Water and Oil Repellent (amphiphobic) Coating on Kevlar Fabric Using Plasma Based Methods for Protective Clothing Applications

Abstract

Military, firefighting, and medical professionals need advanced protection when addressing chemical threats across various settings, such as military engagements, firefighting missions, and emergency rescue operations. Aramid fabrics are important wearable fire/thermal protective materials due to their good flexibility, high temperature resistance, excellent chemical resistance, and inherent fame resistance. However, their light aging and hydrophilicity can cause functional decline and heat damage to wearers once liquid water absorbed by the fabric evaporates and forms high-temperature water vapor, which may diffuse into the garment and scald the skin.

The proposed work involves experiments to activate the surface of aramid fabric using plasma followed by deposition of amphiphobic coating by PECVD (Plasma Enhanced Chemical Vapor Deposition) and/or deposition of SiO_2 / ZnO nano particle by dip coating method.

Apart from experimentation, the candidate will be performing characterization of coated surfaces for water/oil repellent properties, surface energy, surface chemistry and surface morphology using contact angle goniometer, FT-IR (Fourier Transform Infra-Red) spectroscopy, Scanning Electron Microscopy (SEM) techniques.

Academic Project Requirements:

1) Required No. of student(s) for academic project: 1

2) Name of course with branch/discipline: M.Sc. Other

3) Academic Project duration:

(a) Total academic project duration: 20 Weeks
(b) Student's presence at IPR for academic project work: 5 Full working Days per week

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