

## **Nano silver-coated polypropylene water filter: I. manufacture by electron beam gun using a modified Balzers 760 machine**

### **ABSTRACT**

As adequate freshwater supplies decrease steadily, novel technologies are required for water purification. Nanotechnology, a new scientific frontier, promises to revolutionize innovation in many industries. Advancements in nanotechnology are being applied in the water-purification industry to keep harmful bacteria out of drinking water. Due to its bactericidal properties, nano silver is used in many products as an antibacterial. This study aimed to produce a nano silver-coated water-treatment polypropylene filter via the physical vapor deposition method using the Balzers 760 machine equipped with an electron beam gun ESQ 110. The Balzers machine was modified in order to enable coating of the cylindrical filters in a homogenous manner. The nano silver particles were made by electron beam bombardment of the silver metal, which were subsequently deposited on the polypropylene filter evenly. The thickness of the nano layer coated on the filter was about 55.0nm in average, as revealed by the microprocessor unit of the Balzers machine during the coating process. The thickness of the nano layer and the chemical composition of the produced filters were studied by scanning electron microscopy, atomic force microscopy and the X-ray diffraction technique. The filter system produced in this work has the potential to be used as an efficient and cost-effective water treatment method. The inductively coupled plasma/mass spectrometry (ICP/MS) studies revealed that there was no nano silver particle present in the filtered water sample. Hence, there is no risk of contamination of drinking water with the silver nano particles upon application of the manufactured filters. This is the first report on the manufacture of nano silver-coated cylindrical polypropylene filter using the electron beam gun technique.

**Keyword:** Nano silver; Electron beam gun; Balzers machine; Polypropylene filter; XRD; SEM; AFM