

Implementation of complete protocols in a Teflon tube

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Droplet based microfluidics continues to grow as a vehicle to perform chemical and biological reactions using small quantities of fluids, however complex protocols are rarely possible in existing devices. This paper implements a new approach to merging of drops, combined with magnetic bead manipulation, for the creation of ligated double-stranded DNA molecule using “Gibson assembly” chemistry. DNA assembly is initially accomplished through the merging, and mixing, of five drops followed by a thermal cycle. Then, integrating this drop merging method with magnetic beads enable the implementation of a more complete protocol consisting of nine wash steps, merging of four drop, transport of selective reagents between twelve drops using magnetic particles, followed by a thermal cycle and finally the deposition of a purified drop into an Eppendorf for downstream analysis. Gel electrophoresis is used to confirm successful DNA assembly.