Asociación Argentina
de Mecánica Computacional

Mecánica Computacional Vol XL, págs. 673-673 (resumen)
F.A. Avid, L.C. Bessone, P. Gamazo, J.J. Penco, M.A. Pucheta, M.A. Storti (Eds.)
Concordia, 6-9 Noviembre 2023

3D NUMERICAL PROTOTYPING OF T-JUNCTION DROPLET GENERATORS

David G. Harispe [a, b] **and Pablo A. Kler** [a, b]

[a]*Centro de Investigación de Métodos Computacionales (CIMEC, UNL–CONICET), Colectora RN 168 Km 472, S3000GLN Santa Fe, Argentina.*

[b]*Departamento de Ingeniería en Sistemas de Información, FRSF-UTN, Lavaisse 610, S3004EWB Santa Fe, Argentina.*

Keywords: microdroplet, volume-of-fluid, multiphasic flow, dripping regime, embedded boundaries, three-dimensional.

Abstract. Numerical simulations facilitate the development of prototypes to aid in designing and optimizing devices that generate micro-droplets by dispersing one fluid (dispersed phase) into another (continuous phase). The study of the operating conditions required for experimental production of micro-droplets in two-phase systems is ongoing. To facilitate the analysis, literature operating conditions are taking as starting points for each numerical prototype. In this work we specifically studied droplets generated through T-Junction devices. This configuration is one of the most commonly used in micro-fluidic laboratories as far as it is commercially available as PEEK (Polyetheretherketone) interfaces for liquid chromatography and other similar applications. In these devices, certain assumptions as axial symmetry (valid for coaxial generators), or a conformal domain (rectangular), are not appropriate. To address these issues, a 3D simulation has been developed by using an embedded boundary method that defines the position and shapes of the capillaries within a Cartesian mesh. For the computational model, Basilisk, a free software program for solving flow equations based on the volume-of-fluid method, was used. Basilisk is designed to perform curvature and surface stress calculations, efficiently and accurately, for these types of micro-fluidic applications. The results obtained in the computational study of a T-Junction system for a two-phase model are presented and compared with experiments present in the literature.