

World-to-Chip Microfluidic Interfacing for PCR Assay Chips

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Abstract

We report a practical world-to-chip microfluidic interfacing method with built-in valves suitable for microscale multichamber chip-based assays.¹⁾ The importance of world-to-chip microfluidic interface has been heightened as the need to have multiple chambers on a single chip has emerged from the molecular diagnostic field. For qualitative clinical diagnostics, it is likely that the chip would require at least three chambers: a test sample, a negative control, and a positive control. Also, for quantitative applications, multiple chamber format is useful in holding an unknown sample with a set of known standard samples. Therefore, it is essential that for molecular diagnostics, multiple assays need to be carried out on a single chip. To deal with the above issues, we have proposed a multiple microfluidic interfacing system with built-in valves. Our system is simple and inexpensive to fabricate, and is easy to interface with the real world by using conventional pipette tips. To demonstrate the utility of our world-to-chip microfluidic interface, we designed a microscale PCR chip with four chambers and performed PCR assays. After sample loading and sealing, leakage tests were conducted at 100 °C for 30 min and no detectable leakage flows were found during the test for 100 microchambers. The PCR results yielded a 100% success rate with no contamination or leakage failures. In conclusion, we have introduced a simple and inexpensive microfluidic interfacing system for both sample loading and sealing with no dead volume, no leakage flow and biochemical compatibility.

References

1. Kwang W. Oh, *et. al.*, "World-to-chip microfluidic interface with built-in valves for multichamber chip-based PCR assays," *Lab Chip*, **5**, pp. 845-850, 2005.