

Development of polydiacetylene (PDA) sensor for DNA detection based on ionic interactions

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We developed a new colorimetric diagnostic technology for rapid detection of double-stranded DNA (dsDNA) amplified by polymerase chain reaction (PCR) based on a principle of ionic interactions. Polydiacetylene (PDA) was selected as a colorimetric sensing material due to unique stimuli-responsive color-changing properties. Since a PDA sensor has applicative potentials for various modifications of monomer, we modified a carboxylic acid group of diacetylene monomer with positively charged amine. Positively charged amine can interact with negatively charged DNA. The mixed vesicles containing modified monomer and matrix monomer showed obvious color transitions from blue to red immediately after addition of dsDNA. In order to investigate color change of PDA by single-stranded DNA (ssDNA), a primer was used but blue PDA solution didn't exhibit any color change. In case of the failure of PCR, because ssDNA and template DNA didn't cause color transitions of PDA, sample of amplification failure didn't show chromatic transitions of PDA. The advantage of this study is feasible to detect dsDNA rapidly without using DNA electrophoresis, as well as simple, rapid, sensitive and practical in both medical and research fields.