Design of 3D micromixer for bio-synthesis using COMSOL multiphysics software package

Abstract

Moving parts of micrometer scale make the chips very expensive and fragile and are therefore to be avoided if at all possible. An alternative method for transporting fluid in the samples is through capillary effect, the phenomena which are the spontaneous movement of liquids based on cohesive forces within the liquid and adhesive forces between the liquid and its surroundings can be explored to drive fluid within microchannel by only manipulating the geometric component of the fluid structure. Here, we designed a 6-inlet/Tri-Y micromixer for mixing fluid by passively driven fluid Using COMSOL 3.5 Multiphysics software and Incompressible Navier-Stokes application mode to solves the fluid flow and the Convection and Diffusion application mode solves the transport of the concentration within the fluid, Each microchannel in the mixer has a ellipse cross section with a side of 15 μm. Because of the chosen geometry, microchannel height in the model is <10 μm. To create the curved channel shape, the model uses concentric circles with inner radii of 260 μm, 280 μm, and 300 μm to form the structure, the chosen geometry has help bringing the mixing point 3 mm shorter compared with the previously modeled geometry, thus, the study demonstrate possibility of creating suitable microfluidic structure for the manipulation fluid mixing for medical applications.

Keywords