

Serial dilution of droplets in the microfluidic device using suction valve

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We report a serial dilution microfluidic device to generate arrays of moving droplets containing variation of chemical concentration between individual drops. Microarray system has enhanced sensitivity and reaction efficiency in small scales, favorable mass transport properties, and the potential for scalable and cost-effective small volume assays. In this system, we describe a non-stop passive strategy to create precise and quantitative gradation in array chamber. Under the fully automated system, the precise control of pneumatic microvalves can correctly manipulate individual droplets for delivering, merging and mixing of distinct droplets. The following step, the droplets enter into the array chamber pressed negatively. Herein, we count the maximum number of droplets within array chamber. As a result, we confirm the accurate ratio of the material to comprise the droplets in the array chamber. Finally, controlled the ratio in continuous array chambers demonstrate quantitative gradation. Thus, our method could be valuable as a useful platform to study fundamental biological and chemical reactions, high-throughput and high-resolution screening, or combinatorial synthesis or analysis.