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Polystyrene Surface Modification for Enhancing Adsorption of Biomolecules: a Surface Plasmon Resonance Study

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The study addresses an experimental approach aimed at facilitating the improvement of the Enzyme-Linked Immuno-Sorbent Assay (ELISA) performances. ELISA is a heterogeneous (plate-based) immunological technique widely used as a diagnostic tool. The principle of the assay lies in capturing the biomolecules of interest present in the liquid probe by the capture biomolecules immobilized to the wells of the ELISA microtiter plate. In this scheme, the immobilization mode of the capture biomolecules is of crucial importance for the immunoassay performances. The most common material for the ELISA plates is polystyrene, and the simplest method to control immobilization of the capture biomolecules is partial hydrophilization of the polystyrene surface.
In this study, we show the potentialities of the Surface Plasmon Resonance (SPR) method for detailed real-time label-free monitoring of the sample immunoassay emulating the ELISA protocol. The capture biomolecules were immobilized on polystyrene nanofilms deposited over the SPR chip using a dip-coating technique. The film surface was hydrophilized to different degrees using a wet chemical treatment. The kinetics of the immunoassay was registered by the SPR sensorgram. We assume that this kinetic dependence reproduces the corresponding stages occurring on the ELISA microtiter plate. In our opinion, this approach has a strong promise of facilitating the development of advanced technologies for further improvement of the ELISA technique.

Topics

Session D. Biomedical optics and sensors technology

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