

Experimental Investigation of Air-Water Two-Phase Flow Pattern in T-Junction Microchannel

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Abstract : Water management plays a crucial role in the performance and durability of PEM fuel cells. Whereas the membrane must be hydrated enough, liquid droplets formed by water in excess can block the flow in the gas distribution channels and hinder the fuel cell performance. The main purpose of this work is to increase the understanding of liquid transport and mixing through mini- or micro-channels for various engineering or medical process applications including cooling of equipment according to the operations considered. For that purpose and as a first step, a technique was developed to automatically detect and characterize two-phase flow patterns that may appear in such. The investigation, mainly experimental, was conducted on transparent channel with a 1mm x 1mm square cross section and a 0.3mm x 0.3 mm water injection normal to the gas channel. Three main flow patterns were identified liquid slug, bubble flow and annular flow. A flow map has been built according to the flow rate of both phases. As a sample the following figures show representative images of the flow structures observed. An analysis and discussion of the flow pattern, in mini-channel, will be provided and compared to the case of micro-channel. . **Keywords:** Two phase flow, Clean Energy, Minichannels, Fuel Cells. Flow patterns, Maps.

Keywords : two phase flow, T-junction, Micro and minichannels, clean energy, flow patterns, maps

Conference Title : ICMLC 2023 : International Conference on Microfluidics and Lab-on-a-Chip

Conference Location : Paris, France

Conference Dates : June 22-23, 2023