General-purpose, functionalized poly-L-lysine polymers as bio-sensing layers, and their use in DNA detection

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Designing a biosensor needs to comply with several requirements. Its application, the specific analyte, the sample medium, and the desired physical signal determine the materials and molecules that constitute the bioreceptor and the transducer to form a properly functioning device. In particular the receptor and the transducer work synergistically to form a so-called “functional biointerface”, where the recognition event takes place and is translated into a measurable signal. The functional biointerface is the core of the biosensor, affecting its overall sensitivity, selectivity and efficiency. Thus, controlling the physical and chemical properties of the biointerface will determine the performance of the whole sensing device. Thiol-based monolayers, EDC/NHS coupling chemistry, and silane-based chemistry are well known procedures to immobilize biomolecules on surfaces, but drawbacks exist in chemical instability, materials specificity, and others. Here, we present a new, quick method for surface modification based on functionalized poly-L-lysine (PLL) [1-3]. Due to its electrostatic interaction and the possibility of its easy functionalization with a large variety of functional groups, modified PLLs provide an interesting approach to develop biosensors, because the properties of the surface (such as the type of functional group, antifouling behavior and probe density) can be tuned at will. Here we will show the functionalization and successful detection of DNA with PLL-modified substrates on a variety of substrate materials.

References

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Figures

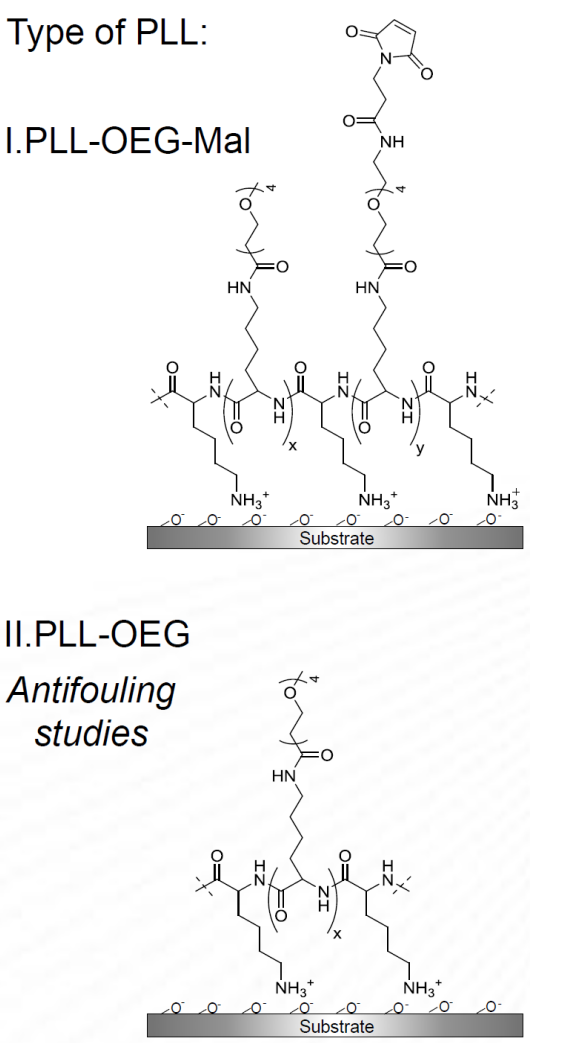

Figure 1. Functionalized PLL with both immobilization and anti-fouling properties (top) and with only anti-fouling properties (botttom).