Electrocatalytic immunosensing on a charge-selective monolayer

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We have studied an electrode surface that is charge-selective to decrease non-specific binding and to increase the sensitivity of electrochemical immunosensors. Furthermore, the signal from immunosensors was amplified by using an enzyme-conjugated antibody. To make a charge-selective monolayer having the resistance to nonspecific binding, the electrode surface was modified by dendrimer and mercaptoundecanol, resulting in a mixed self-assembled monolayer. The dendrimer layer on the fabricated electrode appeared to be positively charged at pH 7. When neutral or negatively charged mediators such as ferrocenemethanol and potassium ferricyanide were used, amplified signals were registered. On the other hand, hexaammineruthenium chloride with positive charge was rejected by the repulsive force between the amine-terminated dendrimer layer and the mediator. As a model immunosensing reaction, we immobilized antigen (dinitophenyl, DNP) on the electrode surface and employed glucose oxidase (GOx)-labeled anti-DNP antibody. When the target proteins were specifically bound to the surface by antigen-antibody interaction, the electrochemical signal was significantly amplified by bioelectrocatalysis with the labeled enzyme (GOx). The GOx-labeled anti-DNP antibody showed a linear detection range from 10^{-5} to 10^{-1} mg/mL.

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References

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