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Electrochemical Detection of Specific DNA Sequences From PCR Amplicons on Carbon and Mercury Electrodes Using Meldola's Blue as an Intercalator

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Abstract: The electrochemical parameters for 7--dimethyl--amino--1,2-- benzophenoxazinium Meldola's Blue, (MDB) on binding to DNA at both a hanging mercury drop electrode (HMDE) and carbon paste electrode (CPE) are described. MDB, which interacts with immobilized calf thymus DNA, was detected using double stranded DNA modified HMDE or CPE (dsDNA modified HMDE or CPE), bare HMDE or CPE and single stranded DNA modified HMDE or CPE (ssDNA modified HMDE or CPE) in combination with adsorptive transfer stripping voltammetry (AdTSV) techniques and decreased peak currents were observed. The discrimination of dsDNA and ssDNA and detection of hybridization between synthetic oligonucleotides were determined from changes in the voltammetric peak of MDB. With the help of the planar phenoxazine ring, MDB was found to be intercalating between the base pairs of dsDNA. Several factors affecting the DNA immobilization, hybridization and indicator accumulation were investigated. The partition coefficient was also obtained from the signal of MDB with a dsDNA modified glassy carbon electrode (GCE). Specific DNA sequences from PCR amplicons were detected based on changes in the MDB reduction signal at the CPE. These results demonstrated that MDB could be used as an electroactive hybridization label for DNA biosensors.

Key Words: DNA, Biosensor, Meldola's Blue, Intercalator, PCR, Hybridization

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