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Plasma-based coatings for the enhancement of biomolecule sensing

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Surface plasmon resonance (SPR)-based methods are currently among the best choice to assess bioaffinity interactions at interfaces dues to their sensitivity to local changes in the refractive index to adjacent media. Over the last decades, a lot of work was carried out to improve the SPR sensor by chemical coating and/or lithography, consisting in preparing "bifunctional coatings" that can provide a high specificity for a targeted molecule and also allow the avoidance of nonspecific adsorption.[1] Since plasma deposition provides highly stable polymer films, we investigate this technique to prepare sensor chips. In this study, two different plasma polymer films (PPFs) are prepared, i.e. amino-containing and carboxylic acid-containing PPFs, thanks to an electrical discharge in a mixture of C_2H_4/NH_3 and C_2H_4/CO_2 respectively. Using the high control over both deposition processes that has recently been achieved in our laboratory,[2,3] multilayer and micropatterned films were prepared in order to obtain a bifunctional coating that can enhance biomolecules sensing. It was observed from preliminary studies that the surface zeta potential of the coating were in accordance with the anti-fouling properties. Moreover, zwitterionic coatings showed a good stability in water. Coatings were characterized by SEM, XPS and WCA measurements. Sensing tests were also carried out to prove that the coating is selective and can bind specifically one protein in a mixture of proteins or in a biological fluids.

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