# Sächsisches Textilforschungsinstitut e.V.

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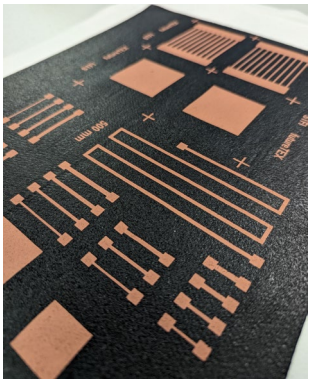
## CarboCopTex – Analysing conductive carbon black and copper-based solutions for possible applications in the production of electrically conductive, sensory structures on stretchable textiles

### Objective

State of the art is to apply silver- or carbon black-based dispersions in screen printing process to prrinted conductive structures on textiles. To drive the sustainable development of printed electronics forward one aim is to find an adequate substitution to the metal conductor silver. The research project focused on the application of new types of copper dispersions, which were converted into conductive layers by conventional drying or sintering methods. The application of these dispersions had not yet been tested in the textile sector. The aim of the project was therefore to develop conductive carbon black and copper-based dispersions and suspensions that enabled the generation of electrically conductive, dissipative and sensory structures on textile substrates.

### Approach and results

In a first development step, various conductive carbon black dispersions and copper-based formulations were developed accordingly through several analytical methods to characterise the flow behaviour, surface tension, wetting behaviour and the particle size distribution. After that different combinations of copper-based highly conductive material layers with conductive carbon black-based layers were tested.



*Sample of printed conductive copper structures on a TPU nonwoven with carbon black layer*

After the print-technical application of various interdigital structures, conductive tracks and larger dimensioned surfaces, topcoats were applied for an additional protective effect against external influences. Light microscopic and scanning electron microscopic images were used to evaluate the print quality of the layer structures produced. The adhesion of the individually applied layers to each other and to the textile substrate was evaluated. Possible cracks or other impurities of the generated conductive path structures were evaluated. Based on this, individual parameters were adjusted to increase the print quality.

The generated samples were further characterised by resistance measurements. Although the investigated samples showed higher values than comparable silver-based systems but still represent a more cost-effective alternative. Based on these results, various designs and structures were evaluated and corresponding functional samples were produced. The focus was on various heating surfaces and sensors for detecting strain and pressure.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The final report on this project is available on request.


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