7-11 JULY 2024
NANOSMAT Barcelona
15th International Conference on Surfaces, Coatings and Nanostructured Materials
www.nanosmat2024.com

ABSTRACT:

Efficiency of O2/SF6 Plasmas on the Disinfection of Filtering Facepiece Respirators

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Devices used in medical procedures and as barriers against contamination are, in general, disposable, generating waste that requires specific destination. Disposal adds costs to healthcare procedures and creates environmental problems, making reuse a necessary condition. This study explored the potential of employing low-pressure plasmas for disinfection of N95 respirators, searching for a more effective eradication of pathogenic organisms while preserving the integrity of the respirator material. The plasma was established using mixtures of oxygen and sulfur hexafluoride (SF6). The proportion of SF6 introduced into the plasma was varied from 0 to 100%, while that of oxygen was correspondingly reduced. Plasma ignition was achieved by applying a radiofrequency signal to the lower electrode, while the upper electrode was grounded. The as-received and the fungal-contaminated fabrics were subjected to treatment on both the powered and grounded electrodes. The sterilization efficiency, alongside the physical and chemical characteristics of the N95 fabrics (PP and PS), were assessed in relation to the proportion of SF6 and the electrical configuration of the treatment. The structural integrity of the fibers was preserved post-plasma treatment, with slight morphological alterations confined to the surface layer. Albeit in reduced amounts, oxygen and fluorine were identified on the treated fibers by means of C-F and C-O groups, majorly on their surfaces. Substantial changes on the surface wettability of the fabrics were imposed only for the treatments conducted with lower SF6 contents. The complete disinfection of the fabrics was attained under different treatment conditions, with negligible alteration to the physical and chemical properties of the fibers. These

results suggest that this approach may represent a new promising route for fabric disinfection.