Numerical Study on Two-Phase Flow in a Y-Junction Rectangular Microchannel

Wasim Khan[1], Bushra Khatoon[2], Vikas Chaudhary[3], Sadhana Sachan[4], M. S. Alam[5]*
[1, 2,3,4,5] Department of Chemical Engineering MNNIT Allahabad
** Corresponding author: msalam@mnnit.ac.in*

Abstract

Numerical investigation of liquid-liquid (water-cyclohexane) two phase flow in a Y junction rectangular cross-sectional microchannel was studied. In this paper, the effect of channel geometry, wall properties (cohesion & adhesion) on flow regime, mixing efficiency and pressure drop under slug flow regime were carried out, respectively. The above analysis was performed on 2D model, developed in ANSYS Academic research CFD 18.2 software using volume of fluid method (VOF) to calculate these parameters in a Y-junction microchannel. For liquid-liquid two phase flow velocities were ranging from 0.025 to 0.5 m/s. In addition, temperature of the wall varied from 300 to 350 K to analyse the heat effects on flow patterns in microchannel was studied and discussed. One of the main objectives of this investigation was to study the hydrodynamics and mixing characteristics in a unit slug length. The effect of wall properties (contact angle), flow velocity, geometry and viscosity of the fluids on flow patterns was also observed. The results obtained from simulation show consistent with available literature and experimental results, wall properties of microchannel were greatly influenced the flow patterns and mixing characteristics in the channel.