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Seminar

Institute for Plasma Research

Title : Surface modification of polymeric materials using glow discharge plasma

Speaker: Dr. Arun Kumar
Anna University, Chennai

Date : 17th June, 2022 (Friday)

Time : 03.30 PM

Venue : Online - Join the talk:

https://lobby.ipr.res.in/DrArunKumar_PDFTalk

Abstract :

Polymeric materials such as polypropylene (PP) and low density polyethylene (LDPE) play a significant role in the biomedical application as they possess excellent flexibility, non-toxicity, low cost to produce and their promising biocompatibility. However, despite of these outstanding characteristics, polymeric materials are often incompatible to use in biomedical materials owing to its poor surface properties such as highly hydrophobic, lack of polar functional groups, low adhesion and surface energies. Hence, it is essential to modify the surface of the polymers without affecting bulk properties. Various surface modification techniques such as chemical etching, corona discharge, e-beam, ion beam, laser treatment, UV irradiation, ozone treatment, wet chemical treatment and plasma based surface treatments have been developed to overcome the drawbacks of the materials by tailoring the surface of polymers. Among them, Plasma-based methods provide many exciting opportunities in surface modification of polymeric films. In this work, various bio functional coatings were developed on the surface of PP and LDPE films using low pressure and atmospheric pressure plasma assisted polymerization techniques for enhancement of their biocompatibility.

The first objective of my work is development of TiO_x based coatings on the surface of PP films using TiCl₄/Ar+O₂ gas mixture as a precursor via glow discharge plasma as a function of various discharge potential to enhance their biocompatible properties. The TiO_x films were studied by different characterization methods such as, XPS, AFM and contact angle measurements. In-vitro analysis was used to determine the cyto-compatibility of TiO_x/PP films.

The second objective of my work is development of SiO_x like coatings on the surface of polypropylene (PP) films. The SiO_x coatings were deposited as a function of various operating parameter (discharge potential and deposition time) using Ar+O₂ glow discharge plasma assisted polymerization and hexamethyldisiloxane (HMDSO) was used as the precursor. The SiO_x films were studied by various characterization methods (contact angle, XPS and AFM analysis). The stability of the coatings during ageing was also examined by storing in air for 30 days. The cyto-compatibility property of the SiO_x film was studied by in-vitro analysis.
