OPTICAL MONITORING OF PROTEINS-GLUCOSE INTERACTION USING HYBRID BIO/NON-BIO INTERFACES

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How proteins are adsorbed and organized at liquid-solid interface is a key issue in biosensors and biomaterials applications, since the properties of the biological layer strongly depends on a complex of physical and chemical phenomena occurring during proteins deposition. Lot of chemical procedures for surfaces functionalization have been proposed to covalently bind proteins and other biomolecules. Hydrophobins are small proteins secreted by fungi, which self-assemble into amphipatic membranes at air-liquid or liquid-solid interface. The physical and chemical properties of some hydrophobins, both in solution and as biofilm, are affected by poly or oligosaccharides. We have studied the interaction between glucose and the hydrophobin Vmh2 from Pleurotus ostreatus. Vmh2 and glucose formed chemically stable biofilms, obtained by drop deposition on flat silicon surface, which were investigated by variable angle spectroscopic ellipsometry (VASE), atomic force microscopy (AFM), and water contact angle (WCA), but also in a spongy-like structure such as that of porous silicon. VASE quantified the amount of glucose in the biofilm. AFM highlighted the presence of nanometric rodlet-like aggregates on the biofilm surface, slightly different from those obtained in the absence of glucose. The wettability of silicon surface, covered by the organic layer of glucose-Vmh2, strongly changed: WCA decreased from 90° down to 17°. We also discovered that a layer of hydrophobin, self-assembled both on planar and porous surfaces, is still able to capture glucose in solution even if presence of a proper binding site has not been proved until now. The design and study of these hybrid interfaces are the new frontier in fabrication of biodevices next generation.

References

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