Signal-amplified Immunoassay Based on Biometallization of Palladium Nanoparticles and Nickel-Phosphorus Enhancement

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A sensitive electrochemical immunosensor was reported with signal amplification by biometallization of Ni-P. In this strategy, the primary antibody probes were immobilized on the aminated glass surface to bond the target antigen. Bounding with alkaline phosphatase (ALP) conjugated second antibody, the sandwich-type immunocomplex was formed. The signal tag of ALP in the immunocomplex can catalyze its substrate of *p*-aminophenyl phosphate to produce *p*-aminophenol, which can reduce Pd(II) in solution to Pd nanocrystals onto the surface. The Pd nanocrystals were served as the catalyst for electroless deposition of Ni-P layer in a successive signal amplification stage. Dissolved by HNO₃, the amount of Ni deposited was determination by adsorptive stripping voltammetry method to quantify the target antigen. With human IgG as the model antigen, the applicability of the method was exploited. By using a bismuth nanoparticles modified glassy carbon electrode for Ni determination, the effect of the concentrations of *p*-aminophenol and Pd(II), biometallization time and temperature on the electroless deposition Ni-P were investigated and optimized. The stripping peak current of Ni was proportional to the concentration of human IgG in a dynamic range of 0.1–100 pg/mL with a detection limit of 0.03 pg/mL.

Keywords: Immunosensor; biometallization, Ni-P enhancement; stripping voltammetry

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