Development of Ag/TiO_2NM-Treated Leathers with antibacterial activity for Footwear Industry

***I. Carvalho*[1,2,3]*, S.M. Marques[2], M. Henriques[3], T. Polcar[1,4], C.J. Tavares[2], S. Carvalho[2,5]**

[1]*Department of Control Engineering, Faculty of Electrical Engineering, Czech Technical University in Prague, Technická 2, Prague 6, Czech Republic*
[2]*GRF-CFUM, Physics Department, University of Minho, 4800-058 Guimarães, Portugal*
[3]*CEB, Centre of Biological Engineering, LIBRO-Laboratório de Investigação em Biofilmes Rosário Oliveira, University of Minho, Campus of Gualtar, 4700-057 Braga, Portugal*
[4]*Engineering Materials, University of Southampton, Highfield, SO17 1BJ, Southampton, UK*
[5]*SEG-CEMUC Mechanical Engineering Department, University of Coimbra, 3030-788 Coimbra, Portugal*

*Corresponding author: isascarvalho@hotmail.com

This work aims to contribute to the industrial development of safer and advanced leathers using nanomaterials (NMs) that are based in titanium oxide doped with silver (Ag-TiO_2NMs). These NMs present an ecological alternative to volatile organic biocides and organic solvents, frequently used nowadays. Safe application of these NMs brings added value to footwear and leather products and reduces the bulk chemical wide pollution. These newly developed materials are expected to be useful for footwear manufacturing (for common or professional use) with advanced protection against bacteria and fungus, which are the most common cause of feet infections, for either common or professional use. Hence, the main aim of this work is the improvement of leather footwear in order to overcome the feet infections and ensure minimum risk of human skin penetration. In order to accomplish the main aim, the cytotoxicity, antimicrobial and self-cleaning properties of leather surface, treated with Ag-TiO2NMs by sputtering deposition were assessed.
The Ag-TiO_2 coatings were deposited onto leather substrates by DC-pulsed reactive magnetron sputtering using two targets, Ti and Ag, in an Ar + O2 atmosphere. Compositional analysis was achieved by X-ray energy dispersive spectrometry (EDX).
Contact angle of the coatings was measured and the results show that with the introduction of silver in TiO_2 microstructure promotea an increase in hydrophobicity. The antibacterial activity of the samples was assessed by agar diffusion method and the results point out to a silver antibacterial activity.