COST
EUROPEAN COOPERATION IN SCIENCE & TECHNOLOGY

# SHORT TERM SCIENTIFIC MISSION (STSM) SCIENTIFIC REPORT

**This report is submitted for approval by the STSM applicant to the STSM coordinator**

**Action number:** CA17107 - STSM ECOST-STSM-Request-CA17107-48218
**STSM title:** Regenerated cellulosic fibers with conductive properties for the healthcare sector
**STSM start and end date:** 26/09/2021-02/10/2021
**Grantee name:** Sofia Plakantonaki

**PURPOSE OF THE STSM:**

The purpose of this Short Term Scientific Mission is to initiate the research on the subject of regenerated cellulosic fibers with conductive properties, as a first step to create sustainable (since cellulose is a raw material abundant in the environment) conductive fibers meant to be integrated in smart clothing, able to detect changes in measurable parameters such as temperature or pulse. This can lead to the early detection of symptoms and distance medical monitoring which will hopefully diminish the need for hospitalization, comfort the stress of parents and offer a supportive tool for health workers. The scope of the project directly addresses the objectives of WG1: Smart textiles for health and medical applications.

**DESCRIPTION OF WORK CARRIED OUT DURING THE STSMS**

During this Short term Scientific Mission I had the opportunity to:

- Discuss and analyse the different critical parameters for the experiment design of regenerated cellulose fibre production with the lyocell method (wet spinning) together with Dr. Mikael Skrifvars and Dr. Tariq Bashir. (Fig. 16)
- Work on the treatment and production of lyocell yarn via ring spinning under the guidance of Dr. Nawar Kadi. (Fig 1 – Fig 6)
- Collect data of commercially available yarns and sensors for use in the smart textiles for medical purposes during my visit at the laboratory of smart textiles. (Fig 7- Fig 8)
- Explore different research results in the field of smart textiles for medical purposes in the “Smart Textiles Showroom” together with Dr. Li Guo. (Fig 9- Fig 10)
- Analyse the different coating possibilities in line with final use of the product (medical applications smart textiles) together with Dr. Tariq Bashir. The emphasis was given to electrically conductive polymers as coatings (especially PEDOT compared to metallic yarns.
- Observe the experimental structure for the coating of yarns with conductive polymers using LEGO® Education materials at the laboratory of smart textiles and measure the conductivity of different fibers produced together with Dr. Emanuel Gunnarsson. (Fig 11- Fig 14)
- Apply finishing (coatings) to offer different properties to the yarns with the guidance and supervision of Dr. Nawar Kadi.
- Familiarise myself with the won-woven technics production and especially needle punching while Dr. Nawar Kadi explained about the critical parameters to be monitored.
- Produce a non-woven fabric with different properties as a result of a double needle punching while layering different fibres: a conductive and a non-conductive side co-existed in the final product.

Additionally:

- I studied the effects of microwave radiation into cellulosic fibres together with PhD candidate Felicia Syrén.
- I learned about the research efforts to produce mechanically recycled fabrics from post-consumer clothing by PhD candidate Katarina Lindström.


