Report on the outcomes of a Short-Term Scientific Mission[1]

Action number: **CA17107**

Grantee name: **ESRA AKGÜL**

Details of the STSM

Title: **Investigation of light-emitting smart textiles**

Start and end date: 01/10/2022 to 31/10/2022

The study is designed in accordance with 'the development of new functional textile materials, textile functionalization with smart and efficient systems like sensorization, communication systems and actuators, considering printing electronics approaches, in order to maximize comfort, well-being; develop interoperability between connected devices' key challenge within the scope of **WG 4**.

With this STSM, It is aimed to research and develop textile coatings for light-emitting smart textiles. It is aimed to evaluate the light emission performance of the obtained textile structures for using future product designs.

Description of the work carried out during the STSM

Within the scope of this study, smart textiles that emit light have been developed to improve the user experience in lighting technology in the automotive industry. The manufacture of EL textiles were accomplished by spray coating. For developing light emitting textile, all layers are applied on a textile surface allowing to create an electroluminescent system, according to the materials as below:

- ✓ Back electrode, Dielectric-Phosphor - Busbar - Front electrode

[1] This report is submitted by the grantee to the Action MC for approval and for claiming payment of the awarded grant. The Grant Awarding Coordinator coordinates the evaluation of this report on behalf of the Action MC and instructs the GH for payment of the Grant.

Figure 1. Sample of developed light emitting textile

For evaluating illuminance measurements of ligth emitting textile and ink composition, some measurement were applied. In order to understand developed ink composition, the SEM-EDS that is one of the characterization methods were used. Illuminance measurements and their accuracy are affected by various parameters such as operating conditions, characteristics of light sources and characteristics of the applied light meter. Consequently, the light-emitting smart textiles were researched and developed the innovative inks for light-emitting smart textiles. The light emission performance of the obtained textile structures was evaluated for using future product designs with this STSM.

Description of the STSM main achievements and planned follow-up activities

Description and assessment of whether the STSM achieved its planned goals and expected outcomes, including specific contribution to Action objective and deliverables, or publications resulting from the STSM. Agreed plans for future follow-up collaborations shall also be described in this section.

The samples developed with different compositions were compared to commercial phosphor ink. According to results, the developed innovative ink can be used in future studies. This STSM allowed working with the University of Minho, Fibrenamics, and the Erciyes University, Engineering Faculty. Considering the increasing demand for wearable technologies in Turkey and Europe, future collaborations for smart textiles will be possible. In this study, although only light-emitting textiles for automotive were studied; it has provided the infrastructure to investigate the use of light-emitting textiles in various industrial product designs from medical applications to decoration.

The general outputs as a result of the my research were as follows;

- ✓ The light-emitting textile coatings were developed,
- ✓ The performance values of the obtained light-emitting surfaces were evaluated
- ✓ The light-emitting textile coatings were optimized,
- ✓ The findings obtained as a result of this study will be transformed into a scientific publication with acknowledgments to the COST Action CA17107 and Fibrenamics. The results will be presented at the international congresses.
- ✓ In the future, a network has been established to develop joint projects with Fibrenamics/ University of Minho

With this study, a new smart textile product has been developed. A new ink has been obtained for the functionalization of light-emitting textile materials. This developed smart textile structure can be applied in various multidisciplinary fields (such as medical, building, and home products). This STSM gave me the opportunity to research smart light-emitting textiles, establish a network of researchers, and lay the groundwork for future collaborations.