Two-phase microfluidic flow in hydrodynamic filtration for efficient cell particle sorting

윤규[1,2], 정현욱[1], 전명석[2,†]
[1]고려대학교; [2]한국과학기술연구원
(mschun@kist.re.kr[†])

As the flow-based passive sorting technique, the hydrodynamic filtration (HDF) has shown to continuously separate into different sizes of subpopulations from cell or particle suspensions. The model framework of HDF involving two-phase Newtonian or the generalized Newtonian fluid (GNF) was developed for the rational design of microfluidic-chip, by performing the complete analysis of laminar flow fraction and complicated networks of main and multiple branch channels. We estimated rigorously pressure drop, velocity profile, and the ratio of flow fraction at each branch point, in which the analytical model for the flow fraction was validated with particle tracing simulations. Several kinds of constitutive model can be considered as the GNF fluids. The objective parameters include the number of the branch channels and the length of narrow section of each branch for arbitrary conditions. As the side flow becomes more viscous, the flow fraction increases but the number of branches decreases, which enables a compact chip designed with fewer branches being operated under the same throughput.