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Properties, ageing behavior and stability of bipolar films containing nano-layers of allylamine and acrylic acid plasma polymers

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Abstract

In this work, a dielectric barrier discharge (DBD) has been used for the deposition of bipolar films containing alternating nano-layers of plasma polymerized allylamine (PPAam) and acrylic acid (PPAac). Various films were obtained by varying the single-layer thickness of each plasma polymer while maintaining a constant total film thickness and two kinds of films were fabricated via different depositing sequences (PPAam/Aac and PPAac/Aam). Films properties, ageing in air and stability in water over a 7 days period were investigated. Results showed that, COO^- and NH_3^+ polar entities, generated from the interaction of PPAam and PPAac, are present in the bipolar films. Concerning the films stability, the different reaction mechanisms involved in the formation of each kind of films resulted in a higher amount of polar groups in the PPAam/Aac films; this conferred these films a higher stability than PPAac/Aam. Concerning the films ageing behavior, all prepared samples underwent some kind of ageing which was found to be dependent on the deposition sequence. Results also showed that bipolar coatings exhibited better cell-material interactions compared to PPAam and PPAac films; with a better cell viability observed on PPAam/Aac coatings after 1 and 7 days culture.

Keywords: plasma polymerization , bipolar film, allylamine, acrylic acid, surface analysis

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