

Applications of plasma species generated using Electron Cyclotron Resonance Plasma

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Abstract:

Electron Cyclotron Resonance (ECR) plasma is an example of cold plasma which is characterized by wide difference in energies of the plasma species. The light species, electrons have sufficiently large energy which facilitates modification of materials surface. Recently, we have re-constructed an indigenous ECR plasma reactor and characterized in terms of electron energy using Langmuir Probe as well as optical emission spectroscopy. The plasma species generated using Ar, H₂+N₂ (H-N) and O₂ were used for surface processing of a polymer, namely; Nylon 6 (N6), Polytetrafluoroethylene (PTFE) and Ultra High Molecular Weight Polyethylene (UHMWPE) so as to understand the nature of plasma-polymer interactions at the surface and enhance biocompatibility. Surface morphological properties of the samples before and after plasma exposure in different experimental conditions were investigated. The surface modification of Ultra High Molecular Weight Polyethylene (UHMWPE) using O₂ and H-N plasma has also been carried out and used for bone tissue engineering. The effect of pre and post plasma treated polymer surfaces on adhesion, proliferation, and differentiation of bone associated cells (Mesenchymal stem cells (MSC)) and Peripheral Blood Mononuclear Cells (PBMNC)) has been considered. Finally, the relation between plasma properties with polymer processing has been elucidated.

Key words : ECR plasma, Langmuir probe. Optical emission spectroscopy, Polymer surface modification, Tissue engineering.