

Reference: Liu, C. N.; Toriello, N. M.; Mathies, R. A. "Multichannel PCR-CE Microdevice for Genetic Analysis" *Anal. Chem.*, **2006**, 78, 5474-5479.

Bioanalysis and Sample: Mathies group developed the microdevice coupled PCR with CE separation aiming at high throughput genetic analysis. The multichannel design can analyze four different samples in a single run within 30 minutes. The author also demonstrated that the device has good lane-to-lane uniformity and the detection limit is as good as 10 DNA copies.

Importance: For fields like medical diagnostics and bio-analysis, the demand for high throughput, low cost, easy to operate, integrated and automated device is increasing. The development of microdevices (micro total analysis system) has a potential to meet this demand. Microdevices which minimize and integrate the traditional analytical protocols on a chip take the advantage of low cost, integration and automation. In this paper, the author designed the multichannel microdevice for PCR-CE process which is used for genetic analysis. The microdevice reduced the analysis time greatly and achieved the high throughput requirement.

Technique: the microdevice is fabricated on a glass-PDMS hybrid substrate. The Ti/PT heaters and resistive temperature detector (RTD) are etched on the top side while PCR chamber and CE channel on the back side. There are four paralleling channels of the microdevice. Two channels share the heater, RTD and cathode while the four channels together share the anode. After the four samples are loaded, they are injected into the PCR chamber. There is heat transfer between heaters and PCR chambers through the substrate. By controlling the temperature of the heaters, the PCR cycles can be achieved. Since the PCR chamber and heaters are only separated by the hybrid substrate, the heating and cooling rate is high and 30 complete PCR cycles can be done in 27 minutes. The four channels can run different sample at the same time. Also, the results show that two different DNA can be amplified and separated in one channel.

Example of Results: the multichannel microdevice in the paper is used to analyze four different samples: (1) M13mp18 template and E. coli K12 cells, (2) only M13mp18 template, (3) E. coli K12 cells, (4) negative control. The analysis is completed in a single run in 30 minutes. The results show that PCR process is successful for the four samples. Especially for sample 1, the two types of DNA don't interfere with each other during the PCR process and can get good separation.

Opinion: I think the author developed a good microdevice for high throughput genetic analysis. The analysis is fast compared to conventional analysis procedure and the detection limit is good. The paralleling analysis of different sample is alluring. However, the lane to lane difference which is due to injection efficiency difference and irregular gel-sample interface is still a problem especially when the initial copy number is small. So I think it is not proper to do a quantitative analysis right now. The author should work on the problems and improve the lane to lane uniformity.

