A Rapid, Label-free and Impedimetric DNA Sensor Based on PNA-modified Nanoporous Gold Electrode

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A gold nanoparticle film was successfully prepared on highly ordered and porous anodic aluminum oxide substrate through thermal evaporation deposition technique. As-fabricated nanoporous gold electrode modified by thiol-derivative peptide nucleic acid (PNA) was applied for impedimetric DNA sensing. *In-situ* kinetic analysis of PNA/DNA hybridization process was realized by electrochemical impedance spectroscopy (EIS) method. Considering the special structure of nanoporous gold electrode, a new equivalent circuit model was proposed for EIS data fitting. The sensitivity of PNA-modified nanoporous gold electrode is $0.4 \Omega/\text{cm}^2 \cdot \text{nM}$. Meanwhile, complementary DNA target could be detected at concentration as low as 10 nM, which indicating that a methodology for rapid, sensitive and label-free detection of DNA has been set-up based on nanoporous gold electrode.

Keywords: anodic aluminum oxide; nanoporous gold electrode; peptide nucleic acid; DNA sensing

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