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Application of Gold Nanoparticles for Electrochemical DNA Biosensor

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Abstract

An electrochemical DNA biosensor was successfully fabricated by using (3-aminopropyl)triethoxysilane (APTES) as a linker molecule combined with the gold nanoparticles (GNPs) on thermally oxidized SiO_2 thin films. The SiO_2 thin films surface was chemically modified with a mixture of APTES and GNPs for DNA detection in different time periods of 30 min, 1 hour, 2 hours, and 4 hours, respectively. The DNA immobilization and hybridization were conducted by measuring the differences of the capacitance value within the frequency range of 1 Hz to 1 MHz. The capacitance values for DNA immobilization were 160 μF, 77.8 μF, 70 μF, and 64.6 μF, respectively, with the period of time from 30 min to 4 hours. Meanwhile the capacitance values for DNA hybridization were 44 μF, 54 μF, 55 μF, and 61.5 μF, respectively. The capacitance value of bare SiO_2 thin film was 0.42 μF, which was set as a base line for a reference in DNA detection. The differences of the capacitance value between the DNA immobilization and hybridization revealed that the modified SiO_2 thin films using APTES and GNPs were successfully developed for DNA detection.