*Figure 1: Opening Lyocell fibres*


*Figure 2: Carding lyocell fibers*

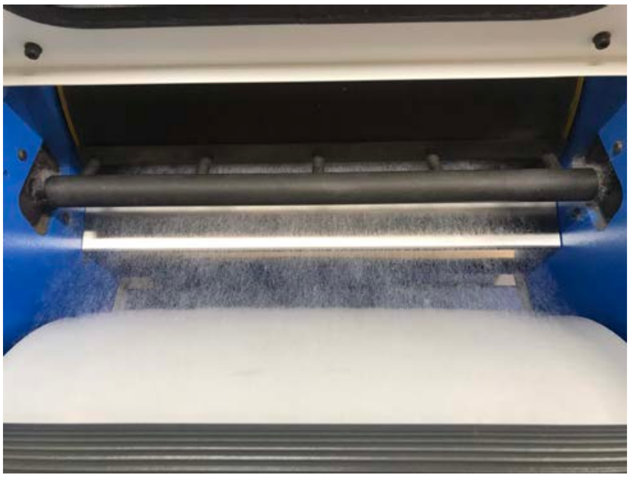
*Figure 3: Carding lyocell fibers*


*Figure 4: Sliver*

*Figure 5: Ring spinning*

*Figure 6: Feeding*

*Figure 7: Sensor*


*Figure 8: Wearable sensor for measuring movement and heart rate*

*Figure 9: Monitoring brain activity*

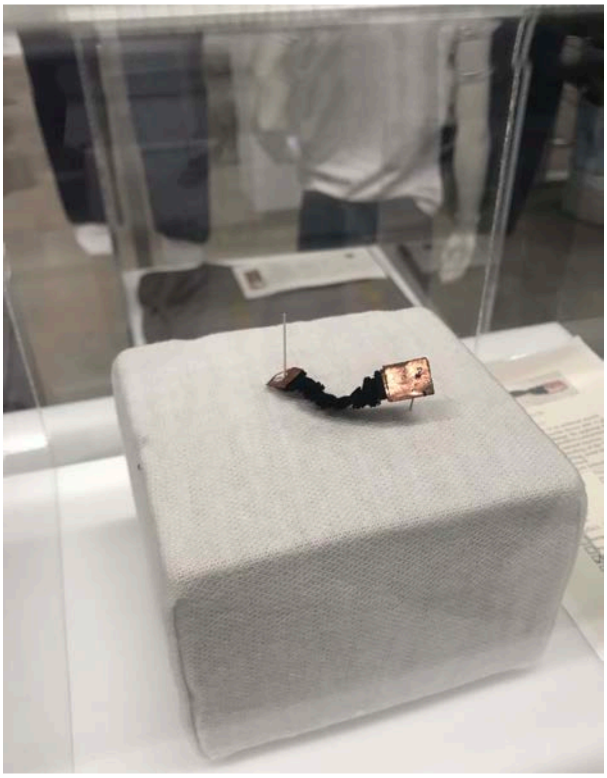

*Figure 10: Artificial musle*

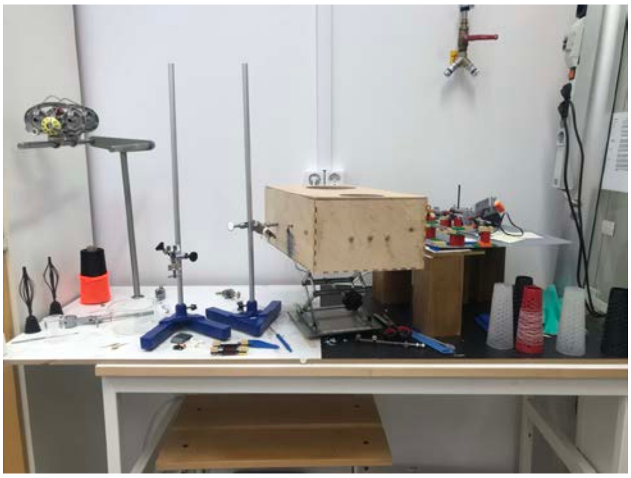

*Figure 11: Experimental structure for the coating of yarns*

*Figure 12: Use of potentiometer*

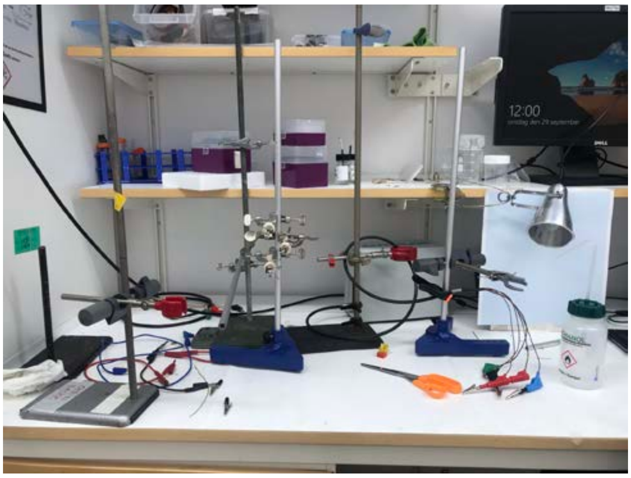

*Figure 13: Structure for computer aided measurement of electronic signals*


*Figure 14: Plug-in device for computer aided measurements.*

Figure 15: Application of finishing material onto paper yarn

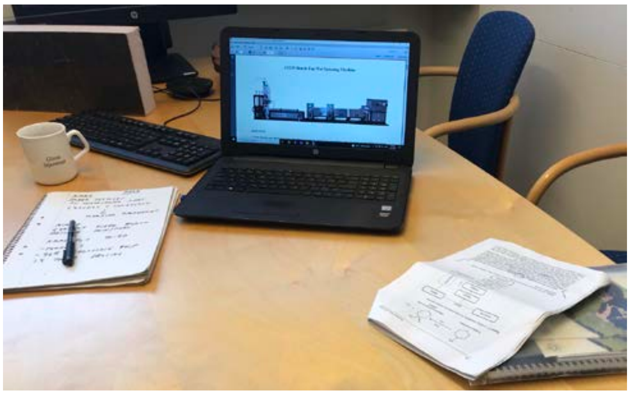

Figure 16: Analysing critical parameters for wet spinning

**DESCRIPTION OF THE MAIN RESULTS OBTAINED**

Besides the vast knowledge gain in different areas of the textile technology, specific tangible results obtained are:

(1) Cellulosic yarns (viscose, lyocell, paper) with different properties embedded to them as a result of different coatings applied.

More specifically the effect of Fatty acid poly glycol ester on the spinnability (ring spinning) of lyocell fibre was studied, and the results are graphically represented in figure 17.

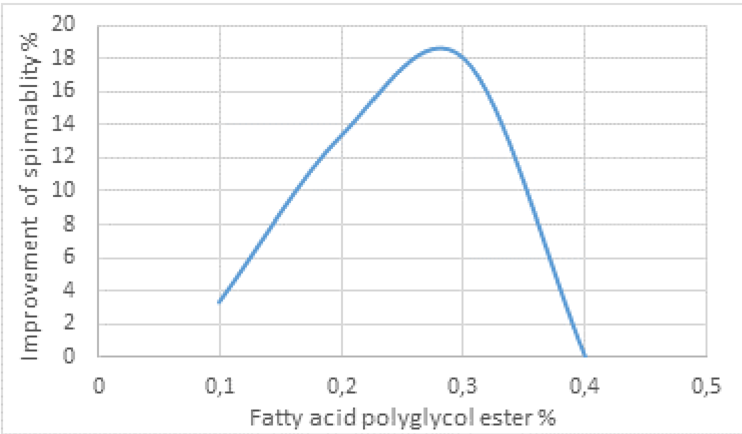


Figure 17: Effect of Fatty acid poly glycol ester on the spinnability (ring spinning) of lyocell fibre

(2) Non-woven fabric with layered properties.

**FUTURE COLLABORATIONS (if applicable)**

Future collaborations were explored and include the production of regenerated cellulosic yarn via wet spinning and ring spinning from waste fruit and the modelling of these fibres to achieve the desired properties according to the final use.