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# Plasma-Polymerized Allylamine-Based Label-Free Piezoelectric Immunosensor Platform: Characterization and Application

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During this study, a polyallylamine (ALL)-based label-free piezoelectric immunoprobe using a quartz crystal microbalance (QCM) was developed. Two routes for antibody (Ab) immobilization were investigated; the first involved the use of glutaraldehyde (GA) as a cross-linker and the second the use of colloid gold nanoparticles (GNPs) for surface amplification. The latter route, in combination with the use of an orienting protein, was further used in developing an immunosensor for an allergenic protein, ovalbumin (OVA). Surface characterization information on all the steps involved in the fabrication of the immunoprobe is provided in this paper. A combination of techniques such as imaging ellipsometry, atomic force microscopy (AFM), time-of-flight secondary ion mass spectrometry (TOF-SIMS) and X-ray photoelectron spectroscopy (XPS) was used for the characterization of the intermediate and final surfaces. Active amino groups were provided through the plasma deposition of ALL on a quartz crystal surface and further utilized for Ab immobilization. Results from this study show that simple, direct piezoelectric immunoprobes can be fabricated through appropriate Ab orientation and surface amplification techniques without the need for labeled compounds. The combination of surface analytical, optical, and mass characterization techniques confirms the effectiveness of these immunosensor fabrication strategies, whose analytical capacities can be extended to detect target molecules with matched antibodies.

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