Sächsisches Textilforschungsinstitut e.V.

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Multifunction 3D printing on textiles

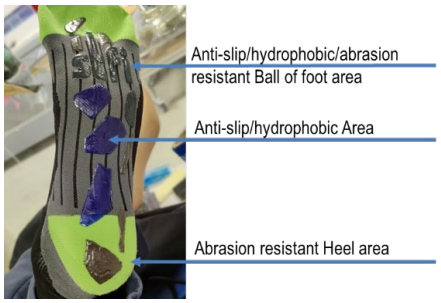
Objective

In the course of functionalising textiles with the help of 3D printing, various extrusion processes are used that can only process one material at a time during the manufacturing process. If two or more materials are required, machines with at least two or more printing nozzles are used, otherwise the material has to be replaced in between. This can result in cost-intensive and time-consuming set-up times, while at the same time grading of the properties is not possbile. The aim of the project was to generate at least three functional modifications on a textile in one step. The approach consisted of the development of a 3D printing process for textiles in which different functions were generated within a print pattern. Two materials were applied to textile substrates via a variable adjustable mixing ratio in the 3D printing process. This was intended to give the textiles the desired functional properties exactly where they were needed.

Approach and results

The focus of the project was set on a two-component (2K) print head. The 2K print head was used to develop a 3D printing process for textiles generating at least three functional modifications. The functional modifications were created by defining the mixing ratio of two pasty materials. The materials are water-based polyurethane dispersions that have been modified with functional additives. Increased abrasion resistance, hydrophobic effectiveness, optical effects, variable surface hardness and antibacterial effectiveness were in the centre of attention.

As part of the project, machine and software modifications were achieved in order to mix two different pasty materials in different ratios during the printing process. The slicer software had to be adapted in order to be able to change these mixtures during the process. Using the functional materials developed, a wide variety of print samples with variable mixing ratios were produced and the 3D printing process was developed. The functionality of the respective functional properties was successfully demonstrated in the corresponding test procedures.



Project demonstrator

At the end of the research work, the 3D printing process was used to produce printed sock and glove patterns equipped with several functional modifications in a single process step. Therefore, this process represents a resource-efficient alternative compared to conventional methods (e.g. screen printing) and favours the ongoing trend towards customised production.

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The final report on this project is available on request.

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