

Integration of Epicyclic Gearing for Continuous Flow in a Centrifugal Microfluidic System

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A reflow system based on the reverse rotation of a centrifugal chip has been reported previously by our group. It allows the cell suspension to simply interact with the hydrodynamic traps several times which could provide a higher probability of trapping. This enables the decrease in the number of wasted cells in a suspension perfused through a typical microfluidic chip. Microfluidics technology has proven its usefulness in preparing single cells for Life Science Research. In our previous design, a trapping efficiency of 85% was obtained using THP-1 cells at a lower rpm (300 rpm). However, one main problem is the high variability of the performance of each chip due to the innate non-uniformity in chip fabrication. As a solution, it was decided to integrate a planetary gear in controlling the motion of the chip. Instead of inducing a reflow, a continuous flow was induced brought by the motion of the chip. This report presents the optimization of the platform.

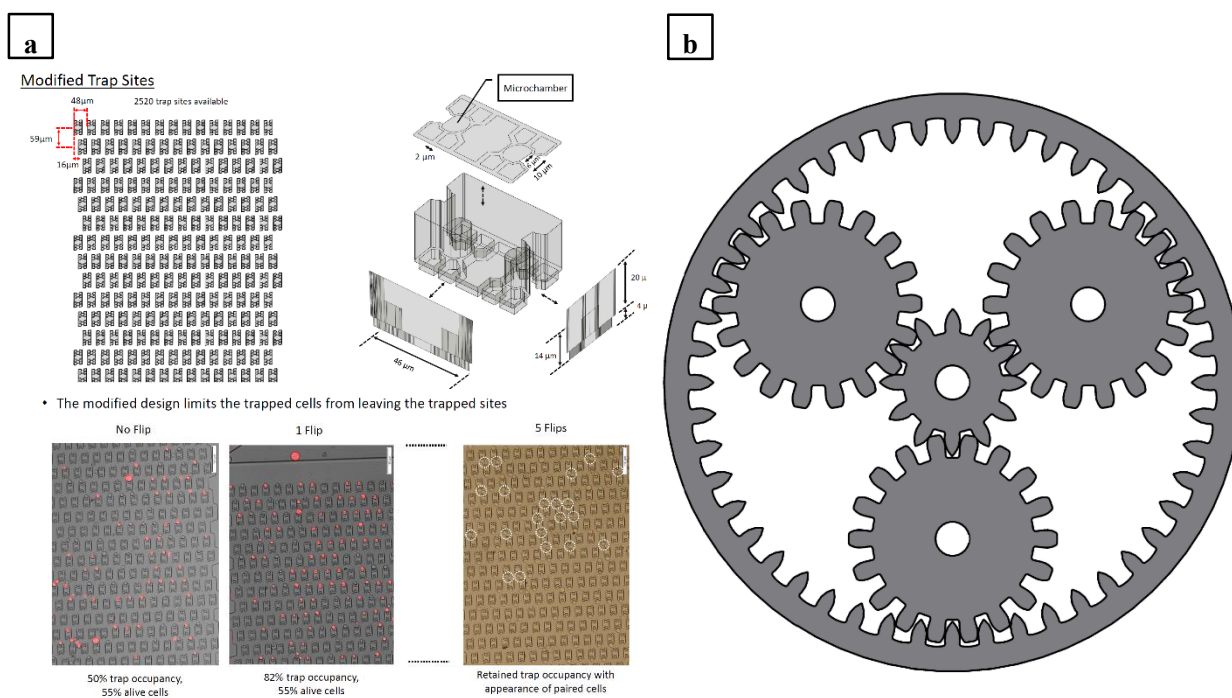


Fig. 1. Design and operation of the microfluidic device. (a) trap array design and sample trapped THP-1 using reflow system. (b) Rough design of the rotating stage based on planetary gear.