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INVESTIGATION OF PRESSURE DRIVEN MICROFLUIDIC FLOW IN MICROGRAVITY

Abstract

Lab-on-a-chip is an effective way to gain comparably the most accurate data in any applicable domain. While it yields close to precise solutions for many biomedical, fluidic, material science problems, its credibility at **microgravity** conditions can expand biological applications beyond the boundary of the biosphere. This research draws experimental results from the database of RVSAT-1, which is a student satellite project carrying a microbiological payload onboard with a fluidic card setup. Fluidic behaviour, which is the consequence of fluid's properties, changes appreciably with operating conditions. This manuscript focuses upon the effect of Micrograviy on fluid behaviour. This paper assumes the most trivial configurations of the microfluidic card i.e., **microchannels** connecting **microwells** which makes basic setup for microbial culture. These configurations are simulated with low Reynold's number in a pressure driven flow. When the fluid flows through microchannels in near-Earth orbit conditions its fashion of filling the wells does not remain the same as compared to that on ground conditions. This can cause one or more irregularities among the few mentioned which are **maldistribution**, different **pressure contours** and change in **velocity components** of fluid flow for the same configuration at two different conditions.

In this manifesto, the simulations in microgravity conditions are compared to their counterparts' simulations and experimental results on ground conditions. Experimental results are used to deduce the error between simulated and practical flow, thereby incorporating the extent of error for microgravity simulations. The simulations are performed using **ANSYS WORKBENCH** simulation software. Experimental setups and simulation designs of the microfluidic cards are specified in this paper, with dimensions of cards, wells and microchannels. A numerical value analysis on the mentioned parameters along with the losses in each configuration in the form of pressure loss is provided. The results are compared across different configurations, and generic designs that can minimize the undesired behaviour are also discussed.