

A single-step and label-free electrochemical DNA detection utilizing metal binding aptamer-tagged molecular beacon probe

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Here, we developed a single-step and label-free electrochemical DNA detection method utilizing aptamer sequence which has specific interaction with Pb^{2+} as signaling reagent. For this purpose, we have designed molecular beacon-like capture probe which consists of target-complementary loop part and Pb^{2+} aptamer-based stem part. The Pb^{2+} binds with aptamer of stem part in the capture probe which hinders the access of Pb^{2+} to the electrode surface during the preconcentration step of SWASV due to the electrostatic repulsion between the negative potential of electrode and the negatively charged DNA backbone of capture probe. When the target DNA hybridization occurs, on the other hand, the structure of capture probe changes from molecular beacon structure to linear structure, consequently Pb^{2+} is released from the capture probe. Accordingly, the current signal of Pb^{2+} is increased linearly according to the increasing amount of target DNA showing subpicomolar limit of detection. Therefore, based on the electrochemical signal of Pb^{2+} , the target DNA can be detected very conveniently without the need for any complicated labeling or secondary procedures.