

## Investigations on Polyester Fabric Coated With Silver Using the Hollow Cathode Discharge Technique With Regard To Their Anti-Microbial Properties

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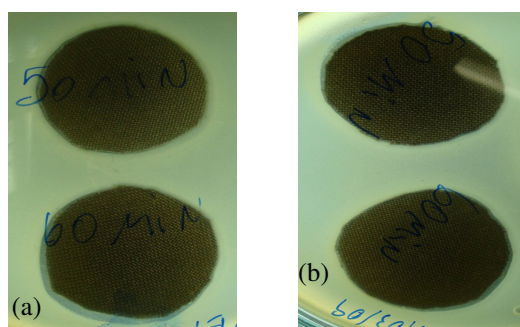
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**Abstract** – Polyester fabric were coated with silver using the hollow cathode discharge with the aim to inhibit the growing of bacteria. After treatment the samples were analyzed by scanning electron microscopy to observe the morphology and dispersability of the particles sputtered at polyester samples. Observing figure 2, can be seen that the samples presented good dispersability and the particles has its morphology very approximately. Figure 1 shows the inhibition zone around the treated samples. Hence, it can be conclude that the treatment is effective against staphylococcus aureus.

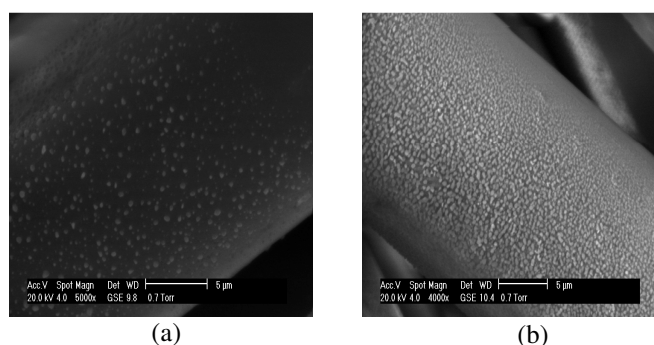
Because of the growing demand for healthy living there is an increase interest in materials capable of killing harmful microorganisms. It is well known fact some metals especially silver and copper exhibit toxic effects on microorganisms. Silver, for instance, is used in materials for wound dressings, sheets, pillowcovers and medical clothing. Silver binds with protein molecules, inhibits cellular metabolism, and finally eradicates microorganisms. Due to its non-toxic nature, silver is innocuous to human skin. In the present work, we report on investigations concerning the anti-microbial effects of silver metal layer on polyester fabric deposited by physical vapour deposition. Layers of silver were deposited on polyester fabric by hollow cathode discharge on a laboratory scale and anti-bacterial activities were investigated using the ISO 20645 standard [1-3].

The plasma jet system obtained from hollow cathode discharge was used for deposition of silver thin film by means of sputtering of the hollow cathode material at low pressure (about  $10^{-2}$  mbar). It constitutes from a DC source (0 – 1200 W) and a cylindrical vacuum chamber (made from glass and closed from both sides by stainless steel flanges). In a vertical mount, the top flange consists of the gas entrance through the hollow cathode, and a cooling loop. The flow of argon was fixed at 6 and 10 sccm. Each film was deposited at different time treatment which was 10, 20, 30, 40, 50 and 60 minutes.

After plasma treatment all the samples was immersed in a solution with LB agar and bacteria. It can be seen that all treated samples showed an inhibition zone around the test fabric which means that the bacteria did not grow showing a good effect against the bacteria. Some results can be seen at figure 1. Fig. 2 presents SEM micrographs of polyester/silver compounds. Most of the silver particle had relatively good dispersibility, thus the bacteria will not grow on the fabric surface.



**Figure 1:** Photography image of a treated polyester fabric immersed in LB agar and bacteria. **a)** Treated sample with 6 sccm argon and treatment time of 50 and 60 minutes. **b)** Treated sample with 10 sccm argon and treatment time of 50 and 60 minutes.



**Figure 2:** **a)** SEM images of polyester treated samples with 6 sccm argon flux and 60 minutes treatment time. **b)** SEM images of polyester treated samples with 10 sccm argon flux and 60 minutes treatment time.

### References

- [1] T. Yuranova, A.G. Rincon, A. Bozzi, S. Parra, C. Pulgarin, P. Albers, J. Kiwi, J. Photochemistry and Photobiology A: Chemistry. 161 (2006) 27-34.
- [2] J.X. Li, J. Wang, L.R. Shen, Z.J. Xu, P. Li, G.J. Wan, N. Huang, Surface & Coating Technology. 201 (2007) 8155 – 8159.
- [3] J. Wanga, et al, Surface & Coating Technology. 186 (2004) 299 - 304.