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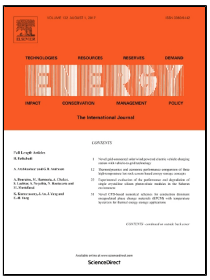

Entropy generation of two-layer magnetohydrodynamic electroosmotic flow through microparallel channels

Zhi-Yong Xie, Yong-Jun Jian

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Entropy generation of two-layer magnetohydrodynamic electroosmotic flow through microparallel channels

Zhi-Yong Xie, Yong-Jun Jian*

School of Mathematical Science, Inner Mongolia University, Hohhot, Inner Mongolia 010021, PR China

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ABSTRACT

The entropy generation analysis of two-layer magnetohydrodynamic electroosmotic flow through a microparallel channel is performed in this study. The two immiscible fluid flows are both driven by a combination of electroosmotic force, pressure gradient and electromagnetic force. Under the framework of Debye-Hückel linearization approximation as well as the assumption of thermally fully developed and the condition of constant wall heat flux, the distributions of velocity and temperature are analytically derived and they are utilized to compute the entropy generation rate. The effects of fluid physical parameter ratios on the distributions of two-layer fluid velocity and temperature are firstly discussed. Then the local and total entropy generation rates are investigated for different magnetic field parameter (*Ha*) and the viscous dissipation parameter (*Br*) under the appropriate fluid physical parameter ratios. The results show that the entropy generation rate strongly depends on the velocity and temperature fields and the local entropy generation reveals a decreasing trend form the microchannel wall towards the fluid interface for both bottom and upper layer fluid. The present endeavor can be utilized to design the efficient thermal micro-equipment.

Keywords: Electroosmotic flow (EOF); Magnetohydrodynamic (MHD); Immiscible fluids; Entropy generation.

1. Introduction

Due to the rapid development of microfluidic devices such as micro-electro-mechanical systems (MEMS), biochemical and biomedical instruments, drug delivery biochip, chemical

* Corresponding author.

E-mail address: jianyj@imu.edu.cn (Y.J. Jian).