Advances in Materials Science and Engineering

Special Issue on

Atmospheric Plasma Surface Treatment of Fibrous Materials

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Currently, plasma technology has assumed a great importance among all available surface modification processes. It is a dry, environmentally friendly, and worker-friendly method to achieve surface alteration without modifying the bulk properties of different materials. Nonthermal or cold plasmas may be divided into two different types: atmospheric pressure plasmas (APP) and vacuum or low-pressure plasmas (LPP). There are many advantages and disadvantages of both types of cold plasma; however, LPP technology requires expensive vacuum systems which make it difficult to upscale and obtain continuous processing. APP processes are a viable alternative, as they are cost-competitive to low-pressure plasma and wet chemical treatments, while avoiding the need for expensive vacuum equipment (like LPP) and allowing the continuous and uniform processing of fibers surface.

Surface modifications are important for changing the characteristics and properties of fibrous materials in order to make them better suited for a wide range of applications. The process of surface modification may include cleaning/degreasing, disinfection/sterilization, redox reactions, etching, grafting, cross-linking (carbonization), and deposition. A thorough understanding of the mechanisms creating these effects is important for this kind of targeted surface engineering and for understanding the advantages APP has over traditional plasma techniques.

Fibrous materials are bulk materials consisting of large quantities of individual fibers and have a variety of applications in textiles, biomedicine, and composite materials. Nanofibers are especially important because their nanoscale features allow for an extremely large surface area and high porosity, and they can be manufactured in high quantities for little cost. Nanofibers also bridge the gap between the nano and macro scales, due to their diameters being in nanometers while lengths are often large enough to be on the macro scale. Due to their large surface area, nanofibers are of great interest when studying surface modification techniques.

This special issue on APP for surface treatment of fibrous materials aims to focus both on the textile applications that compose the majority of the research in this field and also on new advanced applications in all sectors, including construction, agriculture, automotive, aerospace, and medicine. We welcome both original research and review articles.

Potential topics include but are not limited to the following:

- Emerging atmospheric plasma technologies for fibrous material processing
- APP treatment to impart hydrophilicity or hydrophobicity to fibrous materials
- APP surface treatment in composite fibrous materials
- APP assisted dyeing and printing processes of fibrous materials
- APP production of medical materials and antimicrobial coatings
- APP coatings of fibrous materials for protection and comfort

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Papers are published upon acceptance, regardless of the Special Issue publication date.

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