

PRINTING OF NANOSILVER PARTICLES WITH ANTIMICROBIAL PROPERTIES ON TEXTILE

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Nano silver particles, an anti-microbial finish for cotton fabrics in the form of a commercial product Isys Ag (Bezema, Switzerland) were applied to fabrics by printing technique. Commercial products Isys MTX (Bezema, Switzerland) - a reactive organic-inorganic binder and Tubiscreen 300 AB (CHT, Germany) - a polyacrylate thickener were used in combination with Isys Ag. For visual evaluation of print effects and for the evaluation of fastness to washing a red pigment Bezaprint rot (Bezema, Switzerland) was added to printing pastes. White cotton fabric was printed on the magnetic printing machine by the use of a flat screen and rod magnetic squeegee. Five different printing pastes were applied; a) thickener and pigment, b) thickener, pigment, Isys Ag and Isys MTX, c) thickener, Isys Ag and Isys MTX, d) thickener and Isys Ag and e) thickener. Printed samples were dried at 120 °C, 1 min and thermofixed at 170 °C, 3 min. One sample from each group was washed five times at 40 °C according to the ISO 105-C01:1989 (E) standard.

The anti-microbial test was done on washed and unwashed samples c, d, e. The acetylacetone method was used for the detection of formaldehyde. Washed and unwashed samples were observed at different magnifications by the use of Scanning Electron Microscope. Colour differences between one and five times washed samples were measured spectrophotometrically.

The anti-microbial activity on all unwashed samples was determined to be excellent comparing to washed samples. All samples had low formaldehyde content. Colour differences between washed and unwashed samples were found to be low. No differences between samples printed with different components were observed by SEM photomicrographs.

It can be concluded that the thickener itself has antimicrobial properties, which are not a consequence of potential presence of formaldehyde in the printing paste. The washing of fabrics does not remove the pigments applied by printing, because the colour remains unchanged, but does remove the thickener to such extent, that the antimicrobial properties disappear. As can be seen from the SEM micrographs, the whole unwashed fibers, including the applied silver particles, are covered with binder and thickener to such extent, that the silver can not function as an antimicrobial agent. The process in this form did not prove as appropriate for antimicrobial finishing of cotton.

The intention of our research group in the future is to optimize the process of applying nano or micro particles, including microcapsules, to textiles by printing technique.

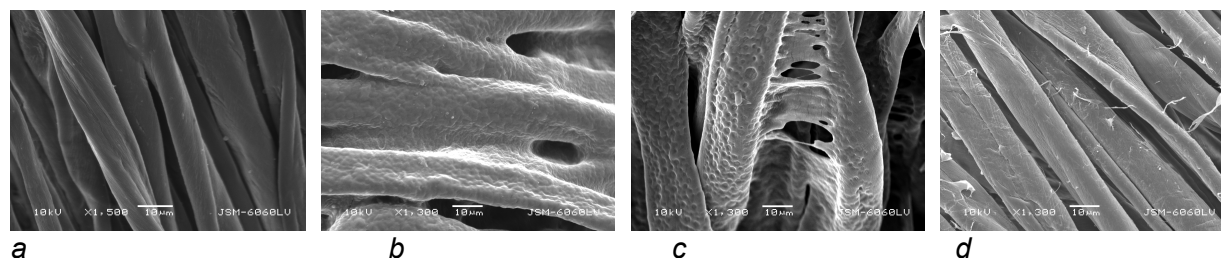


Figure 1: SEM micrographs of cotton fibers; a) unprinted, b) printed with IsysAg+Isys MTX+thickener, c) printed with Isys Ag + thickener, d) printed with Isys Ag+Isys MTX+thickener and washed 5 times.