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Plasma polymers deposited in atmospheric pressure dielectric barrier discharges: Influence of process parameters on film properties

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Abstract: We present results on the deposition of plasma polymer (PP) films in a dielectric barrier discharge system fed with mixtures of argon or nitrogen carrier gas plus different hydrocarbon precursors, where the latter possess different carbon-to-hydrogen ratios: $\text{CH}_4 < \text{C}_2\text{H}_6 < \text{C}_2\text{H}_4 = \text{C}_3\text{H}_6 < \text{C}_2\text{H}_2$. The influence of precursor gas mixture and flow rate, excitation frequency, and absorbed power on PP film compositions and properties have been investigated. The discharge was characterized by electrical measurements, while the chemical compositions and structures of coatings were analysed by X-ray photoelectron spectroscopy, Fourier-transform infrared spectroscopy, total combustion, and elastic recoil detection analyses, the latter two for determining carbon-to-hydrogen ratios. Scanning electron microscopy was used to study the coatings' morphology, and profilometry for evaluating deposition rates.

Keywords: Dielectric barrier discharge, Plasma polymers, Deposition, Biomaterials

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