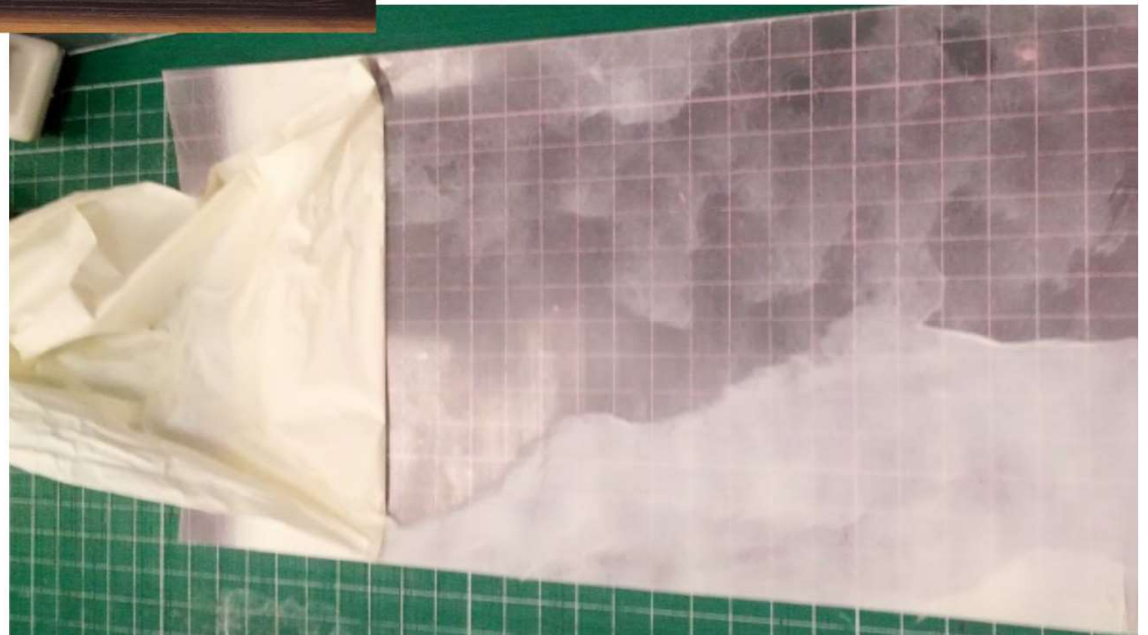
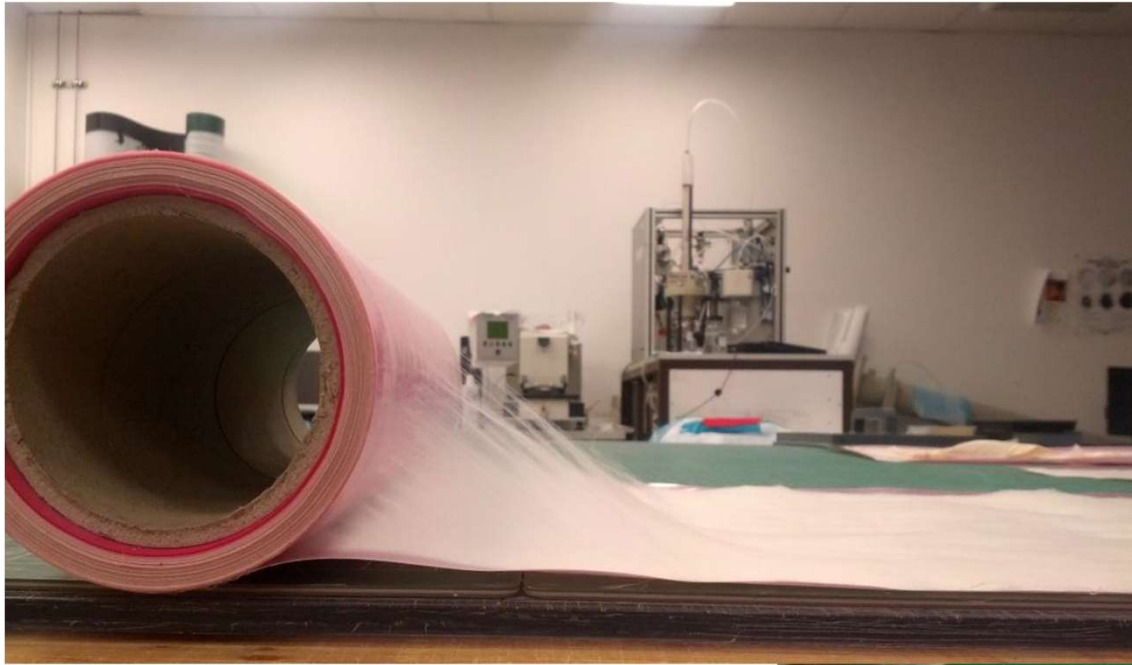


Main goal

- **Antiadhesive / adhesive tools for nanofiber handling**
 - Antiadhesive demonstration tool (MS3)
 - e.g. antiadhesive scaffold for fabrication of vascular protheses (cylindrical collecting electrode)
 - tools for nanofiber handling
 - coilers, rolls, cutters, dividers, tuyeres



Web handling issues





EU Horizon 2020 Fuel Cells and Hydrogen Joint Undertaking programme

Call FCH-01-5-2018: Next generation automotive MEA development.

