Supplementary Information for

An experimental study of the merging flow of polymer solutions in a T-shaped microchannel

Le Song,[a,b,*] Mahmud Kamal Raihan,[b,*] Liandong Yu,[c,†] Sen Wu,[b,d] Nayoung Kim,[b] Savannah Rose Till,[e] Yongxin Song,[d] Xiangchun Xuan[b,‡]

[a] *School of Instrument Science and Opto-electronic Engineering, Hefei University of Technology, Hefei 230009, China*

[b] *Department of Mechanical Engineering, Clemson University, Clemson, SC 29634-0921 USA*

[c] *College of Controlling Science and Engineering, China University of Petroleum, Qingdao 257061, China*

[d] *College of Marine Engineering, Dalian Maritime University, Dalian 116026, P. R. China*

[e] *Department of Bioengineering, Clemson University, Clemson, SC 29634-0905 USA*

---

[*] These two authors contributed equally to this work.

[†] Corresponding author. E-mail address: liandongyu@upc.edu.cn (L. Yu).

[‡] Corresponding author. E-mail address: xcxuan@clemson.edu (X. Xuan).

The three-dimensional numerical simulation of the merging flow of Newtonian water in the T-shaped microchannel was performed in COMSOL®. Fig. S-1 shows the computational domain, where only a length of 2 mm in the main branch and a length of 0.75 mm in each side branch were considered to reduce the computational cost. The width and depth of the channel were used as measured. The flow field was solved from the continuity and Navier-Stokes equations,

$$\nabla \cdot v = 0, \tag{S-1}$$

$$\rho\left(\frac{\partial v}{\partial t} + v \cdot \nabla v\right) = -\nabla p + \eta \nabla^2 v, \tag{S-2}$$

where v is the velocity vector, p is the pressure, ρ is the water density (1000 kg/m^3), and η is the water viscosity (1 mPa·s). The no-slip boundary condition, $v \cdot t = 0$, was imposed to the walls with t being the tangential unit vector. The inlet boundary of each side branch was imposed with the volumetric flow rate. The outlet boundary of the main branch was imposed with a fully developed flow condition. The computational domain was discretized using tetrahedral elements. A grid independence study was conducted to ensure the solution accuracy. A grid with the smallest mesh size of 6 μm near the T-junction but the overall mesh size not exceeding 10 μm in the entire domain was found sufficient to produce mesh-size insensitive results.

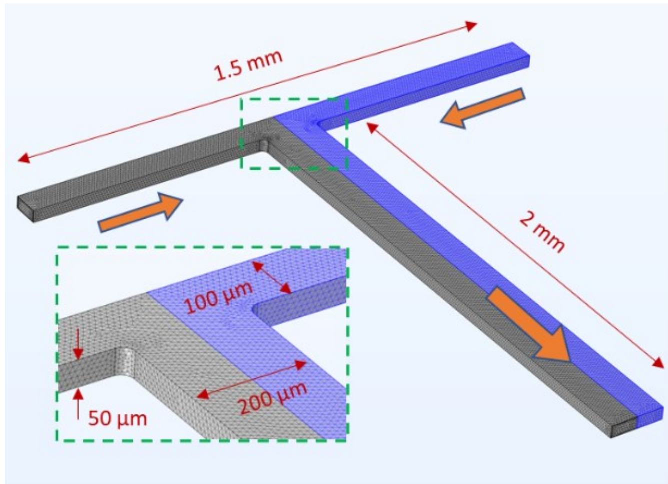

Fig. S-1. Isometric view of the three-dimensional computational domain used for the numerical simulation of water flow in a T-shaped micorchnanel, where the inset shows the zoom-in view of the meshes in the T-junction region.