Antibacterial Performance of Electrically Activated Conductive Water Filter Papers

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Silver and copper thin films were coated on commercially available 3 M water filter papers using DC high vacuum magnetron sputtering techinque. The filter papers (10 X 7 cm size) are flexible structures consisting of nonconductive fibers and metallic nanoparticles were deposited with 300 nm and 1 μm thicknesses resulting in a complete coverage of the fibers surface. Both silver and copper thin films deposited on water filter paper are effectively working against common types of harmful bacteria that are found in waste water. The research is investigating the possibility of creating electrically conductive structures and the synergistic antibacterial effect obtained by using metallic thin films deposited on water filter paper and an electrical current applied to the structures. The antibacterial activity of electrically conductive structures was tested by applying an increased electrical potential. The morphology of the coatings and their adherence to the water filter paper was examined using the digital optical microscopy and Scanning Electron Microscopy and their chemical composition was investigated using the X-ray diffraction technique. All thin films showed good adhesion to water filter fibers and ensured a high area of exposure to contaminated water. The antibacterial effect of different conductive thin films was characterized by using the standardized membrane filtering technique for water and wastewater examination. The testing media (i.e. contaminated water) containing bacterial samples were collected from local wastewater basins. Water was tested for the bacterial content before and after the exposure to conductive thin films coated filters.