Sol-gel supported electroless copper deposition on textile materials

Justus Landsiedel, Waleri Root, Thomas Bechtold, Tung Pham

Research Institute for Textile Chemistry and Textile Physics, University of Innsbruck, 6850 Dornbirn, Austria

Electrical conductivity in textiles is particularly important for the production of e-textiles, i.e. a combination of textile materials with sensors and actuators. Deposition of conductive layers on non-conductive, flexible materials represents a key technology to impart textiles with electrical conductivity, while maintaining the bulk properties. There are multiple options for this functionalization, and the approach we pursue is electroless deposition of copper. The process commonly used for metallization of non-conductive materials such as glass, can be adapted for textile substrates [1]. However, such a process only offers low control over the amount of the deposition and the thickness of deposited layers.

We report on the pretreatment of cellulosics with a sol-gel process to introduce siloxane groups and to generated defined structures on the surface, followed by electroless copper deposition process. The sol-gel process acts as a means to achieve defined surface structure on textiles and thus better control over electroless deposition and therefore over the electrical conductivity of the finished substrates. This is based on the changes in microstructure of the surface and accessibility of the copper salt solution into the fibers structure. The sol-gel layer acts as a template for the microstructures shown in Figure 1.

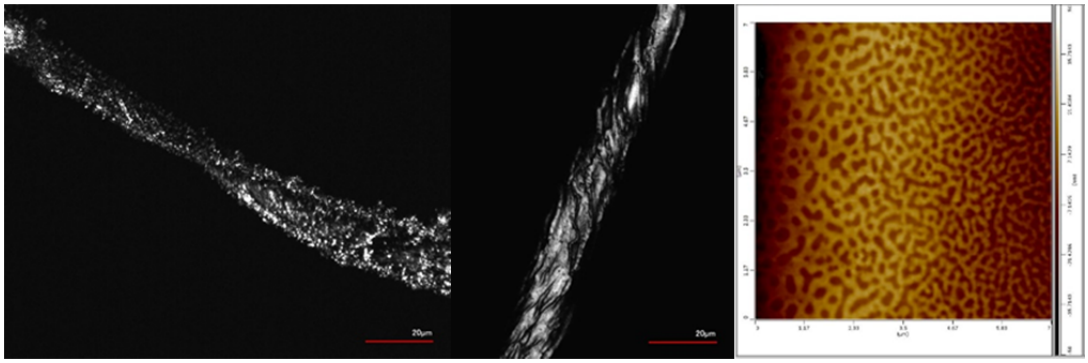

Figure 1: Laser microscopy picture of copper deposition (a) on a plain cotton fiber (b) on a sol-gel coated cotton fiber. (c) AFM height profile of sol-gel structured fiber surface.

[1] W. Root, N. Aguiló-Aguayo, T. Pham, T. Bechtold, Conductive layers through electroless deposition of copper on woven cellulose lyocell fabrics, Surface & Coatings Technology 348 (2018) 13-21.