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Influence of aliphatic side chain on the near atmospheric pressure plasma polymerization of 2-alkyl-2-oxazolines for biomedical applications

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Recently, the plasma polymerization of 2-oxazoline monomers has been studied for the deposition of coatings with potential use in biomedical applications, as they were reported to exhibit antifouling properties which were also present for the parent polymers.[1] In this work, the near atmospheric pressure plasma polymerization of a range of 2-alkyl-2-oxazoline monomers (methyl, ethyl, n-propyl and n-butyl) is explored and the effects of a growing aliphatic side chain on the properties of the obtained coatings are investigated using a variety of analytical techniques (WCA, FT-IR, XPS and NMR). The antifouling capacity of the deposited coatings are examined by cellular, bacterial and protein adhesion tests. With the growing aliphatic side chain, stable coatings are obtained at lower input powers and the coatings become more hydrophobic, while the side chain does not have an influence on the chemical groups deposited in the coating. It also became apparent that the composition of the plasma polymerized coatings significantly differs from the parent polymers. The cellular, bacterial and protein adhesion tests indicated that fouling occurred for all coatings, which may be ascribed to the difference in chemical composition between the 2-oxazoline plasma polymers and the conventionally synthesized poly(2-oxazoline)s. Despite this deviation in terms of antifouling capacity, the obtained coatings show promise as cell-interactive coatings and could find applications in tissue engineering.

[1]Cavallaro A.A., MacGregor-Ramiasa M.N., Vasilev K. Antibiofouling Properties of Plasma-Deposited Oxazoline-Based Thin Films. ACS Appl Mater Interfaces. 2016;8(10):6354-6362.

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