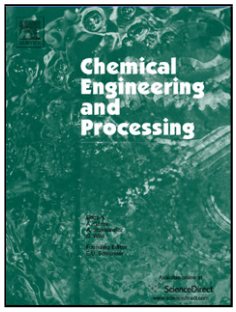

Title: CFD study about the effect of using multiple inlets on the efficiency of a micromixer. Assessment of the optimal inlet configuration working as a microreactor

Author: J. Ortega-Casanova

PII: S0255-2701(17)30929-7
DOI: https://doi.org/doi:10.1016/j.cep.2018.01.017
Reference: CEP 7172

To appear in: *Chemical Engineering and Processing*

Received date: 14-9-2017
Revised date: 12-11-2017
Accepted date: 23-1-2018

Please cite this article as: J. Ortega-Casanova, CFD study about the effect of using multiple inlets on the efficiency of a micromixer. Assessment of the optimal inlet configuration working as a microreactor, *<![CDATA[Chemical Engineering and Processing - Process Intensification]]>* (2018), https://doi.org/10.1016/j.cep.2018.01.017

CFD study about the effect of using multiple inlets on the efficiency of a micromixer. Assessment of the optimal inlet configuration working as a microreactor

J. Ortega-Casanova*
Universidad de Málaga, Andalucía Tech, Escuela de Ingenierías Industriales,
C/ Dr Ortiz Ramos s/n, 29071 Málaga, Spain
*Corresponding author: jortega@uma.es

Abstract

This work deals with a 2D numerical study about the effect the number of inlets of a micromixer on the mixing efficiency when two fluids must be mixed at low Reynolds and high Schmidt numbers. In this study, 6 different inlet configurations (with 2, 3, 4, 5, 6 and 7 inlets) for 2 Reynolds (0.1 and 0.29) and 3 Schmidt numbers (10×10^3, 4×10^3 and 2×10^3) have been considered. Just as reference micromixer and for comparative purposes, the geometry studied in Ortega-Casanova [1], with just 2 inlets, has been now redesigned with more inlets incorporated. Originally, the micromixer with 2 inlets, $Re = 0.29$ and $Sc = 10 \times 10^3$ gave a mixing efficiency of ∼14%, while we show in this work that with 7 inlets and the same Reynolds number, the efficiency can be increased up to ∼80%, when $Sc = 10 \times 10^3$, and up to ∼95%, when $Sc = 2 \times 10^3$. Later, we show that the mixing cost of the optimal inlet configuration is one of the lowest in comparison with previous works. Additionally, when the optimal configuration is used as microreactor, the reacting efficiency also increases in comparison with the 2-inlet configuration. We also estimate the number of inlets for full and complete mixing.

Keywords: Micromixer, Low Reynolds numbers, High Schmidt numbers, Mixing efficiency, Mixing cost, microreactor.

1. Introduction

This work is based on the fact that new device designs are normally conceived to improve their previous versions [1, 2] so a new, and with better performance, micromixer design will be