

Electrochemical DNA detection system with charge properties between PNA and redox couple

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The label-free DNA detection system using peptide nucleic acid (PNA) as a capture probe was developed. The sensing electrode surface was modified with thiolated PNA, and the PNA density on the gold electrode was optimized to prevent surface insulation. The target DNAs were induced onto the immobilized PNA and the hybridization step was performed in the various conditions. After the washing step, the electrode surfaces were analyzed electrochemically in the presence of $\text{Fe}(\text{CN})_6$ as a electron mediators. The detection process is based on the charge properties of the hybridized target DNA and the redox couple. The PNA-modified sensing electrode is neutral due to the PNA's peptide backbone. On the other hand, the hybridized DNAs offer negative charge to the sensing surface. Thus, the electrochemical signal was decreased after the target binding due to the charge repulsion between the hybridized DNA and the negatively charged redox couple.