Surface Modification by Plasma techniques and Plasma Assisted Copolymerization for the Incorporation of Biofunctionalities

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Plasma techniques have been extensively applied for versatile biological applications including self-cleaning surface, antibacterial filter, and biomaterials. In this study, we reported the utilizations of both low pressure plasma and atmospheric pressure plasma for surface modifications and the deposition of functional thin films and the assisted plasma polymerizations. The plasma deposited thin films containing amine, carboxylic, or ethylene oxide functional characteristics were applied specifically in supporting the proliferation of mammalian cells and enhancement of the fouling resistance. In addition, the mechanism of reactions of the plasma polymerization will be elucidated. For example, that factors that modulated the precursors with similar structure but different saturation degree which result in significant different deposition kinetics will be interpreted. For example, the multilayered plasma polymers with alternative functionalities which showed beneficial qualities due to the charge transfer characteristics will be discussed in detail.

Beside the low pressure plasma, the studies by using atmospheric pressure plasma jet (APPJ) which was applied to deposit inorganic thin films and to assist the polymer grafting will also be discussed. The APPJ allowed depositing thin films containing SiO_x and amine functionalities which proved to promote the biocompatibility of various substrates. In addition, APPJ was also applied to graft environmentally responsive polymer on cellulose membrane in a much effective manner that both advantageous characteristics of cellulose and the responsive polymer were clearly revealed.