

عنوان مقاله:

Performance Improvement and Two-Phase Flow Study of a Piezoelectric Micropump with Tesla Nozzle-Diffuser Microvalves

محل انتشار:

دوماهنامه مکانیک سیالات کاربردی، دوره 12، شماره 2 (سال: 1398)

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خلاصه مقاله:

The Present article aims to design a piezoelectric micropump using a combinational form of microvalves with sufficient diodicity in low-pressure gradients. The goal is to enhance the capability of piezoelectric micropumps with Tesla-type valves in order to deliver insulin. Tesla-type valves are in the category of passive valves which have sufficient diodicity in case of high-pressure gradients. However, low mass flow rates are often required in drug delivery devices. In this paper, the performance of MT۱۳۵ Tesla-type valve in low pressure-gradient flows has been investigated and a range of reunion angles, which have not been studied before has been examined by numerical solutions. Inspired by nozzle-diffuser valve types, some changes in the bypass path of the microvalve have been exerted to boost the diodicity of the valve in low-pressure conditions that resulted in ۹.۹۷% increase of diodicity. At last but not least, the velocity gradients in single-phase flow of water has been attained and performance of micropump toward other kinds of flows has been investigated by a volume of fluid (VOF) model including water as the primary phase and air as the secondary one. To complete the analysis, a VOF model consisting of an arbitrary kind of Casson fluid with the primary phase of water was reached and discussed.

کلمات کلیدی:

Micropump, Piezoelectric, Tesla, type valve, Nozzle, diffuser valve, Multiphase flow

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