

**Report for the 1000 EUR grant for the  
Doctoral Research Visit in a Joint Research on the topic of  
Mechanical Reliability and Failure Mechanism of Photopolymer-based 3D-Printed  
Multilayer Stretchable Electronics**

Grantee: Zhao Fu, Doctoral Candidate, Tampere University, Finland

Event: Research visit to Holst Center, Netherlands during 3.9.2023 – 16.9.2023

## **Background**

I initiated a plan of a joint research together with the collaborator in Holst Center, Eindhoven, Netherlands with a project titled *Mechanical Reliability and Failure Mechanism of Photopolymer-based 3D-Printed Multilayer Stretchable Electronics*. By initial plan, this research would consist of the stretchable electronics fabrication using the customized stereolithography (SLA) 3D printing technology and equipment at Holst Center, and the reliability and failure mechanism against stretching test at Tampere University. For learning this advanced fabrication technology and a better understanding of the investigated sample, we planned a research visit for me to learn the fabrication technology at Holst Center in Netherlands. This research was expected to promote the research collaboration and to promote the development of advanced 3D printing for stretchable electronics fabrication.

## **Event Execution**

Due to the change in the collaborator's work schedule, the planned visit was shortened to 2 weeks during 3.9.2023 – 16.9.2023. During the visit, I conducted the following activities:

- Visited the 3D printing laboratory and learnt the working principle of the printer.
- Practiced the stretchable electronics fabrication using their equipment.
- Fabricated two initial samples and verified their functionality.

There were two major changes against the initial plan: (1) the length of visit was shortened from 2 months to 2 weeks due to their schedule. So, instead I fabricate all planned samples there, they proposed that I mainly learn and understand the fabrication process there, and the collaborator would continue to fabricate the experimental samples after I leave. We acted in this way. (2) In the sample fabrication at Holst Center, we were challenged by the unknown influence of the conductor's geometry. Thus, we decided to first investigate the impact of the conductor's width on the stretchability and failure mechanism of the 3D-printed stretchable electronics. So, we narrowed the research question.

## **Research Outcome and Status**

Through this research visit, I have learnt the fabrication of stretchable electronics using SLA 3D printing technology and understood its unique advantages. After the visit, I customized the stretching test setup, tried stretching test and electrical measurement of the two initial samples at Tampere University. However, the performance was poor. We discussed and identified the cause was due to the material used. At the moment, the work with sample fabrication is ongoing at Holst Center. We expect that more robust samples can be fabricated, and the research question could be answered.