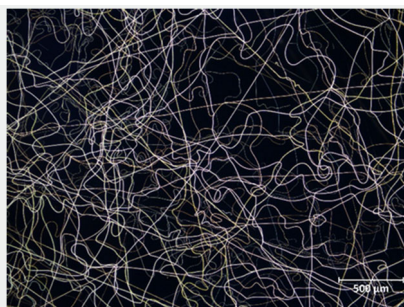
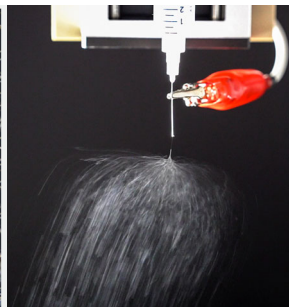




Electrospun fibers on foil



Electroless silver plated fibers



Electrospinning process

## PILOT TECHNOLOGY

### ELECTROSPUN FLEXIBLE TRANSPARENT ELECTRODES

#### OBJECTIVES

- ▶ Development of a scalable low cost alternative to indium tin oxide (ITO) electrodes by electrospinning conductive transparent fibers on glass and polymer foils.

#### RESULTS

- ▶ Electrospinning allows the deposition of fibers in the nanometer to micrometer range with a very high aspect ratio on glass substrates or foil. The wide-meshed fiber deposition stands out for high transparency and low haze. The fibers can be spun from intrinsically conductive polymers or can be made conductive by post-treatment. These low density coatings display high conductivity.
  - ▶ Flexible chemistries
  - ▶ Sheet resistance: 5 – 1000  $\Omega$ /sq
  - ▶ Transmission: From very low to up to > 90%
  - ▶ Haze: From very high to < 2%
- ▶ A needleless electrospinning mechanism was developed and implemented in a roll-to-roll plant. Thus, continuous homogenous fiber deposition on flexible foils is feasible.
  - ▶ Feasibility of roll-to-roll manufacturing
  - ▶ Transmission: ca. 91 % on PET
  - ▶ Haze: ca. 1.5 % on PET

#### APPLICATIONS

- ▶ Flexible Displays
- ▶ Photovoltaics
- ▶ Internet of Things (IoT)
- ▶ Wearables

Substrates:

- ▶ Glass
- ▶ Polymers

#### CONTACT

INM – Leibniz Institute  
for New Materials  
Campus D2 2  
66123 Saarbruecken / Germany  
[www.leibniz-inm.de](http://www.leibniz-inm.de)

Dr. Peter William de Oliveira  
Head of Optical Materials  
[OptiMat@leibniz-inm.de](mailto:OptiMat@leibniz-inm.de)  
Phone: +49-681-9300-375  
Fax: +49-681-9300-279