Timing: 36 months (01/2019 – 12/2021)



Partners:

- Centre National de la Recherche Scientifique (University of Montpellier)
- BMW Group
- Johnson Matthey Fuel Cells
- 3M Deutschland
- Freudenberg Performance Materials
- Zentrum für Sonnenenergie und Wasserstoff-Forschung Baden-Württemberg
- Technical University of Munich
- Technical University of Berlin
- Pretexo
- Elmarco

Finance:

- ELM – 40% of personal costs

N.	Proposer name	Country	%
1	CNRS	FR	12,7
2	BMW	DE	11,4
3	JMFC	UK	20,0
4	3M	DE	5,6
5	FPM	DE	12,2
6	ELM	CZ	3,8
7	ZSW	DE	9,2
8	TUM	DE	12,6
9	TUB	DE	11,1
10	PTX	FR	1,3
	Total		100,0

Main goal

- **Part of composite of polymer electrolyte membrane**
 - Preparation of polymer membrane in lab scale
 - Transfer to pilot scale

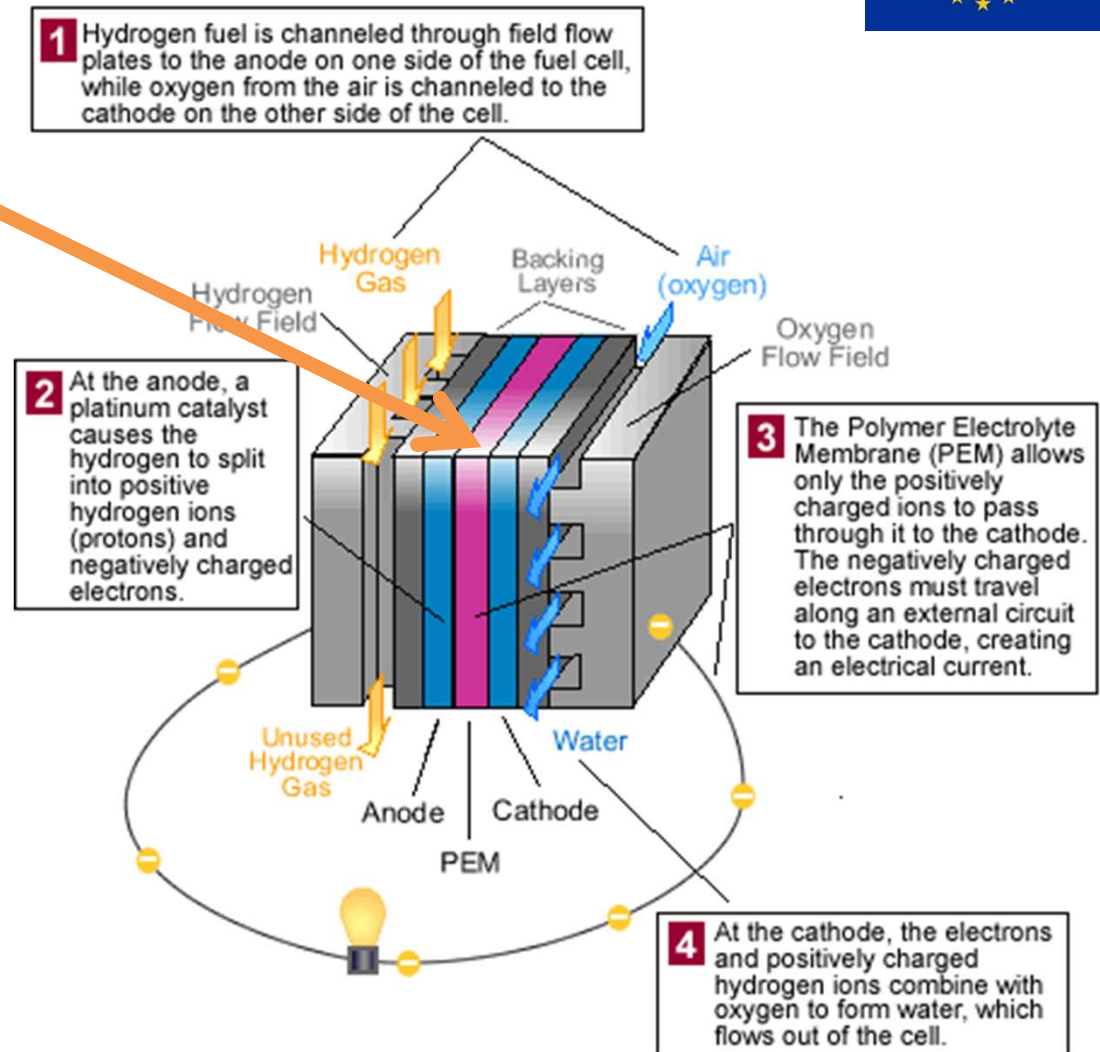


Image: https://fr.wikipedia.org/wiki/Fichier:Fuel_cell_still.gif

Thank you for your attantion

www.elmarco.com