A simple electrochemical method for ultrafast analysis of PCR amplicons

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We herein developed a simple and ultrafast electrochemical method to detect the polymerase chain reaction (PCR) amplicon by utilizing the oxidase-mimicking activity of cerium oxide nanoparticles (CeO_2). In the sensor, the presence of target DNA induces the production of PCR amplicons, which electrostatically interact with CeO_2 and 3,3',5,5'-tetramethylbenzidine (TMB) substrate and thus limit the formation of CeO_2-TMB complex that is required for the promotion of CeO_2-catalyzed TMB oxidation reaction. As a result, the oxidase-mimicking activity of CeO_2 is not effectively exerted, leading to the significantly diminished electrochemical current signal generated from the reduction of oxidized TMB. With this novel strategy, we successfully determined PCR amplicon derived from Escherichia coli (E. coli) with the total assay time less than 6 min even without the post-purification of DNA amplicon.