

Abstract

Cost-Effective Multiplex Real-Time PCR Chip System Using Open Platform Camera †

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Abstract: This paper proposes a cost-effective real-time multiplex polymerase chain reaction (PCR) chip system for point-of-care (POC) testing. In the proposed system, nucleic acid amplification is performed in a reaction chamber built on a printed-circuit-board (PCB) substrate with a PCB pattern heater and thermistor. Fluorescence can be detected through the transparent plastic on the other side of the substrate. Open platform cameras were used for miniaturization and cost effectiveness. We also used a simple and cost-effective oblique lighting to stimulate fluorescence. Response performance was investigated by observing the change in the average brightness of the chamber images with various reference dye concentrations. In addition, we investigated the interference properties between different colors by measuring the fluorescence response for each dye concentration mixed with the maximum concentration of the different dyes. Quantitative performance was validated using standard DNA solutions. Experimental results show that the proposed system is suitable for POC real-time multi-PCR system.

Keywords: real-time polymerase chain reaction; multiplexing; open platform camera; PCR chip; PCB substrate