Preparation Of AgNPs Decorated Non-woven Fabrics Using An Atmospheric Pressure Plasma Jet

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Due to the progressive demand growth of medical, healthcare and hygiene non-woven fabrics, the interest for efficient, non-toxic, durable and cost-effective antimicrobial finishing of fabric materials rapidly increases. There are two factors which dominate the property of the antibacterial non-woven fabrics, a proper antimicrobial agent and a practical decorating strategy.

Owning to its broad-spectrum antibiotics property and rare yet associated with drug resistance, silver has become one of the most largely metals used to confer antibacterial properties to biomaterials. Presumed to be more active than bulk silver materials, silver nanoparticles (AgNPs) have been expected as a new generation of antimicrobials. Therefore, it is a great interesting in the development of fabrics decorating AgNPs as the antibiotics. Considering the emergence of cytotoxicity and genotoxicity of silver nanoparticles goes against some practical applications in human body, it is important to fabricate antibacterial materials with firm loading of AgNPs.

Anchoring or grafting AgNPs on the fabrics by normal dipping–pad–dry method have been substantial discussed. However, the risk of the release of AgNPs to the microenvironment would be high. Another way to incorporate silver into fibers is usually added in metallic form during melt-spinning. This increases production complexity and costs of final products due to the presence of solid metallic silver particles in the process.

In this work, an atmospheric pressure nonequilibrium DC plasma jet has been employed for the decorating of AgNPs on non-woven fabrics. The materials were pretreated by the deposition of a first layer of organosilicon thin film, then were decorated AgNPs by a dipping-pad-dry process, and finally were covered by a top layer of thin film. The N_2 plasma jet was characterized using optical emission spectroscopy. The methods of SEM/EDX, XPS and GD-OES were implemented for the morphology and stoichiometry of the samples. The result reveals the morphology and stoichiometry of the films can be tailored by controlling the parameters of the process. Antibacterial characterization of the films were performed using Escherichia coli (*E. coli*) and Staphylococcus aureus (*S. aureus*) strains, which show the effective antibacterial activity of the samples.